SAHA | SAN ANTONIO HOUSING AUTHORITY
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818 S. FLORES ST. ◊ SAN ANTONIO, TEXAS 78204 ◊ www.saha.org

Procurement Department

REQUEST FOR PROPOSALS

For
Victoria Plaza Apartments Rehabilitation and Modernization

For

HOUSING AUTHORITY OF THE CITY OF SAN ANTONIO, TEXAS AND AFFILIATED ENTITIES

RFP#: 1805-909-23-4796

Prepared by:

Department of Procurement
of
The San Antonio Housing Authority
818 South Flores Street
San Antonio, Texas 78204

President and CEO …….... David Nisivoccia

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Section A
Background Information and Evaluation

I. Background Information: The San Antonio Housing Authority d/b/a San Antonio Housing Authority ("SAHA") is a public housing agency created by resolution of the City of San Antonio in 1938 pursuant to the Texas Housing Authorities Law (now Chapter 392 of the Texas Local Government Code) and federal law. SAHA is a unit of government and its functions are essential governmental functions. The property of SAHA is used for essential public and governmental purposes and is exempt from all taxes, including sales tax on all its purchases of supplies and services.

SAHA enters into and executes contracts and other instruments that are necessary and convenient to the exercise of its powers. SAHA maintains contractual arrangements with United States Department of Housing and Urban Development (HUD) to manage and operate its low rent public housing program and administers the Section 8 Housing Assistance Payments Programs. SAHA programs are federally funded along with development and modernization grants and rental income.

Its primary activity is the ownership and management of over 6,300 public housing units. It also administers rental assistance for almost 12,000 privately owned rental units through the Section 8 program. It operates and manages its housing developments to provide decent, safe, sanitary and affordable housing to low income families, the elderly, and the disabled, and implements various programs designed and funded by HUD.

SAHA has created a number of affiliated public facility corporations ("PFCs") pursuant to Chapter 303 of the Texas Local Government Code (the Public Facility Corporation Act). In some instances, these PFCs own projects. In other cases, PFCs or other related entities serve as partners in partnerships that have been awarded low-income housing tax credits. SAHA's affiliated entities own and operate over 3,000 units of affordable housing.

SAHA staff also manages the San Antonio Housing Finance Corporation ("Finance Corporation"), which is primarily a conduit issuer of bonds for contractors of affordable housing projects. The Finance Corporation was created pursuant to Chapter 394 of the Texas Local Government Code (the Texas Housing Finance Corporations Act). When used herein, "SAHA" shall include its affiliated entities.

As a part of our social mission and federal mandate, SAHA is committed to providing economic, training and educational opportunities to the low income individuals in the communities we serve. All contractors are required to recruit and hire low income individuals for new positions and provide training & educational opportunities to the greatest extent feasible for these individuals.

SAHA is governed by a Board of Commissioners and managed on a day-to-day basis by its President and CEO. The SAHA Board of Commissioners, upon the advice of the President and CEO, approves all major policy and contractual decisions. The President and CEO is then charged with implementing these actions.

II. Property Rehabilitation Opportunities:

At this time, The Housing Authority of the City of San Antonio and its affiliated entities (SAHA) invite proposals from qualified, experienced construction companies to provide for the rehabilitation and modernization of the Victoria Plaza Apartments located at 411 Barrera, San Antonio, TX 78210 as further described in Exhibit A. The property is geographically located in the southeastern quadrant of downtown in the City of San Antonio across from HemisView Plaza. The properties consist of 185 units in a 9-story high-rise brick building. The building occupants have historically been seniors and disabled. Amenities include a Community Room, Cafeteria, craft shop, Office for Senior Services and a nutrition center with Wi-Fi available in the community room.

SAHA will consider proposals from responsible organizations or individuals currently engaged in the performance of property construction, rehabilitation and modernization services who have competency in performing comparable on-site property improvements for similar properties, acceptable financial resources and personnel staffing to perform the services requested. The structure is currently vacant.

III. Timeline:

DATE ISSUED	June 7, 2018
NON-MANDATORY PRE-SUBMITTAL MEETING & SITE VISIT	June 20, 2018 at 10:00 A.M. Victoria Plaza Apartments 411 Barrera San Antonio, TX 78210
LAST DATE FOR QUESTIONS	June 26, 2018
PROPOSAL DUE DATE	July 11, 2018 at 2:00 P.M. SAHA Procurement Dept. 818 S. Flores, San Antonio, TX 78204
ANTICIPATED APPROVAL BY THE BOARD	Aug/Sept 2018

SAHA reserves the right to modify this schedule at their discretion. Notification of changes in connection with this solicitation will be made available to all interested parties via an emailed Addendum and by posting on SAHA's website and other websites.

IV. Objectives:

The services to be provided include all aspects of demolition, rehabilitation, and modernization of the Victoria Plaza Apartments including incorporation of energy use improvements consistent with the attached plans and specifications, including applicable regulatory compliance standards, codes, rules statutes, and reporting.

The goal of the rehabilitation and modernization of this property is to enhance and improve the asset and to extend its useable life as a safe and desirable residential facility. Achievement of this goal will include, but not be limited to the:

- Reduction of energy and utility consumption;
- Improvement of resident safety;
- Reduction of maintenance costs; and
- Improvement of aesthetics and livability;

V. Desired Outcome:

A. The successful Contractor will assume full responsibility for the property reconstruction at a date and time reflected in a Notice to Proceed issued by the SAHA Construction Services Department. SAHA expects an approximate 18 month construction period.

VI. Evaluation: Each proposal submittal will be evaluated based upon the following information and criteria:

A. Initial Evaluation-Responsiveness: Each proposal received will first be evaluated for responsiveness (i.e., meeting the minimum requirements as stated in the RFP)

B. Evaluation-Responsibility: SAHA shall select a minimum of a three-person panel, using the criteria established below, to evaluate each of the proposals submitted in response to this RFP to determine the Respondent's level of responsibility. SAHA will consider capabilities or advantages that are clearly described in the proposal that may be confirmed by oral presentations, site visits, demonstrations, and references contacted by SAHA. All proposals will be evaluated as to their overall value to SAHA.

C. Restrictions: All persons having familial (including in-laws) and/or employment relationships (past or current) with principals and/or employees of a Respondent will be excluded from participation on SAHA's evaluation panel. Similarly, all persons having ownership interest in and/or contract with a Respondents will be excluded from participation on SAHA's evaluation panel.

D. Evaluation Criteria: The evaluation panel will use the following criteria to evaluate each proposal:

5 Excellent
4 Above Average
3 Average
2 Below Average
1 Poor
0 Non Responsive

Continues on next page.

No.	Points	Weight	CRITERION DESCRIPTION
1	0-5	20%	**Experience in Affordable, Mixed-Income and Multi-story Construction, Rehabilitation and Modernization:** Depth and breadth of Respondent's experience and qualifications beyond the Minimum Qualifications; Familiarity with rehabilitation and modernization of existing multi-story buildings. Proven record of accomplishment in the Multi-story construction, rehabilitation and modernization. Record of accomplishment of work with other governmental entities, including housing authorities, HUD, Non Profits, and multifamily industry.
2	0-5	20%	**Project Management:** Respondent's proposed project approach and draft plan for this project. Use of technology in the plan to control risks and schedule slippage.
3	0-5	10%	**Capacity/Financial Viability:** Respondent's financial and staffing capacity to support a project of this size and scope. Current number of active projects which affect project manpower and schedules.
4	0-5	10%	**Construction Plan**: Clarity and sufficiency of proposed Plan; Capacity to execute to proposed plan and complete construction in a timely and on budget manner. Proposed plan schedule and timeline for completion. Number and type of sub-contractors utilized vs. self-performed work.
5	0-5	5%	**Strength of the Contractor's Section Utilization 3 Plan**
6	0-5	5%	**Strength of the Contractor's S/W/MBE Utilization Plan**
7	0-5	30%	**Price proposal:** Competitive fee structure offered that's within SAHA's expected costs and available funding.
		100%	**Total Points for Criteria**
		POINTS	**HUD SECTION 3**
1		5	**Section 3 Preference:** A firm may qualify for Section 3 status for up to an additional 5 points.
a		5	**Category I:** As detailed in Attachment D
b		4	**Category II:** As detailed in Attachment D
c		*3*	**Category III:** As detailed in Attachment D
d		2	**Category IV:** As detailed in Attachment D

E. Competitive Range: Once a competitive range is established from the proposals submitted, SAHA reserves the right to require Respondents within the competitive range to make a presentation to the evaluation committee. Presentations, if requested, shall be a factor in the award recommendation.

VII. Minimum Qualifications: Respondents must meet the following criteria:

A. Type of Organization: Firms or joint ventures of firms with a demonstrated record of expertise in one or more of the following:

- Construction and completion of two or more projects within the past 10 years of a similar nature, size and scope as contemplated herein.
- Completion of two or more projects in the past 10 years reflecting Respondent's experience in rehabilitating and modernizing affordable multifamily housing by incorporation of energy use improvements .
- Continuous operation for three (3) or more years as a construction firm or 10 or more years' experience of principals collectively in the construction, rehabilitation and modernization of multi-family residential housing.
- Valid Contractor's license to do business in the State of Texas.
- Project Manager shall have a minimum of 10 years of project management experience in the rehabilitation and modernization of high rise construction rehabilitation projects.

- Proven ability to adhere to project budgets and schedules.
- Minimal litigation background over past five (5) years.

End Section A

Section B
Instructions to Respondents

I. **Point of Contact**: The point of contact for purposes of obtaining the Request for Proposal and to submit responses is:

POINT OF CONTACT	Charles Bode, Assistant Director of Procurement San Antonio Housing Authority 818 S. Flores San Antonio, TX 78204 Phone: (210) 477-6703 E-mail: charles_bode@saha.org

The Request for Proposals can be obtained by calling 210-477-6059 or online at

www.saha.org

http://nahro.economicengine.com

http://www.publicpurchase.com

All Addenda will be posted on SAHA's website www.saha.org, http://nahro.economicengine.com and www.publicpurchase.com. Any changes that are issued before the proposal submission deadline shall be binding upon all prospective Respondents.

Respondents shall address all communication and correspondences pertaining to this RFP process to only the Contact person identified above. Respondents must not inquire or communicate with any other SAHA staff member or official (including members of the Board of Commissioners) pertaining to this RFP. Failure to comply with this requirement is cause for a proposal to be disqualified. During the RFP solicitation process, SAHA will not conduct any ex parte conversations which may give one prospective Respondent an advantage over other prospective Respondents.

II. **Prohibitions:** Contact with members of the SAHA Board of Commissioners, or SAHA officers and employees other than the contact person listed herein**,** by any prospective Respondent, after publication of the RFP and prior to the execution of a contract with the successful Respondent(s) could result in disqualification of your proposal. In fairness to all prospective Respondent(s) during the RFP process, if SAHA meets in person with anyone representing a potential provider of these services to discuss this RFP other than at the pre-submittal meeting, an addendum will be issued to address all questions so as to insure no Respondent has a competitive advantage over another. This does not exclude meetings required to conduct business not related to the RFP, or possible personal presentations after written qualifications have been received and evaluated.

III. Non-Mandatory Pre-Proposal Conference: A pre-proposal conference will be held at Victoria Plaza Apartments, located at 411 Barrera, San Antonio, Texas 78210 as indicated herein. The purpose of this conference is to assist Respondents in understanding the RFP documents and required submittal documents. At this conference, SAHA will conduct an overview of the RFP documents, including attachments. Any questions must be submitted in writing (e-mail is acceptable) to the contact person listed herein and will be answered in an addendum.

IV. SAHA'S Reservation of Rights:

SAHA reserves the right, without liability, to:

- reject any or all proposals, to waive any informality in the RFP process, or to terminate the RFP process at any time, if deemed by SAHA to be in its best interests.
- award a contract pursuant to this RFP to one or more Respondents.
- terminate a contract awarded pursuant to this RFP, at any time for its convenience upon 30 days written notice to the successful Respondent.
- determine the days, hours and locations in which the services are performed in this RFP.
- retain all proposals submitted and not permit withdrawal for a period of 90 days subsequent to the deadline for receiving proposals without the written consent from SAHA.
- negotiate the fees proposed by all Respondents. If such negotiations are not, in the opinion of SAHA successfully concluded within a reasonable timeframe as determined by SAHA, SAHA shall retain the right to end such negotiations.
- reject and not consider any proposal that does not meet the requirements of this RFP, including but not necessarily limited to rejection of incomplete proposals and/or proposals offering alternate or non-requested services and from Respondents deemed non- responsive and non-responsible.
- prohibit any further participation by a Respondent or reject any proposal submitted that does not conform to any of the requirements detailed herein. Each prospective Respondent further agrees that he/she will inform SAHA in writing within five (5) days of the discovery of any item that is issued thereafter by SAHA that he/she feels needs to be addressed. Failure to abide by this timeframe shall relieve SAHA, but not the prospective Respondents, of any responsibility pertaining to such issue.
- award, to revise, change, alter or amend any of the instructions, terms, conditions, and/or specifications identified within the RFP documents issued, within any attachment or drawing, or within any addenda issued.
- to advertise for new proposals or to proceed to do the work otherwise if proposals are rejected.
- cancel the award of any proposal(s) at any time before the execution of the contract documents by all parties.
- reduce or increase estimated or actual quantities in whatever amount necessary if funding is not available, legal restrictions are placed upon the expenditure of monies for this category of service or supplies, or SAHA's requirements in good faith change after award of the contract.

- make an award to more than one Respondents based on ratings or to make an award with or without negotiations or Best and Final Offers (BAFO)
- establish a competitive range for responses based on the initial scores and to require presentations by the Respondents within the competitive range.
- require additional information from all Respondents to determine level of responsibility. Such information shall be submitted in the form and time frame required by SAHA.
- amend the terms of the contract any time prior to contract execution.
- contact any individuals, entities, or organizations that have had a business relationship with the Respondents regardless of their inclusion in the reference section of the proposal submittal.

V. **Timely Submissions:** Late submissions will not be accepted. Proposals received prior to the submittal deadline shall be securely kept, unopened, by SAHA. No proposal received after the designated deadline shall be considered. Respondents are cautioned that any proposal submittal that is time-stamped as being received by SAHA after the exact time set as the deadline for the receiving of proposals shall not be considered. Any such proposal inadvertently opened shall be ruled to be invalid. No responsibility will attach to SAHA or any official or employee thereof, for the pre-opening of, or the failure to open a proposal not properly addressed and identified.

VI. **Pre-Qualification:** Respondents will not be required to pre-qualify to submit a proposal. However, all Respondents will be required to submit adequate information showing that the Respondents is qualified to perform the required work

VII. **Review of RFP Forms, Documents, Specifications and Drawings:** It shall be each Respondent's responsibility to examine carefully and, as may be required, properly complete all documents issued pursuant to this RFP. Unless otherwise instructed, specifications and drawings (if provided) do not purport to show all of the exact details of the work. They are intended to illustrate the character and extent of the performance desired under the proposed contract and may be supplemented or revised from time to time.

VIII. **Responses:** A total of one (1) original signed copy (marked "ORIGINAL") using the Proposal Form attached as Attachment F, and Four (4) exact copies, (marked copy) shall be placed unfolded in a sealed package with the Respondent's name and return address and addressed as follows:

{RFP # {Insert Number}
{Insert Exact Title of RFP}
{Insert Month, day, year, Time of Bid Opening}
The San Antonio Housing Authority
Procurement Department
818 S. Flores
San Antonio, Texas 78204

The Respondents shall bind the proposal such that SAHA can, if needed, remove the binding (i.e. “comb-type, etc.) or remove the pages from the cover (i.e. 3-ring binder, etc.) to make copies then return the proposal submittal to its original condition.

IX. Withdrawal of Proposals: A request for withdrawal of a proposal due to a purported error must be filed in writing by the Respondents within 48 hours after the proposal deadline. The request shall contain a full explanation of the purported error. The foregoing shall not be construed to violate the common law right of withdrawal for material error as defined in State statute. SAHA retains the right to accept or reject any and all bids to the extent permitted by law. Negligence on the part of the Respondents in preparing his/her proposal confers no right of withdrawal or modification of the proposal after such proposal has been received and opened.

X. Mistake in Proposal Submitted: After a proposal has been opened it may not be changed for the purpose of correcting an error in the pricing. This does not affect the common law right of the Respondent to withdraw a bid due to a material mistake in the bid.

A. Irregular Proposal Submittal: A proposal shall be considered irregular for any one of the following reasons, any one or more of which may, at SAHA's discretion, be reason for rejection:

- If the forms furnished by SAHA are not used or are altered or if the proposed costs are not submitted as required and where provided.
- If all requested completed attachments do not accompany the proposal submittal.
- If there are unauthorized additions, conditional or alternate proposals, or irregularities of any kind which may tend to make the proposal incomplete, indefinite or ambiguous as to its meaning or give the Respondents submitting the same a competitive advantage over other Respondents.
- If the Respondent adds any provisions reserving the right to accept or reject any award or to enter into a contract pursuant to an award.

XI. Disqualification of Respondents: Any one or more of the following shall be considered as sufficient for the disqualification of a prospective Respondents and the rejection of his/her proposal:

- Evidence of collusion among prospective Respondents. Participants in such collusion will receive no recognition as Respondents or Respondents for any future work with SAHA until such participant shall have been reinstated as a qualified bidder or Respondent. The names of all participants in such collusion shall be reported to HUD and any other inquiring governmental agency.
- More than one proposal for the same work from an individual, firm, or corporation under the same or different name(s).
- Lack of competency, lack of experience and/or lack of adequate resources.

- Unsatisfactory performance record as shown by past work for SAHA or with any other local, state or federal agency, judged from the standpoint of workmanship and progress.
- Incomplete work, which in the judgment of SAHA, might hinder or prevent prompt completion of additional work, if awarded.
- Failure to pay or satisfactorily settle all bills due on former contracts still outstanding at the time of award.
- Failure to demonstrate minimum qualification requirements of SAHA.
- Failure to list, if required, all team members, subcontractors (if subcontractors are allowed by SAHA) who will be engaged by the successful Respondent(s) to participate in the Project.
- Failure of the successful Respondents to be properly licensed by the City, County and/or the State of Texas and/or to be insured by a commercial general liability policy and/or worker's compensation policy and/or business automobile liability policy, if applicable.
- Any reason to be determined in good faith, to be in the best interests of SAHA.

XII. Questions/Inquiries: A Respondent may inquire or question any of the proposal documents or any part of the information contained therein, by submitting, in writing to the contact person listed herein, at least eight (8) days prior to the proposal submission deadline, a complete and specific explanation as to what he/she is requiring clarification. SAHA reserves the right to issue a revision to the applicable RFP requirements in the form of an Addendum or may reject the Respondent's request.

XIII. Substitutions: Respondents must propose a Project that meets the requirements of the RFP documents. All verbal communications or instructions provided by any SAHA personnel shall only become official and binding when issued as an addendum by the SAHA Procurement Department.

XIV. No Liability for Costs: SAHA assumes no liability or responsibility for the costs incurred by the Respondents for any materials, efforts or expenses required in the preparation of proposals or in connection with presentations or demonstrations prior to the issuance of a Contract.

XV. Proposal Opening Results: Proposals are publicly opened and the results are generally a matter of public record. When SAHA has concluded all evaluations, has chosen a final top-rated Respondent/s, has completed the award and is ready to issue such results, SAHA shall notify the successful Respondent/s. All proposal documents submitted by the Respondents are generally a matter of public record unless such information is deemed to be proprietary.

XVI. Award: Submissions will be evaluated on the criteria stated in Section A of this RFP. After evaluation of the responses, the Contract will be awarded to one or more the Respondent/s representing the "Best Value" to SAHA after preferences for Section 3 business concerns are considered. The Selected Contractor will then enter into a construction agreement with SAHA.

XVII. Taxes. SAHA, as a governmental entity, is exempt from Texas State Sales and Use Taxes and Federal Excise Taxes. A letter of Tax Exemption will be provided upon request.

XVIII. Insurance: If a Respondent receives an award and unless otherwise waived in the Contract, the Selected Developer will be required to provide an original Certificate of Insurance confirming the minimum requirements found within Exhibit I to SAHA within 10 days of contract signature.

XIX. Exceptions. SAHA will consider any exception to the RFP that the Respondent wishes to include but the failure of SAHA to include such exceptions does not give the successful Respondent the right to refuse to execute SAHA's contract form. It is the responsibility of each prospective Respondent to notify SAHA, in writing, in its Proposal of any exceptions to the RFP terms. SAHA will consider such clauses and determine whether or not to include in the Contract.

XX. <u>RIGHT TO PROTEST:</u>

A. Rights: Any prospective or actual Respondents or contractor, who is allegedly aggrieved in connection with the solicitation of a proposal or award of a contract, shall have the right to protest. Such right only applies to deviations from laws, rules, regulations, or procedures. Disagreements with the evaluators' judgments as to the number of points scored are not reasons for an appeal. An alleged aggrieved protestant claiming this right is hereby informed that these regulations do not provide for administrative appeal as a matter of right for that alleged aggrieved protestant.

A.1 Definition: An alleged aggrieved "protestant" is a prospective Respondent or Respondents who feels that he/she has been treated inequitably by SAHA and wishes SAHA to correct the alleged inequitable condition or situation.

A.2 Eligibility: To be eligible to file a protest with SAHA pertaining to an RFP or contract, the alleged aggrieved protestant must have been involved in the RFP process in some manner as a prospective Respondents (i.e. recipient of the RFP documents) when the alleged situation occurred. SAHA has no obligation to consider a protest filed by any party that does not meet these criteria.

A.3 Procedure: Any actual or prospective contractor may protest the solicitation or award of a contract for material violation of SAHA's procurement policy. Any protest against a SAHA solicitation must be received before the due date for receipt of Proposals or proposals and any protest against the award of a contract must be received within ten calendar days after contract award or the protest will not be considered.

All protests must be in writing and submitted to the Director of Procurement for a written decision. The Director of Procurement shall make a recommendation to the Contracting Officer who shall issue a written decision and findings to the Contractor within 30 days from receipt of the written protest. This decision is then appealable to the Board of Commissioners within 30 days of receipt of the written decision. Appeals which are not timely filed will not be considered and the decision becomes final. All appeals shall be marked and sent to the address as listed in the following example:

APPEAL OF RFP NO. (insert exact number of RFP here)
San Antonio Housing Authority
Attn: Procurement Department
818 South Flores Street
San Antonio, TX 78204

XXI. Bonding

A. SAHA requires a Bid Bond for this bid in the amount of 5% of the Base Bid. Bid Bond shall be submitted with the Proposal Fee Sheet. Bid Bond must be submitted with proposal. Proposals without Bid Bond will be rejected.

B. Performance Bond: The Contractor must provide SAHA a 100% Performance Bond for total contract value, however if the Contractor is unable to acquire the equitable bonding that is acceptable to SAHA within ten (10) days of signed contract, then the Contractor will be deemed in breach of contract.

C. Payment Bond: The Contractor must provide SAHA a 100% Payment Bond for each Project Contract executed by SAHA, however if the Contractor is unable to acquire the equitable bonding that is acceptable to SAHA within ten (10) days of signed contract, then the Contractor will be deemed in breach of contract.

XXII. Escalation: No escalations shall be considered, this will be a fixed fee contract.

End Section B

Section C
Information To Be Submitted

The response to this RFP shall be submitted in the manner described in this Section. Each category must be separated by index dividers and the index divider must extend so that each tab can be located without opening the proposal and labeled with the corresponding tab reference noted below. Failure to submit the proposal in the manner specified may result in a premature opening of, post-opening of, or failure to open and consider that proposal and may be cause for elimination of that Respondent from consideration for award.

C.1 Tab 1, References: The Respondent shall submit 3 former or current clients/projects within the past 10 years, preferably other than SAHA, for whom the Respondent has performed construction services similar to those being proposed herein. The list shall, at a minimum, include for each reference:

- **C.1.1** The client's name and name of the contact
- **C.1.2** The client's current telephone number and address
- **C.1.3** Description of services provided to the client
- **C.1.4** Project and construction type
- **C.1.5** Date of services

This information shall be submitted under the Tab 1 of the Proposal.

C.2 Tab 2, HUD Forms, Conflict of Interest Questionnaire and Form 1295: These Forms are attached hereto as Attachment B to this RFP document must be fully completed, except as noted, executed where provided thereon, and submitted under this tab as a part of the proposal submittal. ***NOTE*** The successful Respondent shall be required to submit a Form 1295 to the Texas Ethics Commission in compliance with Government Code 2252.908 and a copy of the submission along with the Certification prior to execution of the contract with SAHA.

This information shall be submitted in the form of Tab 2 to the Proposal.

C.3 Tab 3, Profile of Firm Form: The Profile of Firm Form is attached hereto as Attachment C to this RFP document and Respondent is required to describe its form of business (i.e., individual, sole proprietor, corporation, non-profit corporation, partnership, limited liability company). This Form must be fully completed, executed and submitted under this tab as a part of the submittal by the Respondent. Also submit the Company Biography under this tab.

This information shall be included as Tab 3 of the Proposal.

C.4 Tab 4, Evaluation Factors: The Respondent must submit under this tab a response that addresses each of the following evaluation factors. Small/Minority/Woman/Veteran Owned Business Enterprise and Section 3 utilization plans are covered in Tabs 6 and 7 below.

A. Experience: Respondent shall provide a narrative describing the firm's credentials to deliver the required services including the firm's license information, number of employees, type of client base, and location of offices. Include awards or honors earned from industry organizations and publications. Respondent shall list current projects that the firm is presently committed, or will be committed, with client name, dollar amount, the start and completion dates, and the services being provided (e.g., Construction Manager, General Contractor, etc.). Respondent shall list at least two projects of similar type, scope, and complexity that have been constructed within the past 10 years or are being constructed by your firm and describe the services provided. Respondent shall provide information on two or more projects in the past 10 years reflecting Respondent's experience in rehabilitating and modernizing affordable multifamily housing by incorporation of sustainable energy use improvements and other innovative and modernizing products. Respondent shall state if it has worked with other governmental entities, including housing authorities, HUD, Non Profits, and multifamily industry.

B. Project Management: Respondent shall list the firm's management, supervisory, technical professional personnel, and consultants that will be assigned to the project and their time commitment in (a) the pre-construction phase and (b) the construction phase. Provide one-page résumés of key personnel with title/position, education, professional license or registration, general employment history, and experience with this type of project. Key personnel shall include at a minimum the project manager(s), superintendent(s), and pre-construction phase cost estimator. Provide relevant references names with contact information (email and phone number) for the project manager(s). Respondent shall provide a table identifying personnel named in this section that were assigned to projects listed in A and their job titles for that project.

C. Capacity/Financial Viability: Respondent shall provide a copy of the most recent audited annual and unaudited interim period financial statements. Respondent shall provide a short account of any legal conflict encountered with customers/clients dating to January 1, 2012 regarding contract disputes and non-performance. Respondent shall provide a letter from provider indicating bonding capacity and indicate currently available capacity

D. Construction Plan: Respondent shall provide a comprehensive plan indicating how Respondent's firm will deliver the pre-construction and construction services required by this RFP. Respondent shall include a project organizational chart designating the lines of authority and discuss the roles and decision-making authority of each person on Respondent's team and specific experience each has with pre-construction services, constructability issues, modernization and energy usage techniques, and value engineering. Respondent shall provide a detailed construction schedule for the project based upon projected Milestones and describe the method by which the Respondent intends to meet the schedule. Respondent shall describe the methods it intends to use for a) tracking and reporting construction scope, schedule, and accounting information including contingency amount reporting, b) quality control program for construction, c) safety program for construction, d) construction documentation including the use of technology to provide documentation to SAHA. Include information on Respondent's approach to maintaining a safe and secure work environment for workers and neighboring properties and indicate Respondent's approach to compliance with OSHA standards. Respondent shall provide its current safety EMR or equivalent rating.

E. Price Proposal: The Proposal (Attachment F) shall include the Respondent's not-to-exceed fee offer to perform all Services in the "Original" response only. The not-to-exceed fee offer shall include, without limitation, all of Respondent's costs, overhead, and profit for the complete performance of Services for the Project.

This information shall be included as Tab 4 of the Proposal.

C.5 Tab 5, Section 3 Business Preference: Any Respondent claiming a Section 3 Business Preference, shall under this tab include the fully completed and executed Section 3 applicant certification form for low-income employees for whom Respondent is seeking the preference, verification of total number of full-time employees, names and addresses of low-income residents who are Respondents employees. **Note: If you qualify as a Section 3 Business Concern, your proposal will receive a preference over other respondents as specified in Attachment D.**

This information shall be included as Tab 5 of the Proposal.

C.6 Tab 6, Small/Minority/Woman/Disadvantaged/Veteran Business Enterprise Utilization Plan: The Respondents shall submit a plan that details how the Contractor will make a good faith effort to subcontract with S/W/MBE companies. ***FAILURE TO PROVIDE THE SWMBE PLAN MAY CAUSE THE RESPONSE TO BE DISQUALIFIED AS NON-RESPONSIVE.***

This information shall be included as Tab 6 of the Proposal.

C.7 Tab 7, Section 3 Good Faith Effort Compliance Plan: Respondents are required to complete and submit the SECTION 3 PROGRAM GOOD FAITH EFFORT COMPLIANCE PLAN outlining their efforts to employ qualified Section 3 businesses or persons. The goal as stated in the Good Faith Effort Compliance Plan is thirty percent (30%) of new hires for Section 3 persons per contract. The subcontracting goal is ten percent (10%) for Section 3 Businesses for construction contracts and three percent (3%) for Section 3 Businesses for non-construction contracts. SAHA will provide a listing of qualified Section 3 Businesses upon request. ***FAILURE TO PROVIDE THE SECTION 3 PROGRAM GOOD FAITH EFFORT COMPLIANCE PLAN MAY CAUSE THE RESPONSE TO BE DISQUALIFIED AS NON-RESPONSIVE.***

This information shall be included as Tab 7 of the Proposal.

C.8 Tab 8, Proposal Checklist and Certification: Respondent shall certify that the Proposal documents are complete and included in the response and to the Certification contained in Attachment E.

This information shall be included as Tab 8 of the Proposal.

End Section C.

Section D
Terms and Conditions

These Terms and Conditions shall be considered required terms of any Contract between the Successful Respondent and SAHA. The Contractor must also be familiar with federal guidelines issued by HUD. These guidelines, together with any supplemental general conditions issued by HUD, outline requirements for the conduct of work and administrative requirements. The guidelines include, but are not limited to, Termination for Convenience, Default, Clean Air and Water standards, and compliance with Davis-Bacon wage rates.

I. GENERAL RESPONSIBILITIES:

A. Specifications. The Contractor shall provide the Project in accordance with the Specifications which are included herein.

B. Regulatory/Licensing. Contractor shall comply with all applicable federal, state and local laws, rules, regulations, ordinances and codes and obtain any licenses or permits required to provide the services. Obtaining licenses and permits shall be the sole responsibility of the Contractor.

C. Timesheets. Contractor shall keep accurate timesheets for all employees assigned to perform any project, task, or assignment in the Project.

D. Unacceptable Employees: If any employee of the Contractor is deemed unacceptable by SAHA, Contractor shall immediately replace such personnel with a substitute acceptable to SAHA.

E. Uniforms/Badges: Contractor shall provide uniforms and/or ID badges for all employees working on SAHA's properties. No employee will be allowed on SAHA's properties out of uniform and/or without an ID badge.

F. Criminal history/Drug testing. Contractor shall perform criminal history checks and drug screening tests on all employees performing work and if requested provide summaries of the results to SAHA. Prospective employees whose criminal history checks discloses a misdemeanor or felony conviction involving crimes of moral turpitude or harm to persons or property shall not be used to perform work under this RFP or any resulting contract. Criminal history and drug screening checks will be completed at the sole expense of the Contractor.

G. Work on SAHA Property: The Contractor shall take all necessary precautions to prevent the occurrence of any injury to persons or property during the progress of such work and shall immediately return said property to a condition equal to or better than the existing condition prior to the commencement of work at the site at no cost to SAHA.

H. Wages. Contractor shall pay all salaries and expenses of, and all Federal, Social Security taxes, Federal and State Unemployment taxes, and any similar taxes relating to its employees used in the performance of the contract. The Contractor further agrees to comply with all Federal, State and local wage and hour laws and all licensing laws applicable to its employees or other personnel furnished under the agreement.

I. Independent Contractor: The Contractor shall be considered an independent contractor. Nothing herein shall create any association, agency, partnership or joint venture between the parties hereto and neither shall have any authority to bind the other in any way.

II. **SECTION 3 REQUIREMENTS. Contactor is required to prepare and submit monthly reports on Section 3.** Contractor shall utilize Section 3 residents and businesses as defined in Attachment D to perform the requirements under the Project to the greatest extent feasible and shall document such efforts monthly. Contractors will be evaluated on their performance at achieving this goal and such evaluation shall be a factor in future awards.

III. **SUBCONTRACTORS**. Contractor may not use any subcontractors to accomplish any portion of the services described within the RFP documents or the contract without the prior written permission of the SAHA. Also, any substitution of subcontractors must be approved in writing by SAHA prior to their engagement. All requirements for the "Prime" Contractor shall also apply to any and all subcontractors. It is the Contractors' responsibility to insure the compliance by the subcontractors. Regardless of subcontracting, the Contractor remains liable to SAHA for the performance under the contract. The Contractor shall assure that its subcontractors comply with all applicable HUD regulations and SAHA requirements including but not limited to Section 3 requirements, insurance, Davis Bacon wage requirements and reporting, permitting, code compliance, and licensure.

IV. LIMITATION/INDEMNIFICATION/INSURANCE

A. Limitation of Liability: In no event shall SAHA be liable to the successful Respondents for any indirect, incidental, consequential or exemplary damages.

B. Indemnification. The Contractor shall indemnify and hold harmless SAHA and its officers, agents, representatives, and employees from and against all claims, losses, damages, actions, causes of action and/or expenses resulting from, brought for, or on account of any bodily injury or death of an employee of the Contractor, its agent, or its subcontractor of any tier received or sustained by any persons or property growing out of, occurring, or attributable to any work performed under or related to this Agreement, to the extent resulting in whole or in part from the negligent acts or omissions of the Contractor, any subcontractor, or any employee, agent or representative of the Contractor or any subcontractor. **CONTRACTOR ACKNOWLEDGES AND AGREES THAT THIS INDEMNITY CONTROLS OVER ALL OTHER PROVISIONS IN THE AGREEMENT, SURVIVES TERMINATION OF THIS AGREEMENT.**

For clarification purposes**,** Contractor shall indemnify and hold harmless SAHA, their agents, consultants and employees from and against any and all property damage claims, losses, damages, costs and expenses relating to the performance of this Agreement, including any resulting loss of use, *but only to the extent caused by the negligent acts or omissions of Contractor*, its employees, sub-subcontractors, suppliers, manufacturers, or other persons or entities for whose acts Contractor may be liable.

C. SAHA Actions. It is agreed by and between the parties hereto that in no event shall any official, officer, employee, or agent of SAHA in any way be personally liable or responsible for any covenant or agreement herein contained whether expressed or implied, nor for any statement, representation or warranty made herein or in any connection with this agreement.

D. Insurance: The Contractor shall maintain in full force and effect during the entire contract term insurance in the form and in amounts found in Exhibit I.

V. LIQUIDATED DAMAGES: For each day that performance under the contract is delayed beyond the time specified for completion, the successful Respondents shall be liable for liquidated damages in the amount the daily subsidy ($ds) times the number of apartments in the property (185) or ($ds X 185). However, the timeframe for performance may be adjusted at SAHA's discretion in writing prior to default under the contract.

VI. WARRANTY: The Respondent represents and warrants to the Customer that the Respondent will perform the Services with reasonable care and skill and in accordance with best commercial practices and standards in the industry for similar services.

VII. INVOICING:

A. Invoices. Invoices must contain a complete description of the work or service that was performed, the contract price for each service, the purchase order number, contract number (if applicable), date of service, and address of service location or delivery address. Contractor(s) must submit a separate invoice for each purchase order issued by SAHA unless prior approval is obtained from SAHA. To insure prompt and timely payment of invoices, and unless utilizing a progress payment schedule, invoices shall be sent electronically to the following address:

Accounts_Payable@saha.org

If the Contractor does not have the capability to send invoices electronically, they may be mailed to:

San Antonio Housing Authority
Finance and Accounting
P.O. Box 830428
San Antonio, TX 78283-0428

B. Progress Payments. If applicable, SAHA may make progress payments approximately every 30 days as the work proceeds if work meets owner's standards, as approved by the Contracting Officer. SAHA may, subject to written determination and approval of the Contracting Officer, make more frequent payments to contractors which are qualified small businesses in accordance with HUD documents.

C. Direct Deposit. Upon the Award of Contract, Contractor shall complete a form for direct deposit to process all payments electronically to insure prompt and efficient payment of all invoices.

D. Timely Invoicing: Contractor shall invoice SAHA within 60 days after the delivery of the goods or service. If contractor fails to invoice within 60 days SAHA reserves the right to not pay the invoice.

E. Contractor shall submit separate invoice for the Energy Performance Contract (EPC) components of this project and for the balance of the scope of work.

VIII. Laws and Regulations

A. General. SAHA is a governmental entity as that term is defined in the procurement statutes. SAHA and this RFP and all resulting contracts are subject to federal, state and local laws, rules, regulations and policies relating to procurement as applicable. Contractor shall comply with all local, state and federal laws concerning safety (OSHA) and environmental control (EPA and Bexar County Pollution Regulations) and any other enacted ordinance, code, law or regulation. Contractor shall be responsible for all costs incurred for compliance with any such possible ordinance, code, law or regulation. No time extensions shall be granted or financial consideration given to the Contractor for time or monies lost due to violations of any such ordinance, code, law or regulations that may occur.

B. Specific. Contractors shall comply with all statutes, rules, regulations, executive orders affecting procurements by Housing Authorities including but not limited to:

- Executive Order 11246
- Executive Order 11063
- Copeland "Anti-Kickback" Act (18 USC 874)
- Davis Bacon and Related Acts (40 USC 276a-276a-7)
- Clean Air & Water Acts (42 USC 1857(h); 33 USC 1368)
- Contract Work Hours & Safety Standards Act (40 USC 327-330)
- Energy Policy & Conservation Act (PL 94-163, 89 STAT 871)
- Civil Rights Act of 1964, Title VI (PL 88-352)
- Civil Rights Act of 1968, Title VIII (PL 90-284 Fair Housing Act)
- Age Discrimination Act of 1975
- Anti-Drug Abuse Act of 1988 (42 USC 11901 et. Seq.)
- HUD Information Bulletin 909-
- Immigration Reform & Control Act of 1986
- Fair Labor Standards Act (29 USC 201, et. Seq.

C. Incorporation. Each provision of law and each clause, which is required by law to be inserted in this RFP or any contract, shall be deemed to have been inserted herein, and this RFP and any resulting contract shall be read and enforced as though such provision or clause had been physically inserted herein. If, through mistake or otherwise, any such provision is not inserted or is inserted incorrectly, this agreement shall forthwith be physically amended to make such insertion or correction upon the application of either party. The fore-mentioned statutes, regulations and executive orders are not intended as an indication that such statute, regulation or executive order is necessary applicable nor is an omission of such statute, regulation or executive order intended to indicate that it is not applicable.

IX. Termination.

A. Early Termination. In the event any resulting contract is prematurely terminated due to non-performance and/or withdrawal by the Contractor, SAHA reserves the right to seek monetary restitution (to include but not limited to withholding of monies owed) from the Contractor to cover costs for interim services and/or cover the difference of a higher cost (difference between terminated Contractor's rate and new company's rate) beginning the date of Contractor's termination through the contract expiration date. The contract may be terminated under the following conditions:

a. Consent: By mutual consent of both parties, and

b. Termination For Cause: As detailed within the attached HUD Forms. SAHA may terminate any and all contracts for default at any time in whole or in part, if the Contractor fails to perform any of the provisions of any contract, so fails to pursue the work as to endanger performance in accordance with the terms of the RFP or any resulting contracts, and after receipt of written notice from SAHA, fails to correct such failures within seven (7) days or such other period as SAHA may authorize or require.

c. Failure to Fund. SAHA may terminate any contract resulting from this RFP in whole or in part, if funding is reduced, or is not obtained and continued at levels sufficient to allow for the expenditure.

d. Termination for Convenience: In the sole discretion of the Contracting Officer, SAHA may terminate any and all contracts resulting from this RFP in whole or part upon thirty days prior notice to the Contractor when it is determined to be in the best interest of SAHA**.**

B. Action Upon Termination. Upon receipt of a notice of termination issued from SAHA, the Contractor shall immediately cease all activities under any contract resulting from this RFP, unless expressly directed otherwise by SAHA in the notice of termination.

C. Remedies Cumulative. The rights and remedies of SAHA provided under this section are not exclusive and are in addition to any other rights and remedies provided by law or under any contract.

D. Rights Upon Termination. In the event the contract is terminated for any reason, or upon its expiration, SAHA shall retain ownership of all work products including deliverables, source and object code, microcode, software licenses, and documentation in whatever form that may exist. In addition to any other provision, the Contractor shall transfer title and deliver to SAHA any partially completed work products, deliverables, source and object code, or documentation that the Contractor has produced or acquired in the performance of the contract.

X. General Conditions

A. Severability: If any provision of this agreement or any portion or provision hereof applicable to any particular situation or circumstance is held invalid, the remainder of this agreement or the remainder of such provision (as the case may be), and the application thereof to other situations or circumstances shall not be affected thereby.

B. Waiver of Breach: A waiver of either party of any terms or conditions of this agreement in any instance shall not be deemed or construed as a waiver of such term or condition for the future, or of any subsequent breach thereof. All remedies, rights, undertakings, obligations, and agreements contained in this agreement shall be cumulative and none of them shall be in limitation of any other remedy, right, obligation or agreement of either party.

C. Time of the Essence: Time is of the essence as to each provision in which a timeframe for performance is provided in this RFP. Failure to meet these timeframes may be considered a material breach, and SAHA may pursue compensatory and/or liquidated damages under the contract.

D. Examination and Retention of Contractor's Records: SAHA, HUD, or Comptroller General of the United States, or any of their duly authorized representatives shall, until three years after final payment under all contracts executed as a result of this RFP, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract for the purpose of making audits, examinations, excerpts and transcriptions.

E. Right to data and Patent Rights: In addition to other ownership & use rights SAHA shall have exclusive ownership of all, proprietary interest in, and the right to full and exclusive possession of all information, materials, documents, software, and all electronic data discovered or produced by Contractor and/or subcontractors pursuant to the terms of the contract, including but not limited to, reports, memoranda or letters concerning the research and reporting tasks of the contract. Both parties agree to comply with HUD Bulletin 909-23, which is the Notice of Assistance Regarding Patent and Copyright Infringement.

F. **Force Majeure:** Neither SAHA nor Contractor shall be held responsible for delays or default caused by fire, flood, riot, acts of God or war where such cause was beyond, respectively, SAHA or Contractor's reasonable control. Contractor shall make all reasonable efforts to remove or eliminate such a cause of delay or default and shall, upon the cessation of the cause, diligently pursue performance of its obligations under this Agreement.

G. Proposed Fee:

G1. Base: All fees are all-inclusive of all related costs that a Respondent will incur to provide the noted services in compliance with this RFP, including, but not limited to: employee wages and benefits, clerical support, overhead, profit, licensing, insurance, materials, supplies, tools, equipment, long distance telephone calls, document copying and motor vehicle fuel unless otherwise specified in this RFP. Each fee proposed shall be fully "burdened" with profit and overhead costs.

G2. Additional: In addition this fee must include all costs to recruit, hire, supervise, and monitor oversight staff of management agent, train personnel, establish and supervise all systems to keep property's books, records and accounts, management agent's overhead expenses to include and not limited to office space, supplies and equipment, bookkeeping expenses of management agent, bonds and insurance. In case of a discrepancy between a unit price and an extension, the unit price prevails.

H. "Equal": Catalogs, brand names or manufacturer's references where provided are descriptive only and indicate type and quality desired. Bids on brands of like nature and quality will be considered unless specified otherwise. If bidding other than the referenced manufacturer, brand or trade name, Bidder must provide a complete description of product offered, and illustrations and must be included in the bid submittal. Failure to include the above referenced data will require Contractor to furnish specified brand names, numbers, etc.

I. Notice to Proceed: Start work date will be determined by the SAHA Project Manager and Contractor's Manager. Contractor shall not begin work until a Notice to Proceed is received from SAHA signed by the Contracting Officer.

J. Communications:

J1. Form: All claims, notices, demands, requests, instructions, approvals and proposals must be submitted in writing.

J2. Notice to Contractor: Any Notices or Demands upon the Contractor shall be sufficiently given if delivered at the office of the Contractor stated on the signature page of the Contract or at such other office as he / she may from time to time designate in writing to SAHA or deposited in the United States mail in a sealed, postage-prepaid envelope or if delivered with charges prepaid to any telegraph company for transmission and addressed to the office of the Contractor indicated on the signature page of the contract or such other address as may be subsequently specified in writing to SAHA.

J3. Notice to SAHA: All notification papers required to be delivered to SAHA or its designated representative shall, unless otherwise specified in writing to the Contractor, be delivered to attn. Procurement, SAHA at 818 South Flores, San Antonio, Texas, 78204; and any notice to or demand upon SAHA shall be sufficiently given if so delivered or deposited in the United States mail in a sealed, postage-prepaid envelope or delivered with charges prepaid to any telegraph company for transmission to SAHA at the above address or to such other address as SAHA may subsequently specify in writing to the Contractor for such purpose.

J4. Receipt: Any such notice shall be deemed to have been given as of the time of actual delivery; or in the case of mailing, when the same should have been received in due course after the date of surrender to the Post Office; or in the case of telegrams, at the time of actual receipt, as the case may be.

K. Time for Completion: The Contractor shall immediately mobilize and commence work at the time stipulated in the Notice to Proceed to the Contractor and shall be fully completed within **12 months** unless specified otherwise in contractor's response.

L. Safety: Subject to prior approval by SAHA as to size, design, type and location, and to local regulations, the Contractor and his / her subcontractors shall erect Temporary Safety Signs for purposes of identification and controlling traffic. The Contractor shall furnish, erect, and maintain such signs as may be required by safety regulations and as necessary to safeguard life and property.

M. Builders Risk: Contractor is required to acquire Builder's Risk Insurance for any project or projects resulting from this solicitation. In any case SAHA will not be responsible for any loss to Contractor's tools, materials, supplies, the building or project or any other coverage normally covered under Builder's Risk Insurance. See HUD form 5370 attached.

N. Storage: The Contractor and his/her subcontractors may maintain with approval by the SAHA Property & Project Managers various Storage Facilities on the site as may be necessary in the proper conduct of the work. These shall be located to cause no interference with any work to be performed on the site by the Contractor or others. The Contractor shall consult with SAHA regarding the location(s) of these facilities on each site.

O. Removal of Temporary Facilities: Upon completion of the project, or as directed by SAHA, the Contractor shall remove all temporary structures and facilities they installed from the site and leave the premises in equal or better condition than it was at turnover.

P. Final Inspection:

P.1 Notice: The Contractor shall provide prompt written notification to SAHA when all work is completed. A final project inspection shall be made when all work is completed. Until the final inspection has been made and project accepted by SAHA, SAHA shall not advance any of the retainage or make the final payment to the Contractor without the approval and concurrence of the Contracting Officer.

P.2 Inspection Date: Upon receipt of the Contractor's notification of the date when the work has been completed, SAHA shall conduct a final Inspection within 2 calendar days.

P.3 **Inspection Participants:** The final inspection shall be conducted by a SAHA representative/s, any System Manufacturer's Representative/s, and the Contractor's representative/s at a minimum.

P.4 **Inspection Conference:** The inspection team shall meet after completing the final inspection to determine whether the work has been completed in accordance with these specifications and produce a Punch List Schedule which describes any minor items of incomplete or unsatisfactory work and document if there are any major deficiencies which must be corrected by the Contractor and additional inspections scheduled prior to contract settlement.

Q. Settlement Documents: The settlement document shall state that the work was completed in accordance with the construction documents, including change orders except any minor items identified on SAHA's proposed certificate of completion, the total amount due the Contractor and a separately stated amount for each unsettled claim against SAHA. It shall also state that SAHA is released of all liens and all claims except those expressly stated in the Contractor's release and that wages paid to laborers or mechanics were consistent with the wage rate requirements of the contract and there are no outstanding claims for unpaid wages, materials, or supplies.

R. Wage Rate: The Davis Bacon and Related Acts wage and reporting requirements apply to this project.

End Section D.

EXHIBIT A
Multi-Family Retrofit Checklist Sample

SAHA | SAN ANTONIO HOUSING AUTHORITY
Opportunity Lives Here

Multifamily Energy Retrofit Checklist
Levels 1-3

BUILD SA GREEN

Name of Builder/Designer | Name of Applicant | Phone number & e-mail

Address of Project | Project Name | EARZ location?

Conditioned Sq. Ft. | Lot Sq. Ft. | Lawn (turf) Sq. | Ft. Impervious Sq. Ft.

Review Fee (see below)

Statement of Intent

In submitting this project for a Multi-Family Energy Retrofit Program certification, the applicant assures Build San Antonio Green® that the home will adhere to all the requirements listed for Multi-Family Energy Retrofit certification. All substitutions, if required, will be noted and signed by the applicant and the Build San Antonio Green® Certification Manager before the construction is completed.

By signing below, you agree to (i) unconditionally release and forever discharge Build San Antonio Green® from any and all claims, causes, actions, demands, suits, liabilities, and judgments, whether in law or equity, that you or the home owner may have or assert against Build San Antonio Green® with respect to the program and/or the certification of the property, including, without limitation, the property's compliance with the program or the property's market value or efficiency, and (ii) to indemnify and hold harmless Build San Antonio Green® from and against any and all losses, damages, costs, or expenses (including, without limitation, attorneys' fees) now or hereafter incurred, paid or suffered by Build San Antonio Green with respect to or arising out of any such claims, causes, actions, demands, suits, liabilities, and judgments, or otherwise in connection with the certification of the property to the extent allowed by law.

Applicant Signature | Date

Review Fee Calculation

A Review Fee payment must accompany this checklist before your review can be performed. The Review Fee covers the costs of tasks performed by Build San Antonio Green® to determine if you project satisfies the Energy Retrofit Program requirements summarized in this checklist and detailed in the Energy Retrofit Program Guidelines. The fee is based on the conditioned square footage of the house under modification. Please make your check payable to "Build San Antonio Green."

Unit Size	Residential Review Fee Cost/Unit	Commercial Review Fee
up to 500 sq. ft.	$30	20 cents/square foot of non-residential space
501-1200 sq. ft.	$50	
1201+ sq. ft.	$75	

PURPOSE

REFER TO GUIDELINES

This checklist is a quick form developer, builders or designers can use to determine whether a project can meet the minimum requirement to receive Energy Retrofit certification. For detailed description of each of these measures and recommendations, refer to the Energy Retrofit Program Guidelines.

USING THE CHECKLIST

For Energy Retrofit certification, each unit must incorporate all items listed in the "Requirements" section of this checklist. For assistance, please contact Build San Antonio Green at 210-224-7278.

Pre-Construction Requirements	Post Construction Requirements
1. The applicant must submit a copy of the proposed energy measures. 2. The applicant must submit a copy of the Improvement Analysis Report that includes a pre-retrofit HERS Index if available. 3. If a new HVAC system is to be installed or equipment replaced, submit ACCA Manual "J" version 8.2 or later, ACCA Manual "S", ACCA Manual "D." 4. Provide proof of rater/tester's certification with RESNET.1	1. The applicant must submit a copy of the final Improvement Analysis Report that includes the post-retrofit HERS Index and estimated energy savings.

DIGITAL OR PAPER SUBMISSIONS

While BSAG does accept paper submissions, we encourage you to submit digital files whenever possible, including plans, supporting documents, and the checklist.

Energy Retrofit Requirements

Energy improvements must represent a minimum of:
Level 1 certification - 30% improvement or HERS Index of ≤85
Level 2 certification - 50% improvement or HERS Index of ≤75
Level 3 certification - 60% improvement or HERS Index of ≤65 and must include Renewable Energy (Solar Thermal and/or PV System)1 MAKE BOX around this info

☐Enclosed common areas must comply with the 2015 IECC or applicable IECC from permit date; Submit a COMcheck or similar code-approved method to show compliance and projected energy savings.

☐Use RESNET Certified Energy Rater/Energy Auditor to perform a whole- house energy audit/rating and post-retrofit rating on residential units[2]

☐Combustion appliance zone (CAZ) safety test pre- and post-retrofit when applicable [1]

☐Installation of CO alarms if natural gas appliances/equipment are present

☐Locate ALL air leaks and seal as recommended by Energy Rater/Auditor

☐All interior light bulbs (commercial & residential) must be replaced with ENERGY STAR CFLs or equivalent, standard ENERGY STAR fluorescents, or LEDs.

☐Replace existing aerators with low-flow aerators rated at 1.5 gpm or less in all water sink fixtures

☐Replace existing showerheads with low-flow showerheads rated at 1.75 gpm or less

☐If units do not currently have low-flow toilets, they must be replaced with WaterSense High Efficiency Toilets or equivalent rated at 1.28 GPF.

☐New irrigation systems installed must comply with the SAWS conservation ordinance regardless of project location

Check additional selected energy measures for this project:

☐Existing HVAC equipment will be replaced with ENERGY STAR® qualified or equivalent HVAC:

- ☐AC units-minimum SEER 15/EER 12 rating
- ☐Heat Pump-minimum SEER 15/8.2 HSPF rating
- ☐Gas Furnace-minimum AFUE 80 rating
- ☐Other:

☐Exisiting air conditioning ducts will be repaired/sealed with duct mastic in all joints and seams

☐Existing air conditioning ducts will be placed in conditioned space

-OR-

☐Air conditioning supply ducts will be replaced and insulated:
Ducts located in unvented attics minimum R-6
Ducts located in vented attics minimum R-8

☐Installing a communicating programmable thermostat –OR-

☐CPS Energy Smart Thermostat

☐ENERGY STAR qualified cool roof

☐Radiant barrier on underside of roof decking

☐Adding/installing insulation in the attic to a minimum R-38

☐Wall insulation upgraded to a minimum R-13

☐Installation of ENERGY STAR qualified water heater
-OR-

☐Installation of Solar Water Heater, OG-300 certified by the Solar Rating Certification Corporation (SRCC)

☐Installation of ENERGY STAR qualified ceiling fans in all bedrooms and living areas when replacing inoperable or poorly performing ceiling fans

☐Inoperable or poorly performing ventilation fans in all bathrooms will be replaced with ENERGY STAR qualified ventilation fans

☐Existing appliances will be replaced with ENERGY STAR qualified appliances:
Dishwasher
Clothes Washer
Refrigerator

☐Replacing existing windows with ENERGY STAR qualified windows with a max. U-factor of 0.40 and a max. SHGC of 0.25

☐Replacing existing doors with ENERGY STAR qualified doors

☐Weatherization of existing windows and application of approved solar film[1]

☐Renewable Energy(provide system's specifications):
Solar PV System
Solar Thermal

Other Measures (please indicate):

Additional Recommendations:

☐Weatherization of existing windows and installation of solar screens[1]

☐Replace your combustion appliances with power-vented, sealed combustion, induced draft, or direct-sealed units

☐If replacing your range hood, install a range hood ventilation unit that vents to the outside

☐Have your rater conduct a moisture survey

☐Install a water heater insulation blanket and insulate hot water lines [2]

☐Replace an electric coooktop with a gas cooktop or stove

☐Any common laundry room provided should be equipped with Category Tier 3 clothes washing machines as determined by the Consortium for Energy Efficiency (CEE)

☐For IAQ purposes use only Low-VOC or Zero-VOC interior paints if applicable

Marketing Your Project

Build San Antonio Green yard signs are available to use for the applicant to show the public during construction that the project is pending certification with the Build San Antonio Green program. Because final certification is not earned until the project is finished and the results of the testing are submitted, a provided paper notice must be taped to the inside of a street-facing window during construction. The Build San Antonio Green yard signs are the property of Build San Antonio Green.

Post Construction Packet for Residents

The Build San Antonio Green® staff will provide to the applicant, a BSAG Certificate, a SAWS Landscape Care Guide and a digital copy of the Home Resident's Manual for the Project's owner and manager. The applicant must insert or attach copies of HERS testing and ENERGY STAR® documentation (if applicable) as well as copies of warranty and operational instruc¬tion information for all builder installed appli¬ances and materials (such as roofing and fix¬ture warranties) and the HVAC system to include with the Home Resident's Manual package for the Project's owner and residence manager.

FOOTNOTES

1. Send related documentation to BSAG for review.
2. Refer to the Energy Retrofit Guidelines for detailed information.

THE SOLAR READY OPTION

BSAG encourages the contractor and/or homeowner to incorporate renewable energy systems on the house after the retrofit work is performed. At BSAG we offer an option to prepare a house to easily accept renewable energy installations. Please consult with your reviewer for program details and how to achieve the "Solar-Ready"

Questions?

Contact Lina Luque
Director of Certification & Technical Services
210-224-7278

EXHIBIT I
Insurance Requirements

Developer is required to have in place during the term of the contract the following minimum insurance requirements. Developer will be required to provide an original Certificate of Insurance to SAHA within 10 days of contract signature:

Professional Liability	**Required Limits**
SAHA and its affiliates must be named as a Certificate Holder. This is required for vendors who render observational services to SAHA such as appraisers, inspectors, attorneys, engineers or consultants.	~~$1,000,000~~ Not Required for this Project
Business Automobile Liability	**Required Limits**
SAHA and its affiliates must be named as an additional insured and as the certificate holder. This is required for any vendor that will be using their vehicle(s) to do work on SAHA properties.	$500,000 combined Single limit, Per occurrence
Workers Compensation and Employer's Liability	**Required Limits**
Workers' Compensation coverage is Statutory and has no pre-set limits. Employer's Liability limit is $500,000. Workers' Compensation is required for any vendor made up of more than two persons. ***A Waiver of Subrogation in favor of SAHA must be included in the Workers' Compensation policy.*** SAHA and its affiliates must be a Certificate Holder.	**Statutory** Employer's Liability is $500,000
Commercial General Liability	**Required Limits**
This is required for any vendor who will be doing hands on work at SAHA properties. SAHA and its affiliates must be named as an Additional Insured and as the Certificate Holder.	$1,000,000 per accident $2,000,000 aggregate
Builders Risk	**Required Limits**
Builder shall carry Builder's Risk to cover the loss of materials, and/or the building under construction/rehabilitation. SAHA and its affiliates must be named as an Additional Insured and as the Certificate Holder.	Equal to the Contract Cost of the construction or rehabilitation project stated in the contract.

ATTACHMENT A
Plans and Specifications

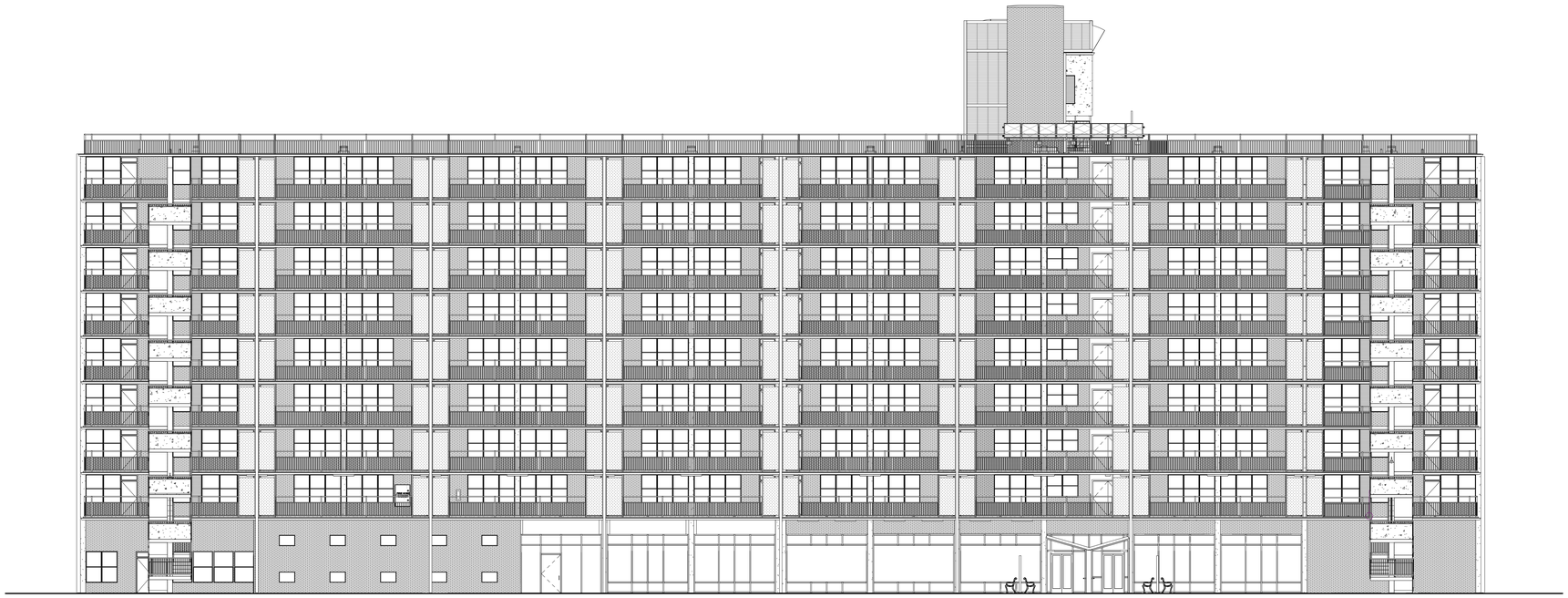
NOTES:

Victoria Plaza General Notes for Bidders

1. The building has been fully vacated, and will remain unoccupied until Cert. of Occupancy has been delivered
2. Contractor shall assume responsibility of the site and building; including physically securing the site and building at all times, for the duration of construction
3. Contractor shall remove and salvage original copper gutter material for auction by the Owner. Contractor shall consolidate and temporarily store copper gutter material in a secure location
4. Contractor shall be allowed use of building elevators for personnel and small tools and material only
5. Contractor shall utilize existing parking spaces and shall limit personnel vehicles to parking on premises only
6. Contractor shall be responsible for temporary displacement of all appliances, and shall set appliances in place and functioning at unit completion
7. Contractor shall administratively track Energy Performance Contract (EPC) items separately from the general scope of work, and shall invoice for EPC items separately
8. Contractor shall be responsible for coordination of all abatement activities with Environmental Engineer of record

SPECIAL NOTE:

Contractor shall work with SAHA's Sustainability Liaison and Build San Antonio Green from beginning of project to obtain level 2 Energy Retrofit Certification. Contractor must ensure compliance with checklist that will be generated from SAHA's Construction and Sustainability Department. Please see attached example of requirements (Exhibit A.).



VICTORIA PLAZA MODERNIZATION

411 BARRERA
SAN ANTONIO, TEXAS 78210

ALTERNATES

ALT #1 - DEDUCT TO ELIMINATE DOWNSPOUT REPLACEMENT

ALT #2 - DEDUCT TO ELIMINATE STAIR PRESSURIZATION SYSTEM & ENCLOSURE

ALT #3 - DEDUCT FOR ELIMINATION OF REMOVAL OF PENTHOUSE SCREEN AS INDICATED, REF. 4/A195

ALT #4 - DEDUCT TO PRESERVE EXISTING LADDER & CAGE

SAN ANTONIO HOUSING AUTHORITY

Commissioners

Morris A. Stribling, DPM	Chairman
Charles Munez	Vice Chairman
Tommy Adrisson	Commissioner
Francesca Caballero	Commissioner
Charles Clack	Commissioner
Marie R. McClare	Commissioner
Jessica Weaver	Commissioner

President & CEO
David Nisivoccia

DRAWING LIST

DRAWING INDEX

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OWNER

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LOCATION:
SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS

ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT JAMES DURAND HOLLIS 10881-1 STATE OF TEXAS
05/25/18
PERMIT SET

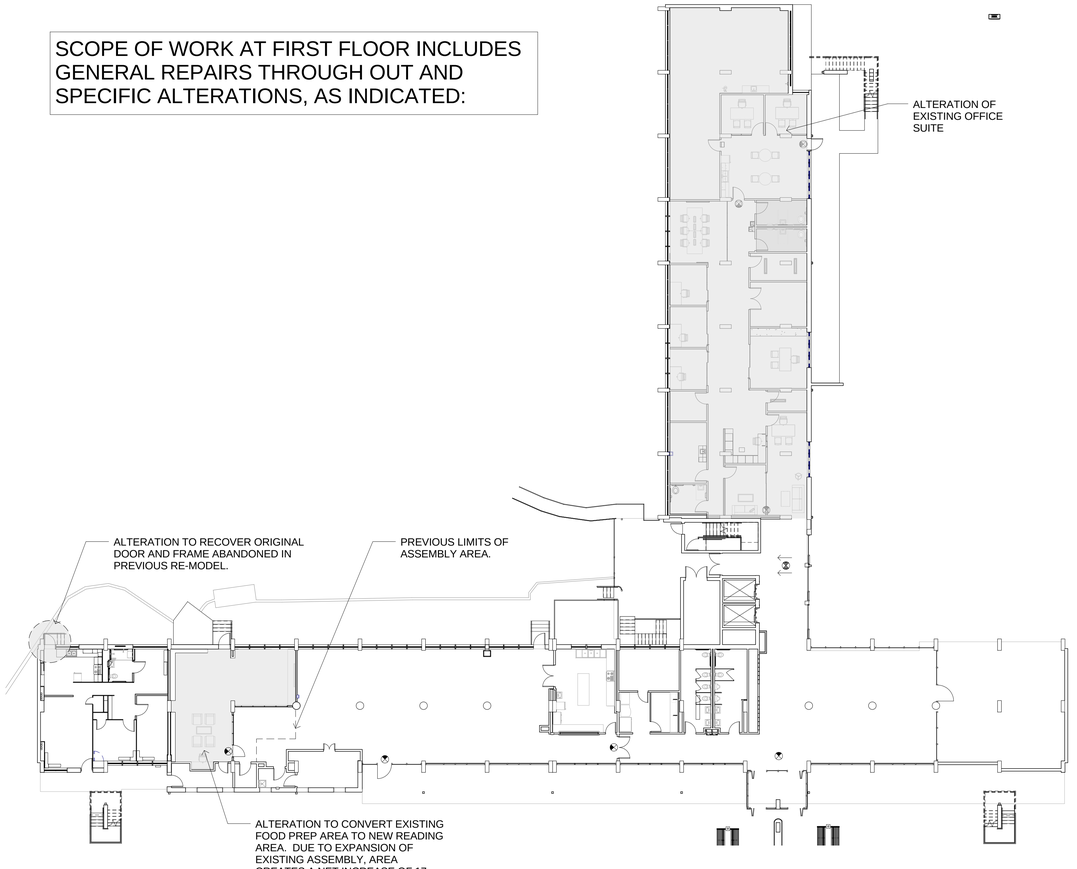
PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

COVER

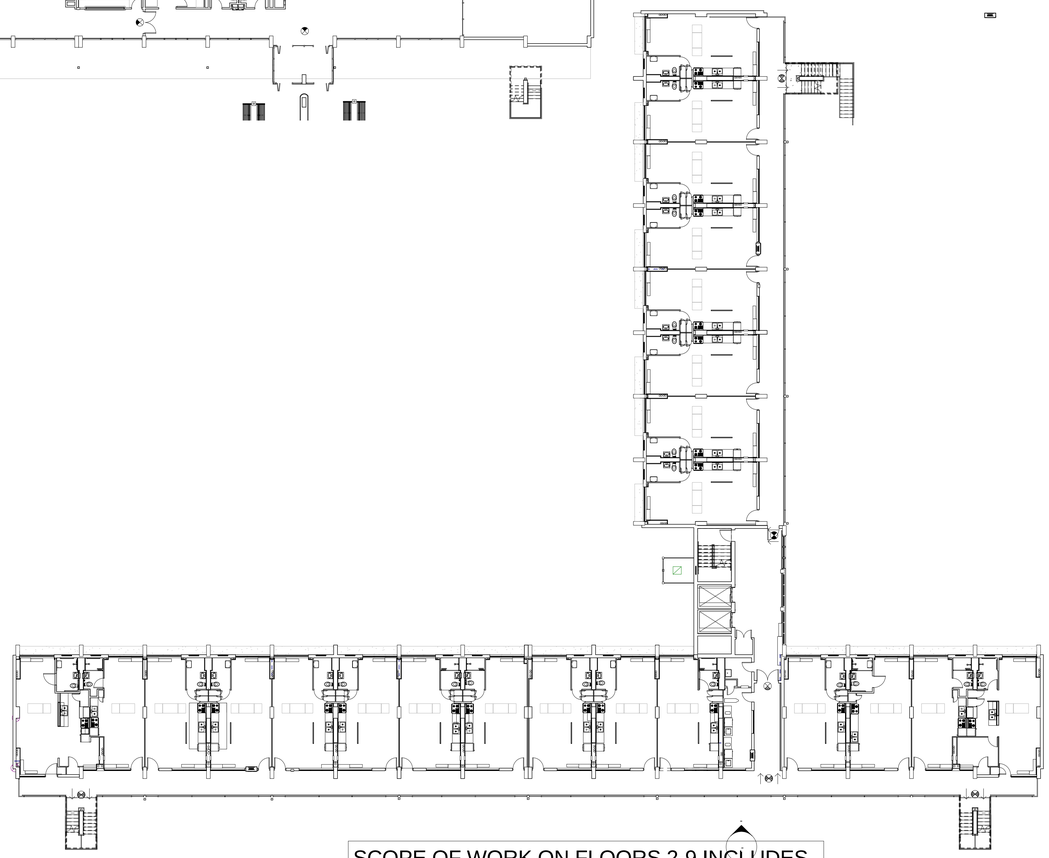
SHEET NUMBER
G-100

CODE SUMMARY PLAN

SCOPE OF WORK AT FIRST FLOOR INCLUDES GENERAL REPAIRS THROUGH OUT AND SPECIFIC ALTERATIONS, AS INDICATED:



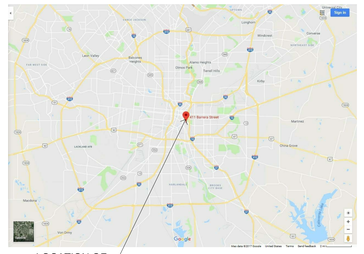
1 CODE SUMMARY PLAN - FIRST FLOOR
1/16" = 1'-0"



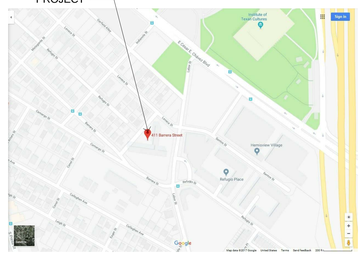
SCOPE OF WORK ON FLOORS 2-9 INCLUDES GENERAL REPAIRS TO EXISTING AREAS TO REMAIN, AS INDICATED:

2 CODE SUMMARY PLAN-LEVELS 2 THRU 9
1/16" = 1'-0"

MAP OF SAN ANTONIO



LOCATION OF PROJECT



BUILDING CODE INFORMATION

2015 INTERNATIONAL BUILDING CODE
2015 INTERNATIONAL MECHANICAL CODE
2015 INTERNATIONAL PLUMBING CODE
2015 INTERNATIONAL EXISTING BUILDING CODE
2015 INTERNATIONAL FUEL GAS CODE
2015 INTERNATIONAL FIRE CODE
2015 INTERNATIONAL ENERGY CONSERVATION CODE
2014 NATIONAL ELECTRIC CODE

SITE INFORMATION

ADDRESS:	411 BARRERA,
	LOT 11
	CITY OF SAN ANTONIO
	BEXAR COUNTY
	STATE OF TEXAS 78210
LAVACA NEIGHBORHOOD ASSOCIATION 470	
ZONING CODE:	MF-33 S HS
CONSTRUCTION TYPE:	II-B
SITE SQUARE FOOTAGE:	52, 744 SQFT.
NEW IMPERVIOUS COVER:	250 SQFT.

BUILDING OCCUPANCY SUMMARY

ROOM NAME	SQUARE FOOT	SF / OCCUPANT	OCCUPANTS
BASEMENT			
MECHANICAL	2983	300	10
EQUIPMENT	326	300	2
			12
1ST FLOOR			
LOBBY	1365	15	91
ELEVATOR LOBBY	422	15	29
PASSAGE	57	15	4
HALLWAY	137	15	10
HALLWAY	293	15	20
VENDING	85	15	6
COMPUTER	74	15	5
FIRE COMMAND	171	15	12
KITCHEN	339	200	2
LOBBY 2	2124	15	142
LIBRARY	482	100	5
CONFERENCE	239	100	3
LIVING ROOM	341	200	2
RES. KITCHEN	163	200	1
BEDROOM 1	126	200	1
BEDROOM 2	121	200	1
DRESSING ROOM	102	200	1
BATH	52	200	1
LOBBY 3	350	100	4
WAITING	71	100	1
CLINIC	82	100	1
RESTROOM	66	100	1
EXAM	74	100	1
INTERVIEW	129	100	2
RECEPTION	207	100	3
SUPPLIES	74	100	1
MDF	67	100	1
HALLWAY	452	100	5
OFFICE	101	100	1
OFFICE	101	100	1
OFFICE	101	100	1
CONFERENCE 2	238	100	3
MANAGER	232	100	3
MECHANICAL	169	100	2
FILES	102	100	2
W. RESTROOM	79	100	1
M. RESTROOM	85	100	1
BREAK ROOM	364	100	4
MAINT. OFFICE	113	100	2
MAINT. OFFICE	111	100	2
STORAGE	216	100	3
SHOP	216	100	3
STORAGE	508	100	6
WASH ROOM	101	100	1
			392
TYPICAL RESIDENTIAL LEVELS			
PUBLIC SPACE	453	15	30
LAUNDRY	159	300	1
JANITOR	45	300	1
RESIDENCE 1	527	200	3
RESIDENCE 2	379	200	2
RESIDENCE 3	447	200	3
RESIDENCE 4	447	200	3
RESIDENCE 5	447	200	3
RESIDENCE 6	447	200	3
RESIDENCE 7	447	200	3
RESIDENCE 8	447	200	3
RESIDENCE 9	447	200	3
RESIDENCE 10	447	200	3
RESIDENCE 11	447	200	3
RESIDENCE 12	447	200	3
RESIDENCE 13	447	200	3
RESIDENCE 14	349	200	2
RESIDENCE 15	555	200	3
RESIDENCE 16	447	200	3
RESIDENCE 17	447	200	3
RESIDENCE 18	447	200	3
RESIDENCE 19	447	200	3
RESIDENCE 20	447	200	3
RESIDENCE 21	447	200	3
RESIDENCE 22	447	200	3
RESIDENCE 23	447	200	3
			99

TOTAL OCCUPANT LOADS		
	BASEMENT	12
	1ST FLOOR	392
	2ND FLOOR	99
	3RD FLOOR	99
	4TH FLOOR	99
	5TH FLOOR	99
	6TH FLOOR	99
	7TH FLOOR	99
	8TH FLOOR	99
	9TH FLOOR	99
	10TH FLOOR	0
	11TH FLOOR	1
	TOTAL OCCUPANT LOAD	1197

BUILDING INFORMATION

BUILDING LEVEL	SQFT.
11TH FLOOR	500
10TH FLOOR	
9TH FLOOR	12,505
8TH FLOOR	12,505
7TH FLOOR	12,505
6TH FLOOR	12,505
5TH FLOOR	12,505
4TH FLOOR	12,505
3RD FLOOR	12,505
2ND FLOOR	12,505
1ST FLOOR	13,511
BASEMENT	3,309
TOTAL SQUARE FOOTAGE	117,360
BUILDING HEIGHT:	107'-9"

FIRE PROTECTION INFORMATION

AUTOMATIC SPRINKLER SYSTEM	NFPA 13
AUTOMATIC FIRE ALARM	NFPA 72
STANDPIPE SYSTEM	NFPA 14
FIRE EXTINGUISHER	NFPA 10

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SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS

ISSUE	DESCRIPTION	DATE

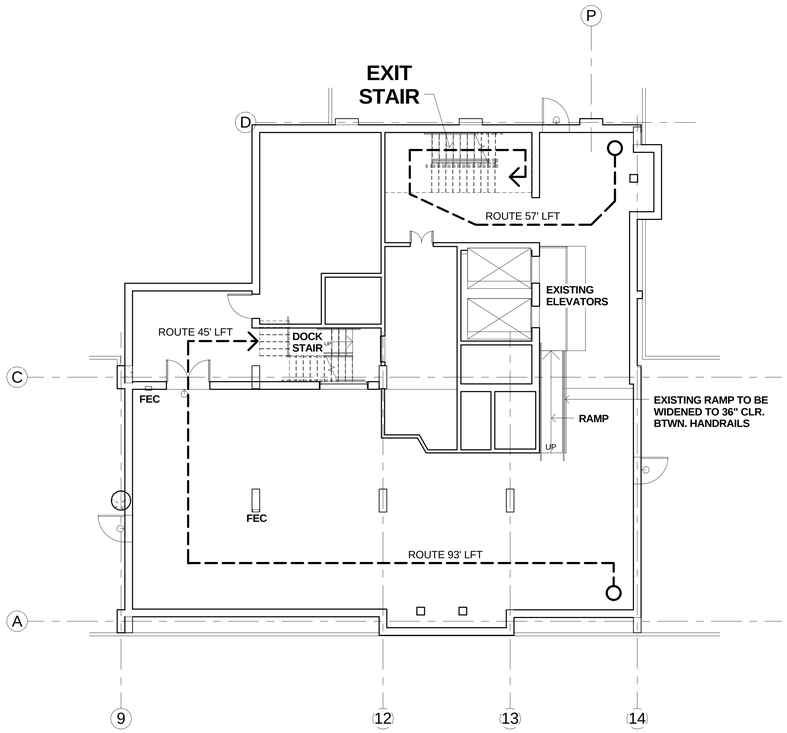
REGISTERED ARCHITECT — GABRIEL DURAND-HOLLIS — 18981-1 — STATE OF TEXAS
05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–981

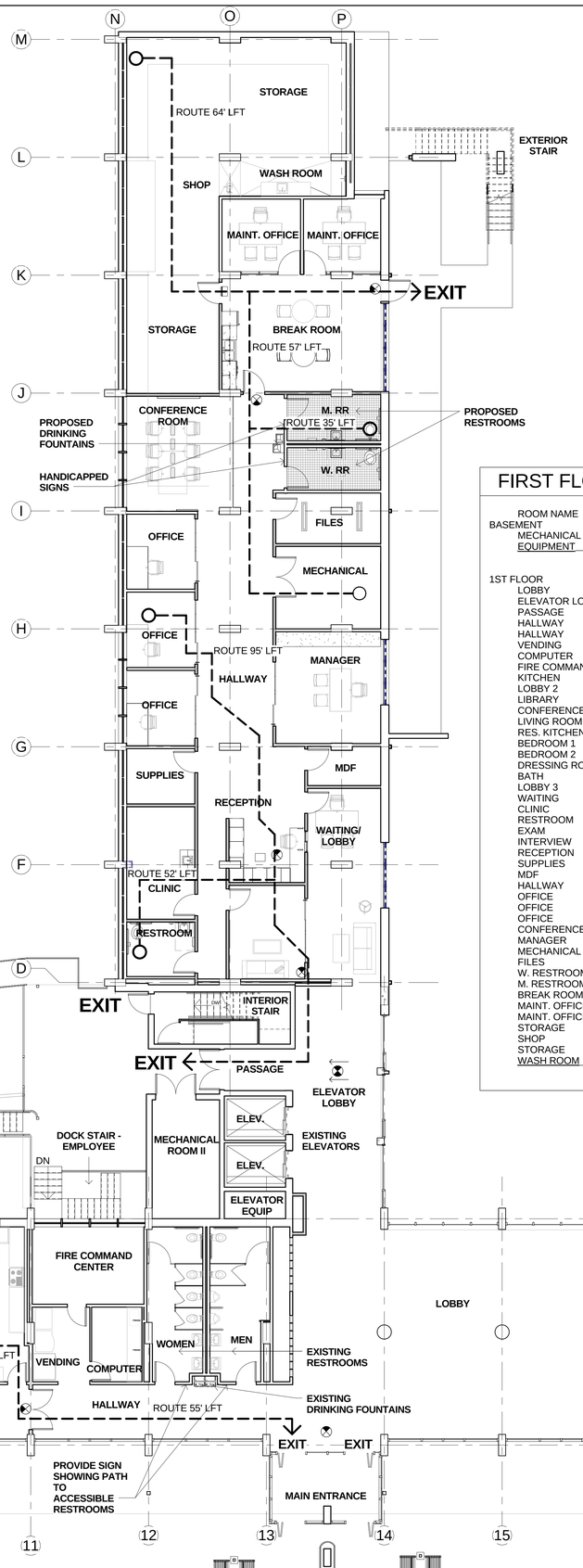
PERMIT INFORMATION

SHEET NUMBER
G-101



2 BASEMENT - Life Safety Plan
1/8" = 1'-0"

PLAN NORTH



1 Level 1 - Life Safety Plan
1/8" = 1'-0"

PLAN NORTH

FIRE SAFETY LEGEND

- FEC - FIRE EXTINGUISHER CABINET
- FHC - FIRE HOSE CABINET
- EMERGENCY EXIT SIGN
- MEANS OF EGRESS ROUTE

OCCUPANCY CLASSIFICATION

PER CERTIFICATE OF OCCUPANCY
NO. 08593B

GROUP:	R-1
CONSTRUCTION TYPE:	IIB
SPRINKLERED:	YES
TOTAL AREA:	117,360 SF
NUMBER OF OCCUPANTS:	140 OCC.
LOT: 11 NCB: 715	BLOCK: 000 ZONE: MF33
NEW HANDRAIL HEIGHT:	34IN
NEW GUARDRAIL HEIGHT:	48IN
EGRESS WIDTH FOR STAIRS:	36IN MIN

USE OF PREMISES: APARTMENTS

FIRST FLOOR OCCUPANCY CALCS.

ROOM NAME	SQUARE FOOT	SF / OCCUPANT	OCCUPANTS
BASEMENT			
MECHANICAL	2983	300	10
EQUIPMENT	326	300	2
			12
1ST FLOOR			
LOBBY	1365	15	91
ELEVATOR LOBBY	422	15	29
PASSAGE	57	15	4
HALLWAY	137	15	10
HALLWAY	293	15	20
VENDING	85	15	6
COMPUTER	74	15	5
FIRE COMMAND	171	15	12
KITCHEN	339	200	2
LOBBY 2	2124	15	142
LIBRARY	482	100	5
CONFERENCE	239	100	3
LIVING ROOM	341	200	2
RES. KITCHEN	163	200	1
BEDROOM 1	126	200	1
BEDROOM 2	121	200	1
DRESSING ROOM	102	200	1
BATH	52	200	1
LOBBY 3	350	100	4
WAITING	71	100	1
CLINIC	82	100	1
RESTROOM	66	100	1
EXAM	74	100	1
INTERVIEW	129	100	2
RECEPTION	207	100	3
SUPPLIES	74	100	1
MDF	67	100	1
HALLWAY	452	100	5
OFFICE	101	100	1
OFFICE	101	100	1
OFFICE	101	100	1
CONFERENCE 2	238	100	3
MANAGER	232	100	3
MECHANICAL	169	100	2
FILES	102	100	2
W. RESTROOM	79	100	1
M. RESTROOM	85	100	1
BREAK ROOM	364	100	4
MAINT. OFFICE	113	100	2
MAINT. OFFICE	111	100	2
STORAGE	216	100	3
SHOP	216	100	3
STORAGE	508	100	6
WASH ROOM	101	100	1
			392

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VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS

ISSUE	DESCRIPTION	DATE

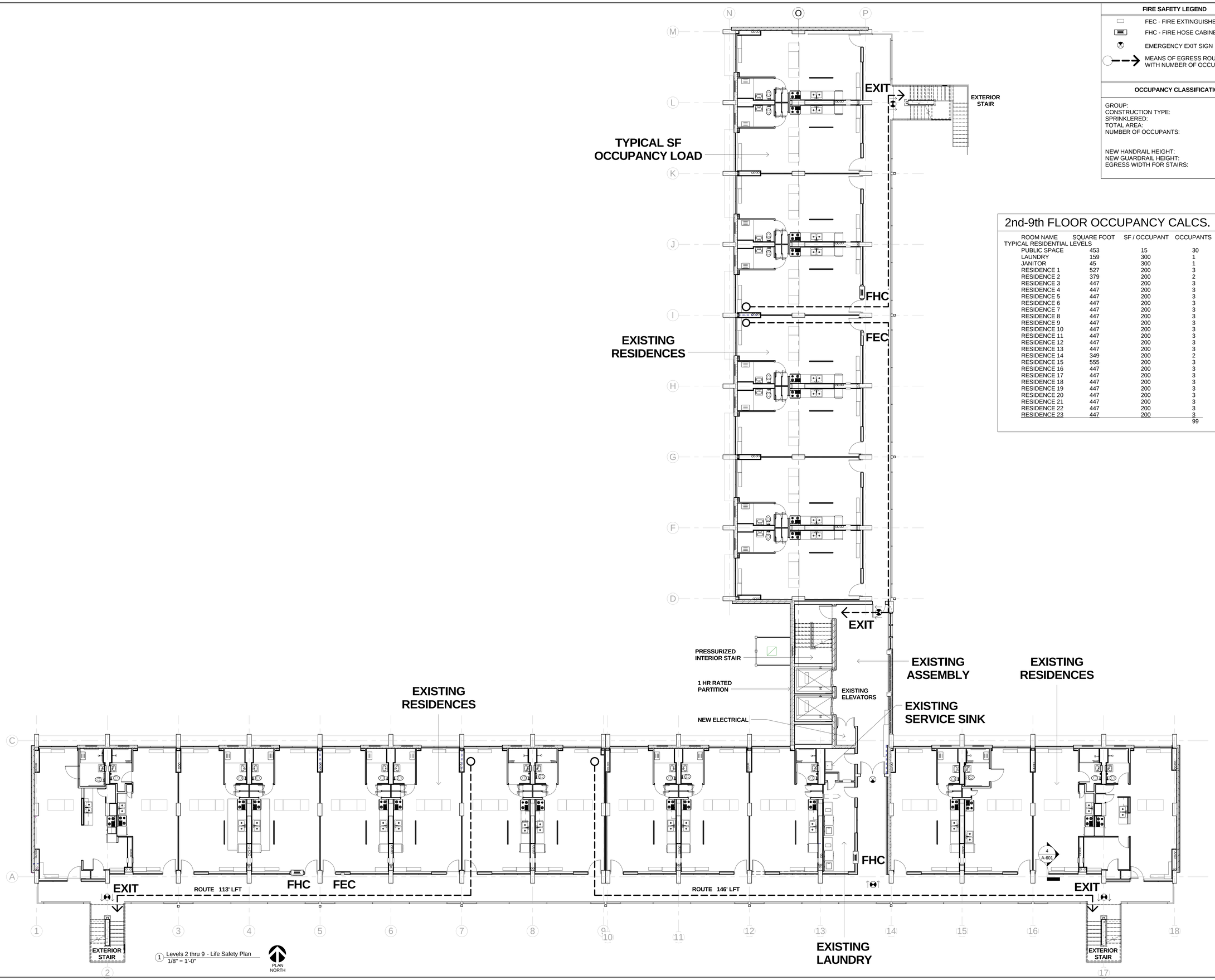
REGISTERED ARCHITECT — GABRIEL DURAND-HOLLIS — 10-881-1 — STATE OF TEXAS
05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

LIFE SAFETY PLAN - BASEMENT & LEVEL 1

SHEET NUMBER
G-102



1 Levels 2 thru 9 - Life Safety Plan
1/8" = 1'-0"

PLAN NORTH

FIRE SAFETY LEGEND

- FEC - FIRE EXTINGUISHER CABINET
- FHC - FIRE HOSE CABINET
- EMERGENCY EXIT SIGN
- MEANS OF EGRESS ROUTE WITH NUMBER OF OCCUPANTS

OCCUPANCY CLASSIFICATION

GROUP:	B
CONSTRUCTION TYPE:	IIB
SPRINKLERED:	YES
TOTAL AREA:	117,360 SF
NUMBER OF OCCUPANTS:	1197 OCC.
NEW HANDRAIL HEIGHT:	34IN
NEW GUARDRAIL HEIGHT:	42IN
EGRESS WIDTH FOR STAIRS:	36IN MIN

2nd-9th FLOOR OCCUPANCY CALCS.

ROOM NAME	SQUARE FOOT	SF / OCCUPANT	OCCUPANTS
TYPICAL RESIDENTIAL LEVELS			
PUBLIC SPACE	453	15	30
LAUNDRY	159	300	1
JANITOR	45	300	1
RESIDENCE 1	527	200	3
RESIDENCE 2	379	200	2
RESIDENCE 3	447	200	3
RESIDENCE 4	447	200	3
RESIDENCE 5	447	200	3
RESIDENCE 6	447	200	3
RESIDENCE 7	447	200	3
RESIDENCE 8	447	200	3
RESIDENCE 9	447	200	3
RESIDENCE 10	447	200	3
RESIDENCE 11	447	200	3
RESIDENCE 12	447	200	3
RESIDENCE 13	447	200	3
RESIDENCE 14	349	200	2
RESIDENCE 15	555	200	3
RESIDENCE 16	447	200	3
RESIDENCE 17	447	200	3
RESIDENCE 18	447	200	3
RESIDENCE 19	447	200	3
RESIDENCE 20	447	200	3
RESIDENCE 21	447	200	3
RESIDENCE 22	447	200	3
RESIDENCE 23	447	200	3
			99

DHR ARCHITECTS

DURAND–HOLLIS RUPE ARCHITECTS, INC.
14603 HUEBNER ROAD
BUILDING 18
SAN ANTONIO, TEXAS 78230
TEL. 210 308–0080
FAX. 210 697–3309
eMAIL OFFICE@DHRARCHITECTS.COM

OWNER:

SAHA SAN ANTONIO HOUSING AUTHORITY
Opportunity Lives Here

SAN ANTONIO HOUSING AUTHORITY
818 SOUTH FLORES STREET
SAN ANTONIO, TX 78204
T: 210.477.6262

LOCATION:

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT — GABRIEL DURAND-HOLLIS — 10881 — STATE OF TEXAS

05/25/18

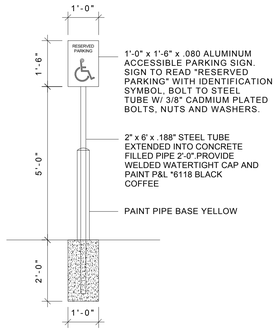
PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

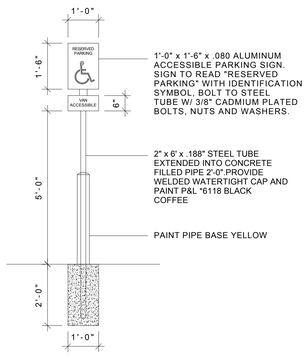
LIFE SAFETY PLAN - LEVELS 2 THRU 9

SHEET NUMBER
G-103

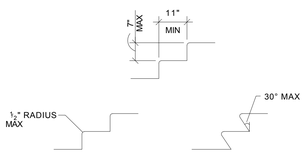
PARKING SIGN



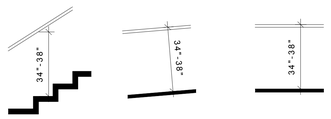
VAN PARKING SIGN



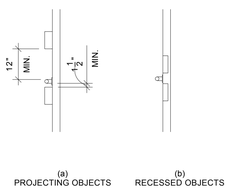
STAIRWAYS



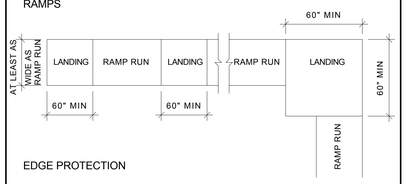
HANDRAILS



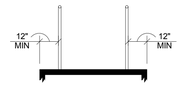
SPACING OF GRAB BARS



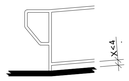
RAMPS



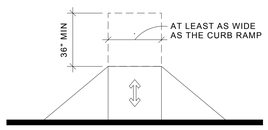
EDGE PROTECTION



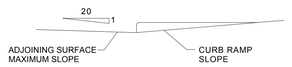
CURB OR BARRIER



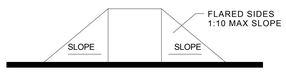
LANDINGS



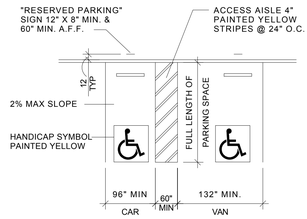
CURB RAMP



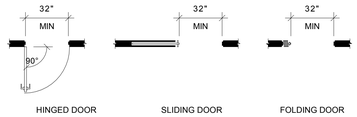
SIDES OF CURB RAMP



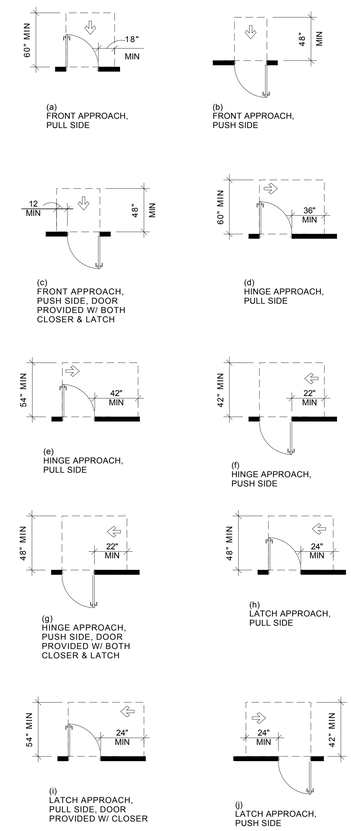
PARKING SPACES



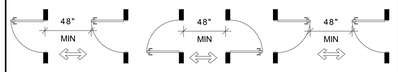
DOORWAYS



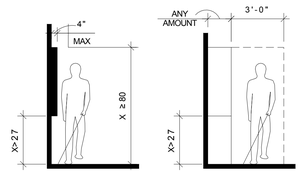
MANEUVERING CLEARANCES



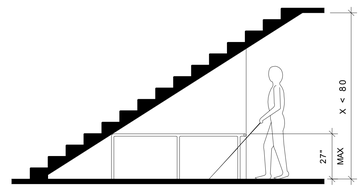
DOORS IN SERIES



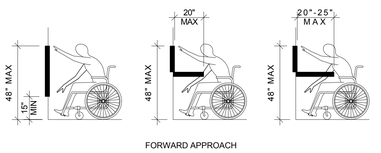
PROTRUDING OBJECTS



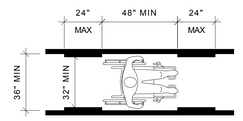
VERTICAL CLEARANCE



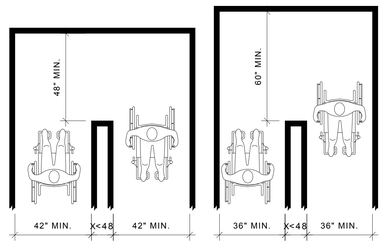
REACH RANGES



WALKING SURFACES

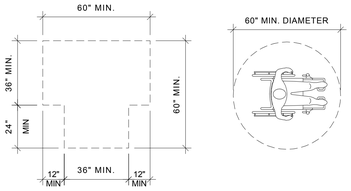


CLEAR WIDTH AND TURN

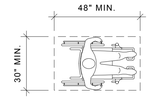


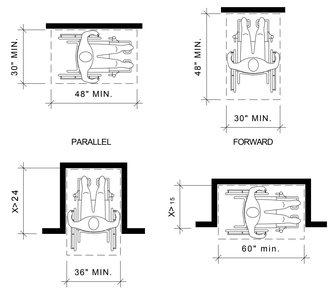
FLOOR OR GROUND SURFACES

TURNING SPACE

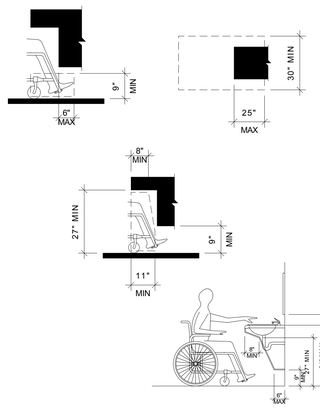


CLEAR FLOOR OR GROUND SPACE





KNEE AND TOE CLEARANCE



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TEL. 210 308–0080
FAX. 210 697–3309
eMAIL OFFICE@DHRARCHITECTS.COM

OWNER:

SAN ANTONIO HOUSING AUTHORITY
818 SOUTH FLORES STREET
SAN ANTONIO, TX 78204
T: 210.477.6262

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION

LOCATION: 411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS

ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT — DANIEL GUADIANO HOLLIS — 10681 — STATE OF TEXAS

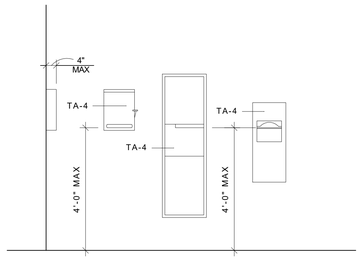
05/25/18

PERMIT SET

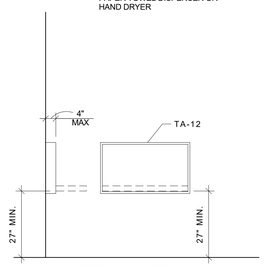
PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–681

ACCESSIBILITY

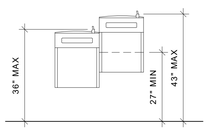
SHEET NUMBER
G-104



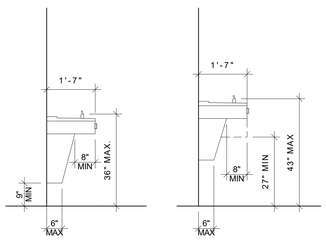
PAPER TOWEL DISPENSER
w/ WASTE RECEPTACLE OR
PAPER TOWEL DISPENSER OR
HAND DRYER



BABY CHANGING STATION
IF HORIZONTAL STATION
INTERFERES W/ GRAB BARS,
INSTALL CHANGING STATION
MODEL DESIGNED FOR 90
DEGREE VERTICAL CONDITION

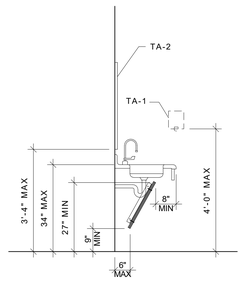


ACCESSIBLE & STANDARD
DRINKING FOUNTAINS
(COMBINED)

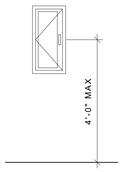


ACCESSIBLE DRINKING
FOUNTAIN

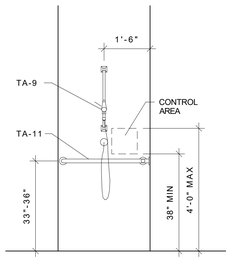
STANDARD DRINKING
FOUNTAIN w/ APRON



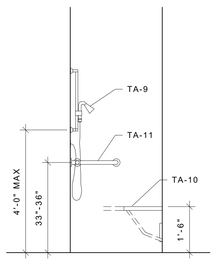
ACCESSIBLE SINK
AT BREAK ROOM



FIRE EXTINGUISHER CABINET

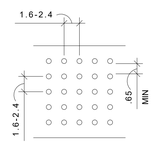


ACCESSIBLE SHOWER
(36"X36")

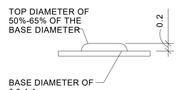


ACCESSIBLE SHOWER
(36"X36")

DETECTABLE WARNINGS

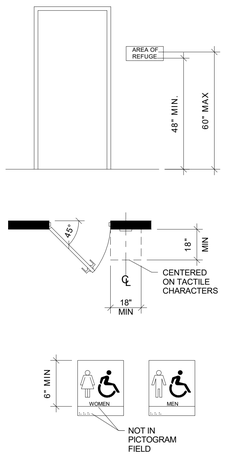


PLAN

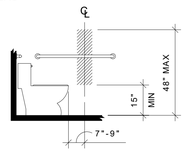


ENLARGED ELEVATION

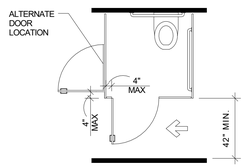
LOCATION OF TACTILE SIGNS AT DOORS



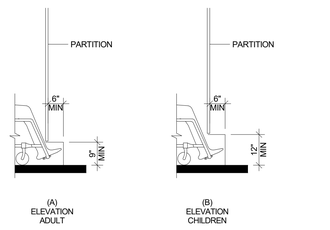
DISPENSERS



TOILET COMPARTMENTS DOORS



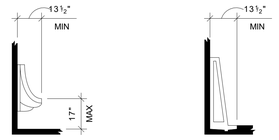
TOE CLEARANCE



(A)
ELEVATION
ADULT

(B)
ELEVATION
CHILDREN

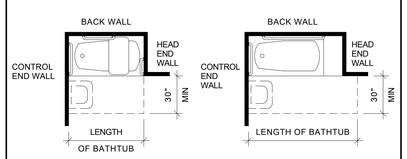
URINALS



WALL HUNG TYPE

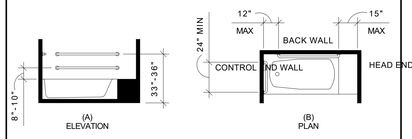
STALL TYPE

BATHTUBS



(A)
REMOVABLE
IN-TUB SEAT

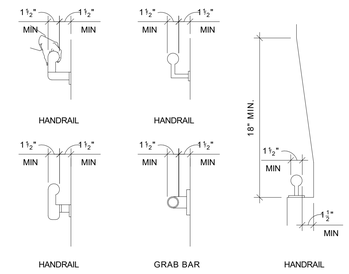
(B)
PERMANENT
SEAT



(A)
ELEVATION

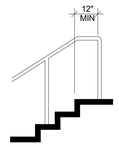
(B)
PLAN

HANDRAIL CLEARANCE

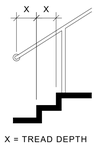


TOP AND BOTTOM EXTENSION AT RAMPS

TOP EXTENSION AT STAIRS

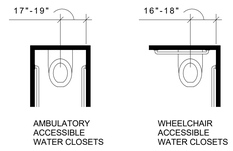


BOTTOM EXTENSION AT STAIRS



X = TREAD DEPTH

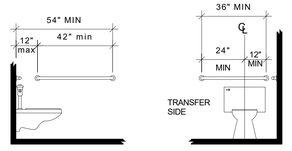
TOILET COMPARTMENTS



AMBULATORY
ACCESSIBLE
WATER CLOSETS

WHEELCHAIR
ACCESSIBLE
WATER CLOSETS

GRAB BARS



TRANSFER
SIDE

DURAND–HOLLIS RUPE
ARCHITECTS, INC.
14603 HUEBNER ROAD
BUILDING 18
SAN ANTONIO, TEXAS
78230
TEL. 210 308–0080
FAX. 210 697–3309
eMAIL OFFICE@DHRARCHITECTS.COM

OWNER:

SAN ANTONIO HOUSING AUTHORITY
818 SOUTH FLORES STREET
SAN ANTONIO, TX 78204
T: 210.477.6262

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION

LOCATION: 411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT
JAMES DURAND HOLLIS
10881
STATE OF TEXAS

05/25/18

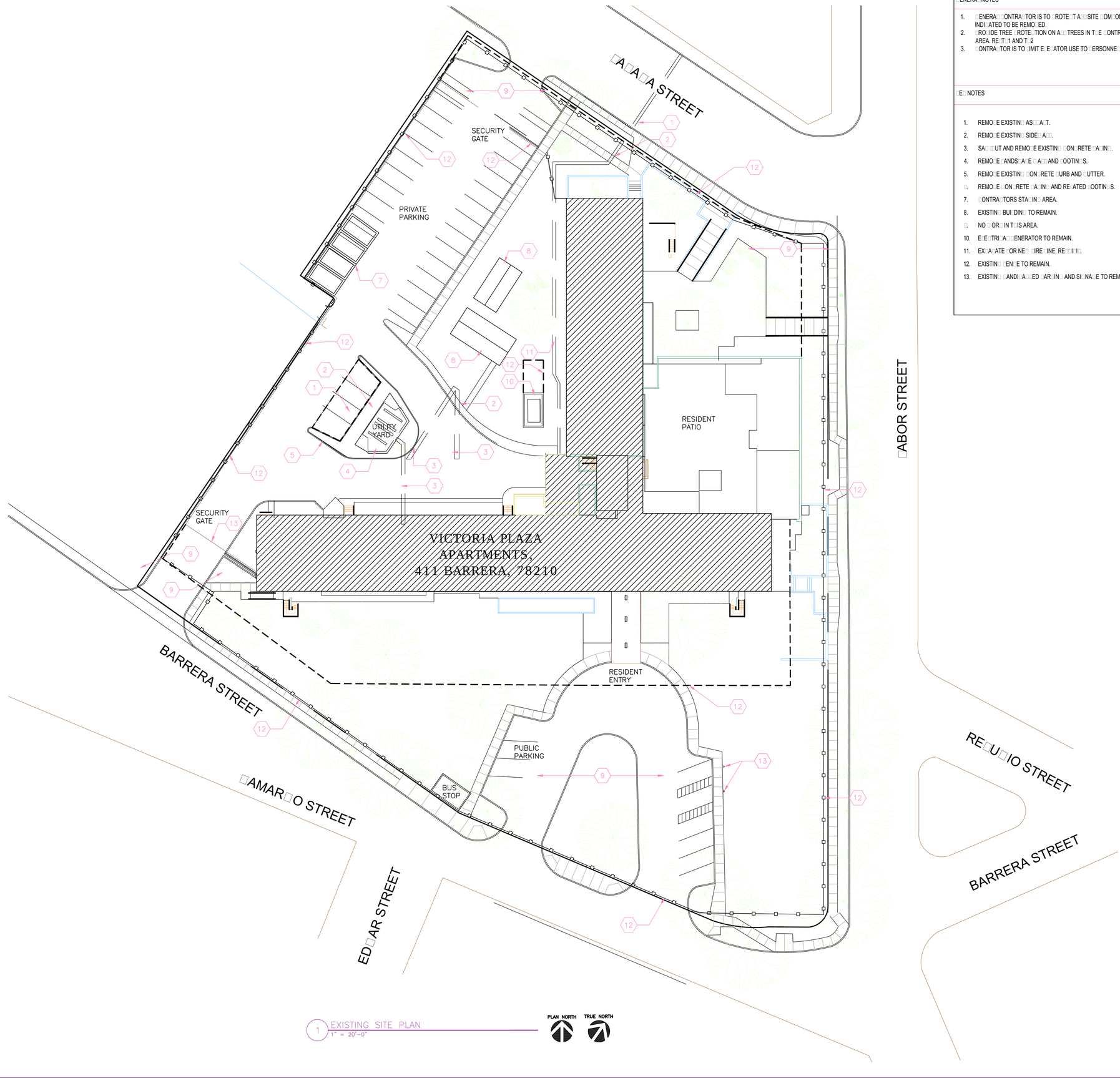
PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

ACCESSIBILITY

SHEET NUMBER

G-105



1 EXISTING SITE PLAN
1" = 20'-0"

PLAN NORTH

TRUE NORTH

□ENERA□ NOTES

1. □ENERA□□ONTRA□TOR IS TO □ROTE□T A □□SITE □OM□ONENTS T□AT ARE NOT INDI□ATED TO BE REMO□ED.
2. □RO□IDE TREE □ROTE□TION ON A□□ TREES IN T□E □ONTRA□TORS STA□IN□ AREA. RE□T□1 AND T□2
3. □ONTRA□TOR IS TO □IMIT E□E□ATOR USE TO □ERSONNE□ AND SMA□□TOO□S.

□E□ NOTES

1. REMO□E EXISTIN□ AS□□A□T.
2. REMO□E EXISTIN□ SIDE□ A□□.
3. SA□□□UT AND REMO□E EXISTIN□ □ON□RETE □A□IN□.
4. REMO□E □ANDS□A□E □A□□AND □OOTIN□S.
5. REMO□E EXISTIN□ □ON□RETE □URB AND □UTTER.
6. REMO□E □ON□RETE □A□IN□ AND RE□ATED □OOTIN□S.
7. □ONTRA□TORS STA□IN□ AREA.
8. EXISTIN□ BUI□DIN□ TO REMAIN.
9. NO □ OR□IN T□IS AREA.
10. E□E□TRI□A□□ENERATOR TO REMAIN.
11. EX□A□ATE □OR NE□ □IRE □INE, RE□□I□□.
12. EXISTIN□ □EN□E TO REMAIN.
13. EXISTIN□ □ANDI□A□□ED □AR□IN□ AND SI□NA□E TO REMAIN.

DHR
DURAND—HOLLIS RUPE ARCHITECTS, INC.
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SAN ANTONIO, TEXAS 78230
TEL. 210 308-0080
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SAHA SAN ANTONIO HOUSING AUTHORITY
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SAN ANTONIO HOUSING AUTHORITY
818 SOUTH FLORES STREET
SAN ANTONIO, TX 78204
T. 210.477.6262

LOCATION:

SAN ANTONIO HOUSING AUTHORITY VICTORIA PLAZA MODERNIZATION

411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS

ISSUE	DESCRIPTION	DATE

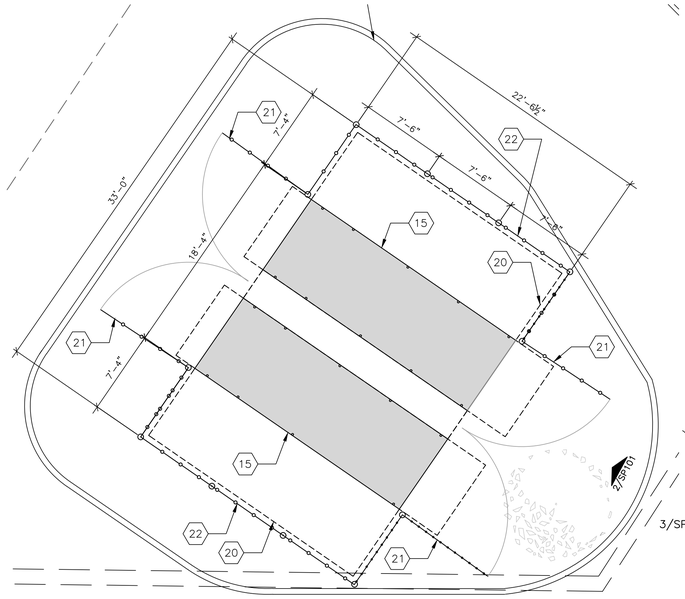
REGISTERED ARCHITECT
GABRIEL BURAND HOLLIS
10861
STATE OF TEXAS

PERMIT SET 05/25/18

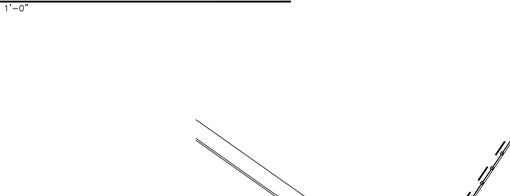
PROJECT ARCHITECT
GABRIEL BURAND HOLLIS, AIA
DHR@DHRARCHITECTS.COM

EXISTING SITE PLAN

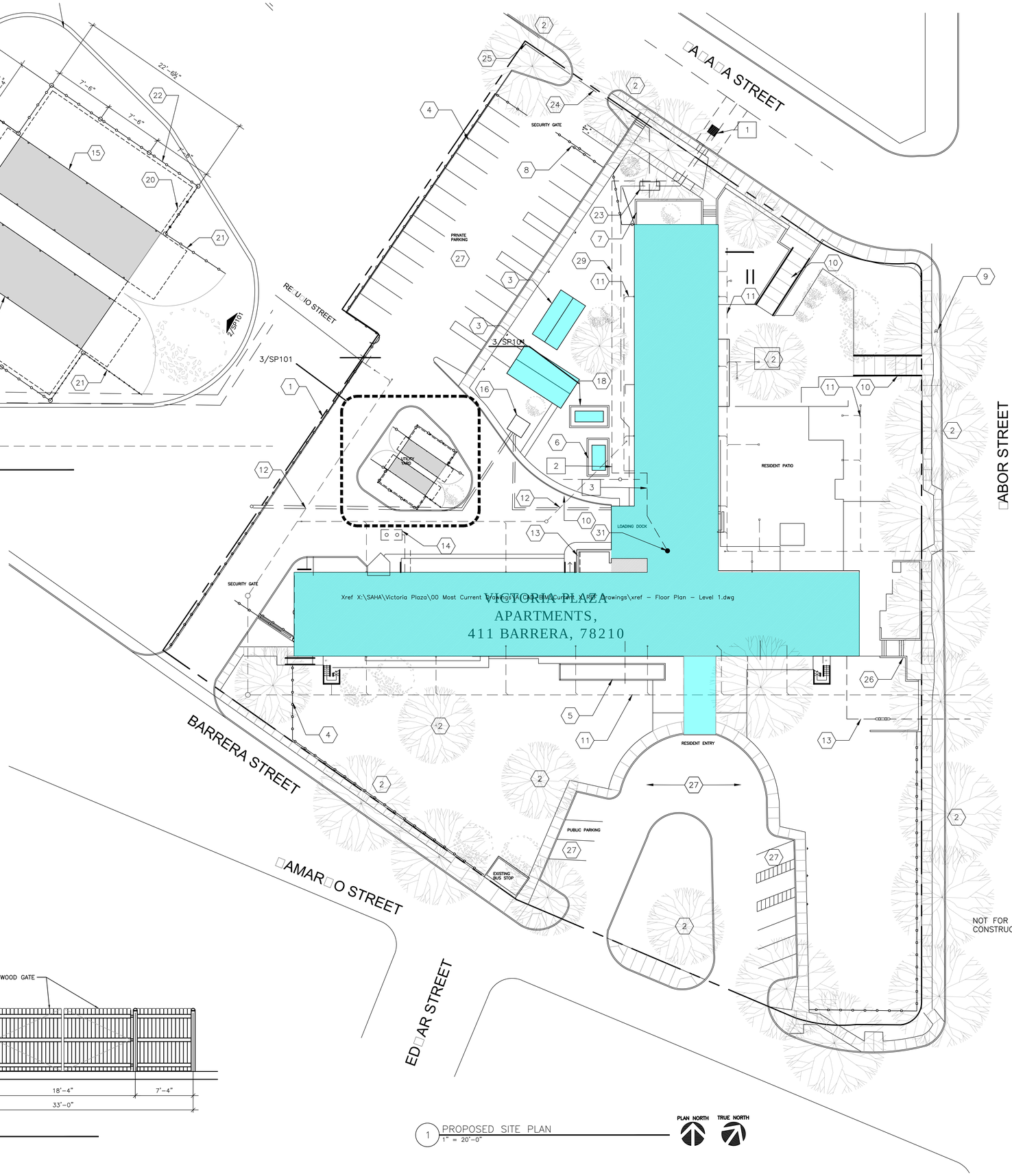
SHEET NUMBER
SP-100



3 ENLARGED UTILITY YARD
3/16" = 1'-0"



2 UTILITY YARD ELEVATION
3/16" = 1'-0"



1 PROPOSED SITE PLAN
1" = 20'-0"

PLAN NORTH TRUE NORTH

GENERAL NOTES

1. THE BUILDING HAS BEEN FULLY VACATED, AND WILL REMAIN UNOCCUPIED UNTIL CERT. OF OCCUPANCY HAS BEEN DELIVERED.
2. CONTRACTOR SHALL ASSUME RESPONSIBILITY OF THE SITE AND BUILDING; INCLUDING PHYSICALLY SECURING THE SITE AND BUILDING AT ALL TIMES, FOR THE DURATION OF CONSTRUCTION.
3. CONTRACTOR SHALL REMOVE AND SALVAGE ORIGINAL COPPER GUTTER MATERIAL FOR AUCTION BY THE OWNER. CONTRACTOR SHALL CONSOLIDATE AND TEMPORARILY STORE COPPER GUTTER MATERIAL IN A SECURE LOCATION.
4. CONTRACTOR SHALL BE ALLOWED USE OF BUILDING ELEVATORS FOR PERSONNEL AND SMALL TOOLS AND MATERIAL ONLY.
5. CONTRACTOR SHALL UTILIZE EXISTING PARKING SPACES AND SHALL LIMIT PERSONNEL VEHICLES TO PARKING ON PREMISES ONLY.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARY DISPLACEMENT OF ALL APPLIANCES, AND SHALL SET APPLIANCES IN PLACE AND FUNCTIONING AT UNIT COMPLETION.
7. CONTRACTOR SHALL ADMINISTRATIVELY TRACK ENERGY PERFORMANCE CONTRACT (EPC) ITEMS SEPARATELY FROM THE GENERAL SCOPE OF WORK, AND SHALL INVOICE FOR EPC ITEMS SEPARATELY.
8. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION OF ALL ABATEMENT ACTIVITIES WITH ENVIRONMENTAL ENGINEER OF RECORD.
9. GENERAL CONTRACTOR IS TO PROTECT ALL SITE FEATURES DURING CONSTRUCTION.
10. LANDSCAPE TO REMAIN UNLESS INDICATED OTHERWISE.

KEYED NOTES

1. PROPERTY LINE
2. EXISTING TREES TO REMAIN
3. EXISTING STORAGE BUILDING TO REMAIN
4. EXISTING METAL PICKET FENCE TO REMAIN
5. EXISTING PLANTER TO REMAIN
6. EXISTING EMERGENCY GENERATOR TO REMAIN
7. EXISTING LANDSCAPE WALL TO REMAIN
8. EXISTING SECURITY GATE TO REMAIN
9. EXISTING FIRE HYDRANT
10. EXISTING RAMP & HANDRAILS TO REMAIN
11. EXISTING UNDERGROUND RAINFALL DIVERSION SYSTEM TO REMAIN
12. EXISTING UNDERGROUND 4" ELECTRICAL CONDUITS
13. EXISTING 6" C.I. WATER SERVICE
14. EXISTING GREASE TRAP TO REMAIN
15. NEW CHILLER, RE MECHANICAL
16. NEW ELECTRICAL TRANSFORMER BY CPS
17. NEW WOOD FENCE
18. NEW ELECTRICAL GENERATOR
19. NEW CURB AND GUTTER
20. ACCESS AREA REQUIRED FOR EQUIPMENT MAINTENANCE
21. 8'-0" HEIGHT WOOD GATE
22. WOOD FENCE
23. NEW BACK FLOW PREVENT AND CONCRETE PAD
24. 4" CONDUIT
25. POLE
26. EXISTING STAIR AND HANDRAILS TO REMAIN
27. EXISTING PARKING TO REMAIN
28. SOURCE FOR TELCO (FIBER & POWER) VERIFY EXACTO LOCATION

BROADBAND KEY NOTES

1. EXISTING AT&T PULL BOX IN MEDIAN. FIELD VERIFY EXACT LOCATION AND COORDINATE WITH AT&T FOR ENTRY INTO PULLBOX.
2. PROVIDE FIELDSHIELD FIBER PIGTAIL SERVICE, SINGLEMODE, IN 14/10MM DIRECT-BURY MICRODUCT FROM PULLBOX AT STREET UNDERGROUND TO BUILDING CRAWL SPACE. DETECTABLE WARNING TAPE SHALL BE PLACED 12" ABOVE BURIED CONDUIT ALONG ENTIRE PATHWAY.
3. EXTEND SERVICE FEED THRU CRAWL SPACE TO MDF RACK LOCATION WITH INDOOR PLENUM TYPE MICRODUCT. REFER TO SHEET A-101 FOR CONTINUATION

BROADBAND GENERAL NOTES

1. CONTRACTOR SHALL PROVIDE ALL CABLES, FIBER OPTICS, WIRING, AND RELATED CONDUIT, RACKS, BOXES AND RACEWAYS REQUIRED FOR THE INSTALLATION OF A COMPLETE SYSTEM CAPABLE OF RECEIVING HIGH SPEED INTERNET THAT IS ACCESSIBLE TO EACH APARTMENT UNIT AND ALL SERVICE LOCATIONS INDICATED ON THE PLANS.
2. CONTRACTOR SHALL COORDINATE PATH OF UNDERGROUND BROADBAND FIBER SERVICE WITH VERIZON CARMARGO ANTENNA SYSTEM SCOPE OF WORK INCLUDED HEREIN.
3. REFERENCE SPECIFICATION SECTION 271000 TELECOMMUNICATIONS INFRASTRUCTURE CABLING SYSTEM.
4. CONTRACTOR SHALL PROVIDE LABELS ON ALL CONDUITS END POINTS WITH TO AND FROM LOCATIONS.
5. ALL EXISTING CONDITIONS SHOWN ARE APPROXIMATELY CORRECT. NOT ALL EXISTING CONDITIONS ARE SHOWN. CONTRACTOR SHALL VISIT THE SITE TO FIELD VERIFY ALL EXISTING CONDITIONS.
6. CONTRACTOR SHALL PROVIDE A LOCATE SERVICE FOR EXISTING UTILITIES AND CONDITIONS PRIOR TO EXCAVATION, TRENCHING, OR BORING.

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SAN ANTONIO HOUSING AUTHORITY VICTORIA PLAZA MODERNIZATION

LOCATION: 411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT GABRIEL DURAND-HOLLIS RUPE 10861 STATE OF TEXAS

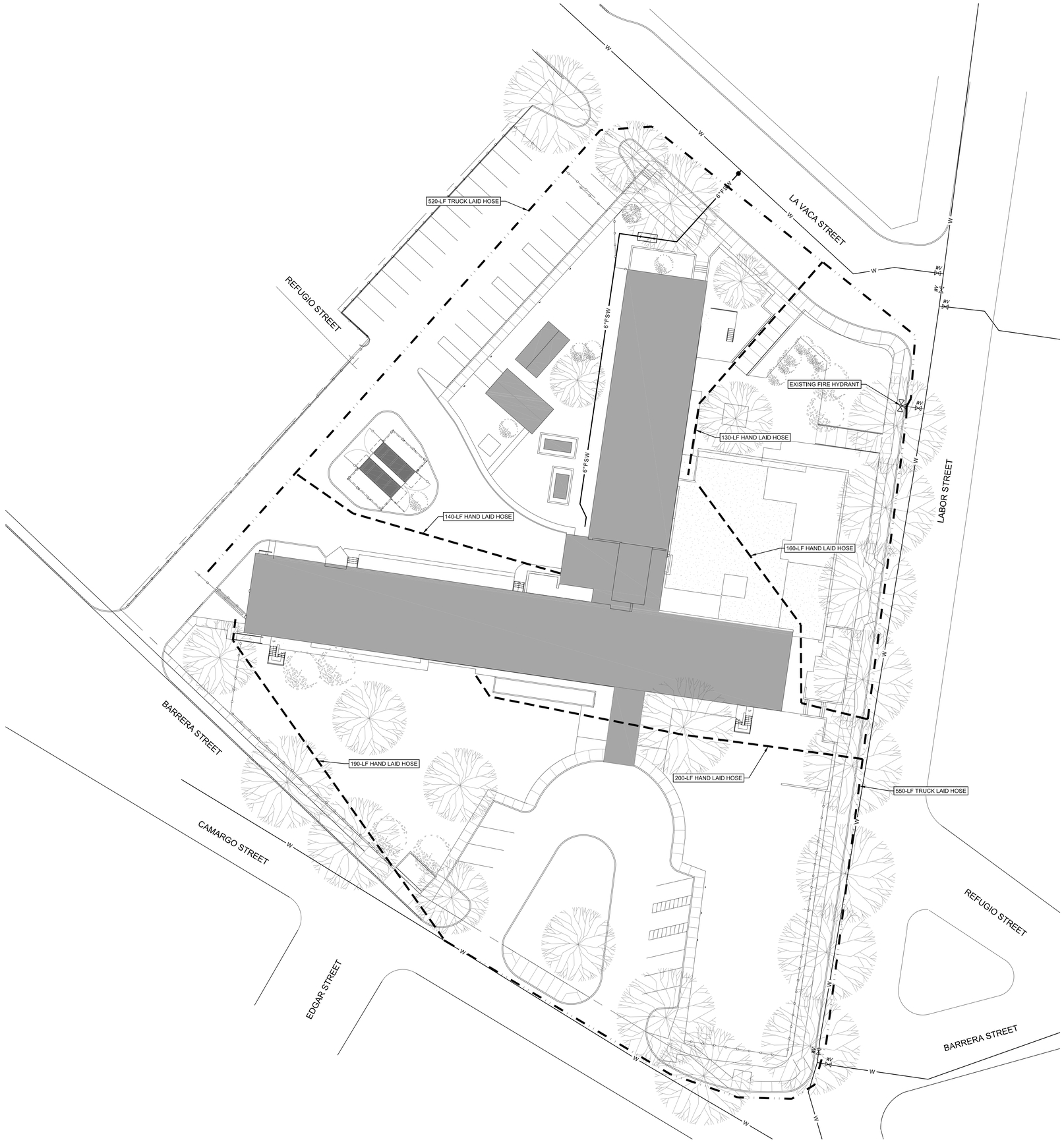
PERMIT SET 08/25/18

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-861

PROPOSED SITE PLAN

SHEET NUMBER
SP-101

SP-101-PROPOSED SITE PLAN.dwg
1/15/2004



NORTH

20' 10' 0 20' 40'

(IN FEET)

SCALE 1" = 20'

LEGEND

HAND LAID HOSE, MAXIMUM 200'

TRUCK LAID HOSE, MAXIMUM 550'

FIRE DEPARTMENT:

1. HYDRANTS MUST BE INSTALLED WITH THE CENTER OF THE FOUR-INCH (4") OPENING AT LEAST 18 INCHES ABOVE FINISHED GRADE. THE FOUR-INCH (4") OPENING MUST FACE THE DRIVEWAY OR STREET WITH ONE- TO SEVEN- FOOT SETBACKS FROM THE CURB LINE(S). NO OBSTRUCTION IS ALLOWED WITHIN THREE FEET (3') OF ANY HYDRANT AND THE FOUR-INCH (4") OPENING MUST BE TOTALLY UNOBSTRUCTED FROM THE STREET.
2. TIMING OF INSTALLATION: WHEN FIRE PROTECTION FACILITIES ARE INSTALLED BY THE CONTRACTOR, SUCH FACILITIES SHALL INCLUDE ALL SURFACE ACCESS ROADS WHICH SHALL BE INSTALLED AND MADE SERVICEABLE PRIOR TO AND DURING THE TIME OF CONSTRUCTION. WHERE ALTERNATIVE METHODS OF PROTECTION APPROVED BY THE FIRE CHIEF ARE PROVIDED, THE ABOVE MAY BE MODIFIED OR WAIVED.
3. COMMERCIAL DUMPSTERS AND CONTAINERS WITH AN INDIVIDUAL CAPACITY OF 1.5 CUBIC YARDS OR GREATER SHALL NOT BE STORED OR OR PLACED WITHIN TEN FEET (10') OF OPENINGS, COMBUSTIBLE WALLS, OR COMBUSTIBLE EAVE LINES.
4. FIRE LANES DESIGNATED ON THE SITE PLAN SHALL BE REGISTERED WITH THE CITY FIRE MARSHALL'S OFFICE AND INSPECTED FOR OWNER'S FINAL APPROVAL.
5. VERTICAL CLEARANCE REQUIRED FOR FIRE APPARATUS IS 13'-6" FOR FULL WIDTH OF ACCESS DRIVE AND AT AN INCLINE GRADE NOT TO EXCEED 12%.
6. FIRE LANE MARKINGS TO MEET REQUIREMENTS OF AUTHORITY HAVING JURISDICTION (AHJ). FIRE LANES TO BE MARKED BY 4" WIDE RED STRIPE, WITH "NO PARKING FIRE LANE" IN 4" HIGH WHITE LETTERS EVERY 40 FEET. PROVIDE SIGNAGE AS REQUIRED BY AHJ.
7. ALL INTERIOR FIRE TRUCK TURNING RADII ARE 25' OR GREATER. ALL EXTERIOR FIRE TRUCK TURNING RADII ARE 50' OR GREATER.
8. ALL LENGTHS OF TRUCK LAID AND HAND LAID HOSE SHOWN ARE EQUAL TO OR LESS THAN THE MAXIMUM ALLOWABLE BY FIRE CODE. SEE LEGEND FOR AVAILABLE LENGTHS.

SIGN DETAILS:

1. SIGNS SHALL BE STANDARD SIZE 18"x24" AND HAVE RED LETTERS AND BORDER ON A WHITE BACKGROUND.
2. SIGNS SHALL BE MOUNTED WITH THE BOTTOM EDGE OF THE SIGN AT LEAST SEVEN (7) FEET ABOVE GRADE AND AT LEAST TWO (2) FEET FROM CURB EDGE.
3. SIGNS SHALL BE PLACES AS FOLLOWS:
   a. LESS THAN FORTY (40) FEET: ONE (1) SIGN WITH A DOUBLE ARROW.
   b. FROM FORTY (40) TO NINETY (90) FEET: TWO (2) SIGNS WITH RIGHT AND LEFT ARROWS.
   c. FOR ONE HUNDRED (100) FEET OR MORE: THREE (3) SIGNS WITH RIGHT/LEFT AD DOUBLE ARROWS IN THE MIDDLE.

1 TYPICAL FIRE LANE SIGN DETAIL
NOT TO SCALE

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LOCATION:

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION-PHASE 1
411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
ISSUE	DESCRIPTION	DATE

STATE OF TEXAS
DONALD N. DACUS
85425
LICENSED
PROFESSIONAL ENGINEER
5/25/18
TBPE FIRM F-432

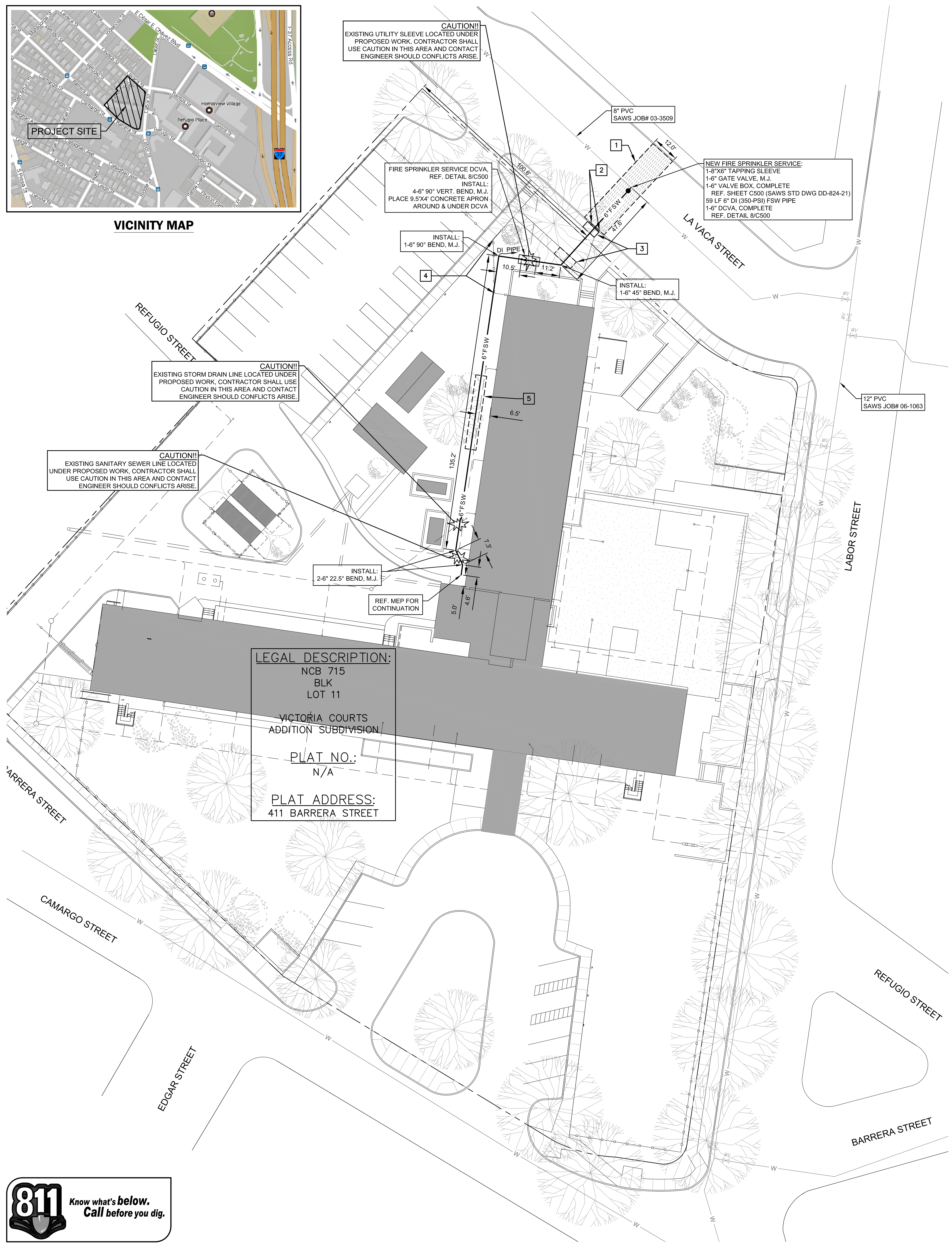
PROJECT ARCHITECT
GABRIEL BURCH-HOLLIS, AIA
TEXAS LICENSE NO. 13481

Fire Protection Site Plan

SHEET NUMBER
C131

INTELLIGENT ENGINEERING SERVICES
ENGINEERING COMMUNITIES FROM THE GROUND UP
10001 REUNION PLACE, SUITE 205 SAN ANTONIO, TEXAS 78216
(512)485-9099 ie-services.com
IES JOB NO: 21700621 TBPE FIRM F-432

4/12/2017 9:45:46 AM C:\Users\a.rocio.flores\Documents\victoria plaza_a.rocio.flores.rvt



LEGEND

— — —	PROPERTY LINE (APPROXIMATE LOCATION)
W	EXISTING WATER MAIN (APPROXIMATE LOCATION)
FSW	NEW FIRE SPRINKLER WATER
●	NEW GATE VALVE
(star)	CAUTION: UTILITY CROSSING

NORTH

20' 10' 0 20' 40'
(IN FEET)
SCALE 1" = 20'

GENERAL NOTES:

1. ALL WORK IS TO BE DONE IN ACCORDANCE WITH APPLICABLE NATIONAL, STATE, MUNICIPAL AND LOCAL CODES.
2. CONTRACTOR IS RESPONSIBLE FOR PROTECTING AND MAINTAINING UTILITY SERVICE TO EXISTING BUILDINGS AT ALL TIMES. EXISTING UTILITIES WHICH ARE DAMAGED WILL BE REPLACED AT THE EXPENSE OF THE CONTRACTOR. OWNER TO BE NOTIFIED 14 DAYS IN ADVANCE OF ANY UTILITY SHUTDOWN.
3. CONTRACTOR SHALL PROTECT ALL EXISTING UTILITIES THAT ARE TO REMAIN DURING THE COURSE OF CONSTRUCTION. EXISTING UTILITIES WHICH ARE DAMAGED WILL BE REPLACED AT THE EXPENSE OF THE CONTRACTOR.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FAMILIARIZING HIMSELF WITH THE JOB SITE.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING AND MAINTAINING ALL SIGNS, BARRICADES, AND LIGHTING OR WARNING DEVICE(S) USED/REQUIRED WITH THIS WORK. ALL TRAFFIC CONTROL DEVICES SHALL BE IN CONFORMANCE WITH THE "TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES", LATEST EDITION.
6. CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTION STAKING.
7. REFERENCE LANDSCAPE PLANS AND SPECIFICATIONS FOR TREE, SHRUB AND PLANT PROTECTION.
8. SEE DETAIL SHEETS FOR ALL APPLICABLE DETAILS.
9. CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY QUESTIONS THAT MAY ARISE CONCERNING THE INTENT, PLACEMENT, OR LIMITS OF DIMENSIONS OR GRADES NECESSARY FOR CONSTRUCTION OF THIS PROJECT.
10. CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS (USE OF SILT FENCES, ETC.) TO KEEP DRAINAGE AND SILT FROM WASHING ONTO ADJACENT PROPERTY OR CROSSING ADJACENT STREETS. CONTRACTOR SHALL IMMEDIATELY REMOVE SILT/ DEBRIS THAT WASHES OFFSITE OR INTO EXISTING STORM DRAIN SYSTEMS.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING TO ITS ORIGINAL OR BETTER CONDITION ANY DAMAGE DONE TO EXISTING UTILITIES, FENCES, PAVEMENT, CURBS, DRIVEWAYS, SIDEWALKS, LANDSCAPING, STRUCTURES, OR SIGNS.
12. THE CONTRACTOR SHALL AVOID CUTTING ROOTS LARGER THAT ONE INCH IN DIAMETER WHEN EXCAVATING NEAR EXISTING TREES. EXCAVATION IN VICINITY OF TREES SHALL PROCEED WITH CAUTION. THE CONTRACTOR SHALL CONTACT THE CITY ARBORIST AT 207-8053 FOR GUIDANCE. CONSTRUCTION INSPECTOR SHALL ALSO BE NOTIFIED.
13. CONTRACTOR IS RESPONSIBLE FOR ALL WORK REQUIRED TO SATISFACTORILY COMPLETE PROJECT AS SHOWN ON THESE PLANS.
14. THE CONTRACTOR SHALL AVOID CUTTING ROOTS LARGER THAN THREE (3) INCHES IN DIAMETER WHEN EXCAVATING NEAR TREES. EXCAVATING IN THE VICINITY OF TREES SHALL PROCEED WITH CAUTION. THE CONTRACTOR SHALL CONTACT THE ENGINEER IF ROOTS LARGER THAN THREE (3) WITHIN THE FIVE (5) FOOT ROOT PROTECTION ZONE ARE NEEDED TO BE PRUNED. ALL ROOTS LARGER THAN ONE (1) INCH IN DIAMETER SHALL BE CLEANLY CUT BY HAND WITH BYPASS TYPE PRUNING SHEARS.
15. THE CONTRACTOR SHALL SAW-CUT EXISTING PAVEMENT, CURBS AND SIDEWALKS AT LOCATIONS AS SHOWN ON THE PLANS OR TO NEAREST JOINT. NO JAGGED OR IRREGULAR CUTS IN PAVEMENT, CURBS OR SIDEWALKS WILL BE ALLOWED OR ACCEPTED.
16. CONTRACTOR SHALL IMMEDIATELY NOTIFY THE OWNER AND ENGINEER REGARDING ANY QUESTIONS FOR DEMOLITION WORK ON THIS PROJECT.

SAWS WATER NOTES:

1. PRIOR TO TIE-INS, ANY SHUTDOWNS OF EXISTING MAINS OF ANY SIZE MUST BE COORDINATED WITH THE SAWS CONSTRUCTION INSPECTION DIVISION AT LEAST ONE WEEK IN ADVANCE OF THE SHUTDOWN. THE CONTRACTOR MUST ALSO PROVIDE A SEQUENCE OF WORK AS RELATED TO THE TIE-INS; THIS IS AT NO ADDITIONAL COST TO SAWS OR THE PROJECT AND IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO SEQUENCE THE WORK ACCORDINGLY.
   - FOR WATER MAINS 12" OR HIGHER: SAWS EMERGENCY OPERATIONS CENTER (210) 233-2014
2. ASBESTOS CEMENT (AC) PIPE, ALSO KNOWN AS TRANSITE PIPE WHICH IS KNOWN TO CONTAIN ASBESTOS-CONTAINING MATERIAL (ACM), MAY BE LOCATED WITHIN THE PROJECT LIMITS. SPECIAL WASTE MANAGEMENT PROCEDURES AND HEALTH AND SAFETY REQUIREMENTS WILL BE APPLICABLE WHEN REMOVAL AND/OR DISTURBANCE OF THIS PIPE OCCURS. SUCH WORK IS TO BE MADE UNDER SPECIAL SPECIFICATION ITEM NO. 3000, "SPECIAL SPECIFICATION FOR HANDLING ASBESTOS CEMENT PIPE".
3. VALVE REMOVAL: WHERE THE CONTRACTOR IS TO ABANDON A WATER MAIN, THE CONTROL VALVE LOCATED ON THE ABANDONING BRANCH WILL BE REMOVED AND REPLACED WITH A CAP/PLUG. (NSPI)
4. SUITABLE ANCHORAGE/THRUST BLOCKING OR JOINT RESTRAINT SHALL BE PROVIDED AT ALL OF THE FOLLOWING MAIN LOCATIONS: DEAD ENDS, PLUGS, CAPS, TEES, CROSSES, VALVES, AND BENDS, IN ACCORDANCE WITH THE STANDARD DRAWINGS DD-839 SERIES AND ITEM NO. 839, IN THE SAWS STANDARD SPECIFICATIONS FOR CONSTRUCTION.
5. ALL VALVES SHALL READ "OPEN RIGHT".

KEYNOTES

1. STREET PAVEMENT PATCH, ENTIRE WIDTH OF STREET, REF. DETAIL 3/C500
2. REMOVE TO NEAREST JOINT & REPLACE CONCRETE CURB, REF. DETAIL 2/C500
3. REMOVE TO NEAREST JOINT & REPLACE SIDEWALK, REF. DETAIL 1/C500
4. SALVAGE & REINSTALL DECORATIVE FENCE
5. HAND DIG THROUGH TREE ROOT PROTECTION ZONE, REF. GENERAL NOTES #14

EXISITNG UTILITY NOTES:

1. THIS UTILITY PLAN HAS BEEN PREPARED TO THE BEST OF OUR ABILITY USING AVAILABLE DATA ON EXISTING UTILITY INFORMATION. EXISTING UTILITY DATA SHOWN ON THIS LAYOUT WAS OBTAINED FROM A SURVEY OF THE VISIBLE FEATURES AT THE SITE AND PUBLIC RECORD MAPS OBTAINED FROM THE UTILITIES.
2. IT IS ESSENTIAL THAT 48 HOURS PRIOR TO CONSTRUCTION ALL UTILITY COMPANIES BE NOTIFIED TO LOCATE AND TAG THEIR UNDERGROUND FACILITIES PRIOR TO EXCAVATION.

San Antonio Water System (Water, Sewer & Recycle Water)	(210) 233-2011
COSA Drainage	(210) 207-2800
City Sidewalk and Trenching Division	(210) 821-3240
COSA Traffic Signal Operations	(210) 207-7765
Texas State Wide One Call Locator	(800) 545-6005
CPS Energy	(800) 545-6005
AT&T	(800) 545-6005
Time warner	(800) 545-6005

3. THE CONTRACTOR NEEDS TO ALLOW FOR THE POSSIBILITY OF UNDETECTED UNDERGROUND UTILITIES. ALSO, THE CONTRACTOR MUST ALLOW FOR CHANGES DUE TO UTILITIES BEING IN LOCATIONS DIFFERENT FROM THOSE SHOWN ON THE UTILITY RECORD DRAWINGS. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND EXPOSING CONFLICTS PRIOR TO CONSTRUCTION.
4. LOCATION AND DEPTH OF EXISTING UTILITIES SHOWN HEREON ARE APPROXIMATE ONLY. ACTUAL LOCATIONS AND DEPTHS MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO THE CONSTRUCTION AND THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF SAME DURING CONSTRUCTION. ANY DAMAGE TO EXISTING UTILITIES, WHETHER SHOWN ON THE PLANS OR NOT, SHALL BE REPAIRED BY THE CONTRACTOR AT HIS EXPENSE.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ACQUIRING ALL PERMITS, TESTS, APPROVALS, AND ACCEPTANCES REQUIRED TO COMPLETE CONSTRUCTION OF THE PROJECT.
6. DUE TO FEDERAL REGULATIONS TITLE 49, PART 192.181, CPS MUST MAINTAIN ACCESS TO GAS VALVES AT ALL TIMES. THE CONTRACTOR MUST PROTECT AND WORK AROUND ANY GAS VALVES THAT ARE IN THE PROJECT AREA.

UTILITY GENERAL NOTES:

1. THE CONTRACTOR SHALL REPLACE "IN-KIND" ALL PAVEMENT SECTIONS ENCOUNTERED WHERE "SAWCUT AND PATCH" IS REQUIRED FOR A UTILITY CONNECTION AND/OR A DRIVEWAY LOCATION.
2. CLAY PLUG - WHERE UNDERGROUND UTILITIES ENTER THE BUILDING, A CLAY PLUG SHALL BE PROVIDED IN THE UTILITY TRENCHES ON THE EXTERIOR SIDE OF THE BUILDING. THE PLUG SHALL EXTEND ONE FOOT BEYOND THE PIPE IN ALL DIRECTIONS AND BE A MINIMUM OF TWO FEET THICK.
3. IN AREAS WHERE LARGE EXCAVATING EQUIPMENT COULD DAMAGE EXISTING UTILITIES, CONTRACTOR SHALL HAND EXCAVATE AROUND CONFLICTING UTILITIES.
4. NO WATER JETTING TO BACKFILL TRENCHES WILL BE ALLOWED ON THIS PROJECT.
5. PROVIDE SEDIMENT CONTAMINATION PROTECTION AS REQUIRED. AS A MINIMUM, PROVIDE SILT FENCING. CONTRACTOR SHALL PROVIDE MORE EFFECTIVE LEVELS OF SEDIMENT CONTAMINATION PROTECTION IF SILT FENCE IS NOT SUFFICIENT.
6. INSTALL A 1.5'x1.5'x18" THICK REINFORCED CONCRETE PAD AROUND ALL VALVES LOCATED IN PAVED AREAS.
7. ALL TRENCHES SHALL BE MADE SAFE TO THE GENERAL PUBLIC BY THE END OF THE WORKING DAY.
8. ALL UTILITY CONNECTIONS SHALL BE COORDINATED WITH THE MECHANICAL, ELECTRICAL AND PLUMBING PLANS. NOTIFY ENGINEER OF ANY CONFLICTS PRIOR TO CONSTRUCTION.
9. ALL SERVICES ARE BROUGHT TO WITHIN 5 FEET OF THE BUILDING. BUILDING CONTRACTOR SHALL INCLUDE IN THEIR BID THE COST TO CONNECT ALL SERVICES TO THE BUILDING.
10. REFERENCE DETAILS AND SPECIFICATIONS FOR PLACEMENT OF TRACER WIRE AND WARNING TAPE ON ALL UTILITIES.

JOINT RESTRAINT NOTE

CONTRACTOR SHALL INSTALL RETAINER GLANDS AT ALL FITTINGS AND PROVIDE RESTRAINING HARNESS OR FIELD LOCK GASKETS AT ALL JOINTS WITHIN THE LENGTH SHOWN. CONTRACTOR SHALL ENSURE THAT ALL TEES, BENDS, VALVES, ETC. HAVE A MINIMUM OF 5 FT OF PIPE WITH NO JOINTS ON EACH SIDE OF THE FITTING. JOINT RESTRAINTS AND RETAINER GLANDS SHALL BE CALCULATED BY THE DEVELOPER'S ENGINEER. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE JOINT RESTRAINTS WITH THE DEVELOPER'S ENGINEER.

TRENCH EXCAVATION SAFETY PROTECTION

CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR STRUCTURAL DESIGN/GEOTECHNICAL/SAFETY/EQUIPMENT CONSULTANT, IF ANY, SHALL REVIEW THESE PLANS AND ANY AVAILABLE GEOTECHNICAL INFORMATION AND THE ANTICIPATED INSTALLATION SITES WITHIN THE PROJECT WORK AREA IN ORDER TO IMPLEMENT CONTRACTOR'S TRENCH EXCAVATION SAFETY PROTECTION SYSTEMS, PROGRAMS AND/OR PROCEDURES SHALL PROVIDE FOR THE ADEQUATE TRENCH EXCAVATION SAFETY PROTECTION THAT COMPLY WITH AS A MINIMUM, OSHA STANDARDS FOR TRENCH EXCAVATIONS. SPECIFICALLY, CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR SAFETY CONSULTANT SHALL IMPLEMENT A TRENCH SAFETY PROGRAM IN ACCORDANCE WITH OSHA STANDARDS GOVERNING THE PRESENCE AND ACTIVITIES OF INDIVIDUALS WORKING IN AND AROUND TRENCH EXCAVATION.

UTILITY TRENCH COMPACTION NOTE

ALL UTILITY TRENCH COMPACTION TESTS WITHIN THE STREET PAVEMENT SECTION SHALL BE THE RESPONSIBILITY OF THE GEOTECHNICAL ENGINEER. FILL MATERIAL SHALL BE PLACED IN UNIFORM LAYERS NOT TO EXCEED TWELVE INCHES (12") LOOSE. EACH LAYER OF MATERIAL SHALL BE COMPACTED AS SPECIFIED AND TESTED FOR DENSITY AND MOISTURE IN ACCORDANCE WITH TXDOT METHODS TEX-113-E, TEX-114-E, AND TEX-115-E. THE NUMBER AND LOCATION OF REQUIRED TESTS SHALL BE DETERMINED BY THE GEOTECHNICAL ENGINEER AND APPROVED BY THE OWNER. UPON COMPLETION OF THE TESTING THE GEOTECHNICAL ENGINEER SHALL PROVIDE THE OWNER WITH ALL TESTING DOCUMENTATION AND A CERTIFICATION STATING THAT THE PLACEMENT OF FILL MATERIAL HAS BEEN COMPLETED IN ACCORDANCE WITH THE PLANS.

INTELLIGENT ENGINEERING SERVICES
ENGINEERING COMMUNITIES FROM THE GROUND UP

DURAND–HOLLIS RUPE ARCHITECTS, INC.
14603 HUEBNER ROAD
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TEL. 210 308–0080
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eMAIL A.TREVINO@DHRARCHITECTS.COM
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OWNER:
SAHA SAN ANTONIO HOUSING AUTHORITY
Opportunity Lives Here
SAN ANTONIO HOUSING AUTHORITY
818 SOUTH FLORES STREET
SAN ANTONIO, TX 78204
T. 210.477.6262

SAN ANTONIO HOUSING AUTHORITY VICTORIA PLAZA MODERNIZATION-PHASE 1

411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS

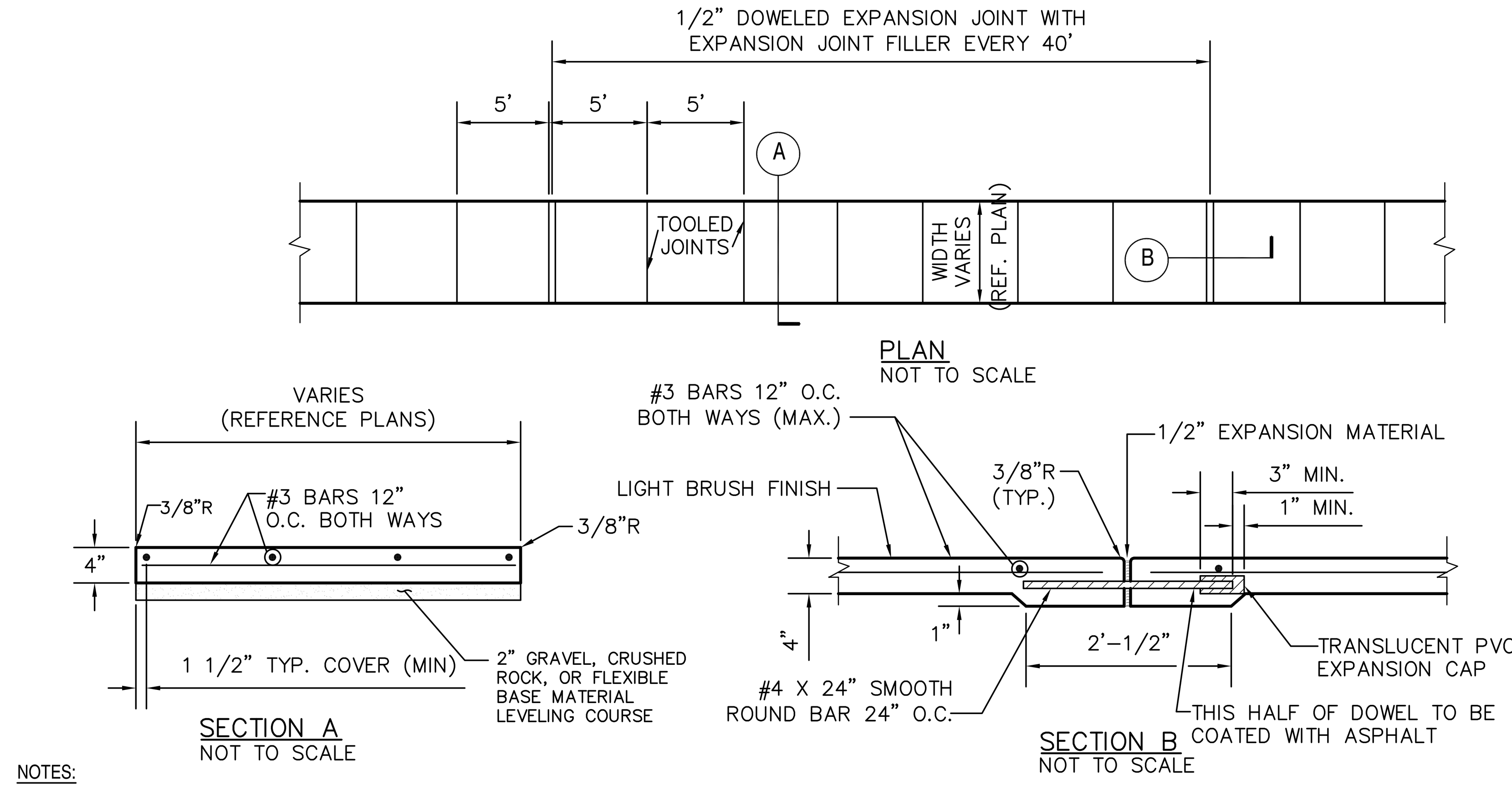
ISSUE	DESCRIPTION	DATE

STATE OF TEXAS
DONALD N. DACUS
85425
LICENSED PROFESSIONAL ENGINEER

PROJECT ARCHITECT

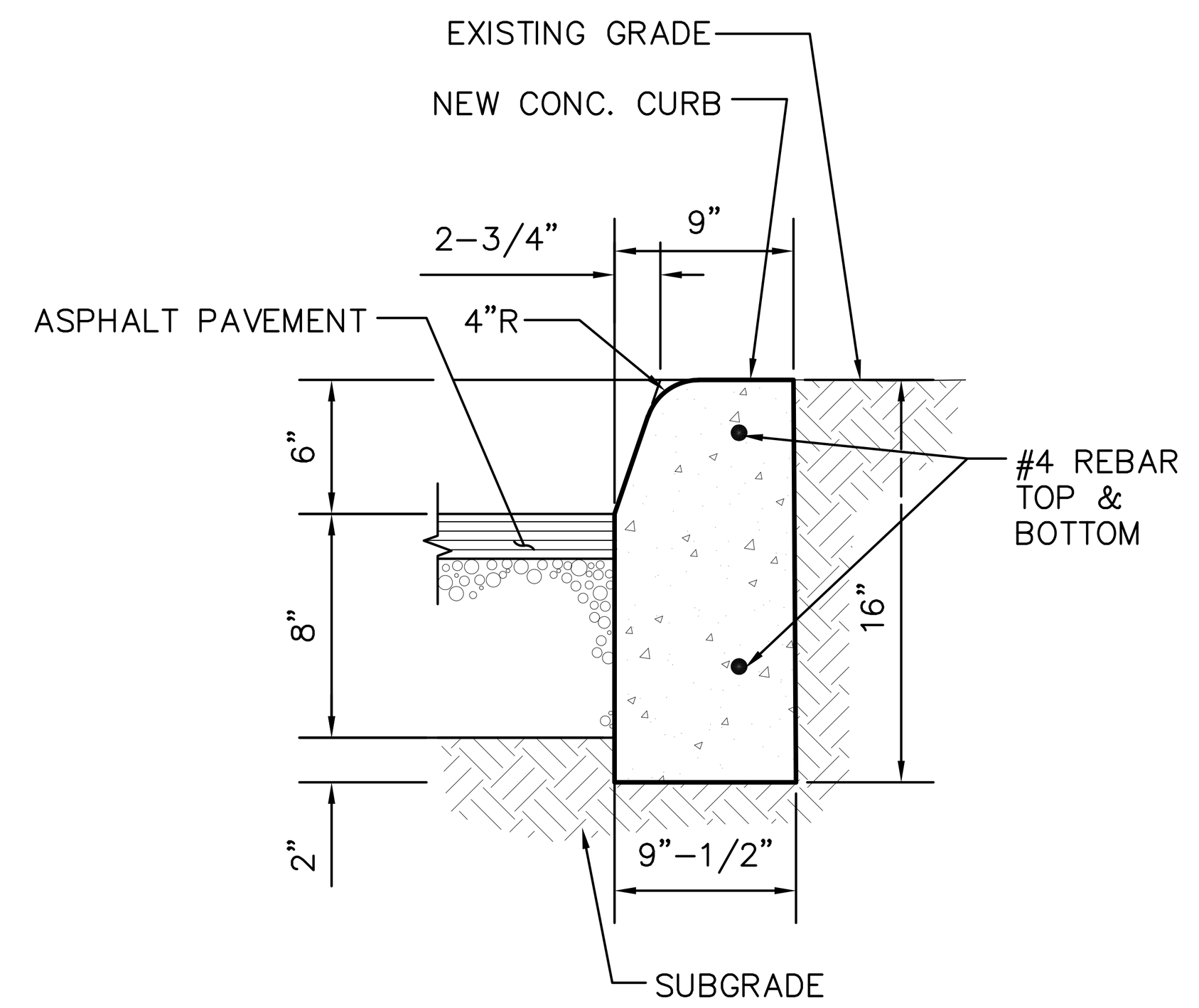
Utility Plan

SHEET NUMBER
C150

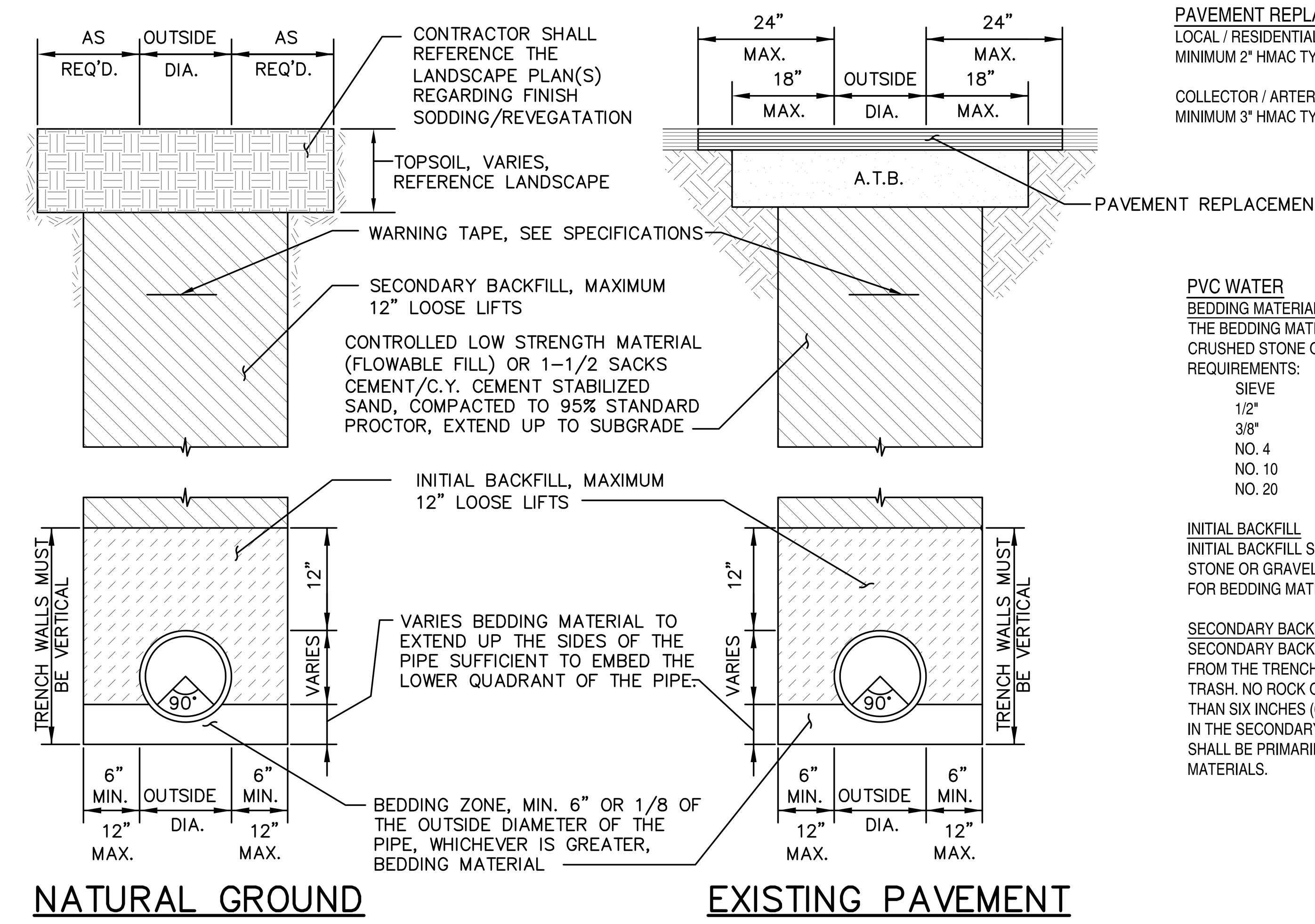


NOTES:
1. CROSS SLOPE OF SIDEWALK SHALL BE MAXIMUM SLOPE OF 1:50.
2. SIDEWALK SHALL BE 4" 3000 PSI CONCRETE UNLESS OTHERWISE SPECIFIED BY OWNER.
3. ALL HONEYCOMB IN BACK OF CURB TO BE TROWEL-PLASTERED BEFORE POURING SIDEWALK.
4. LUG MAY BE FORMED BY SHAPING SUBGRADE TO APPROXIMATE DIMENSIONS SHOWN.
5. DOWEL INTO EXISTING SIDEWALK WITH NO.4 X 24" ON CENTER.
6. REFERENCE LANDSCAPE DRAWINGS FOR ADDITIONAL INFORMATION.
7. SIDEWALKS LESS THAN 5 FEET IN WIDTH SHALL BE PROVIDED WITH A PASSING SPACE AT A MAXIMUM SPACING OF 200 FEET.
8. ALL JOINTS TO BE SEALED.

1 REINFORCED CONCRETE SIDEWALK DETAIL
NOT TO SCALE



2 CURB AT NATURAL GRADE SECTION
NOT TO SCALE



PAVEMENT REPLACEMENT
LOCAL / RESIDENTIAL STREETS:
MINIMUM 2" HMAC TYPE D OVER 10" ASPHALT TREATED BASE (A.T.B.)

COLLECTOR / ARTERIAL STREETS:
MINIMUM 3" HMAC TYPE C OVER 10" ASPHALT TREATED BASE (A.T.B.)

PVC WATER

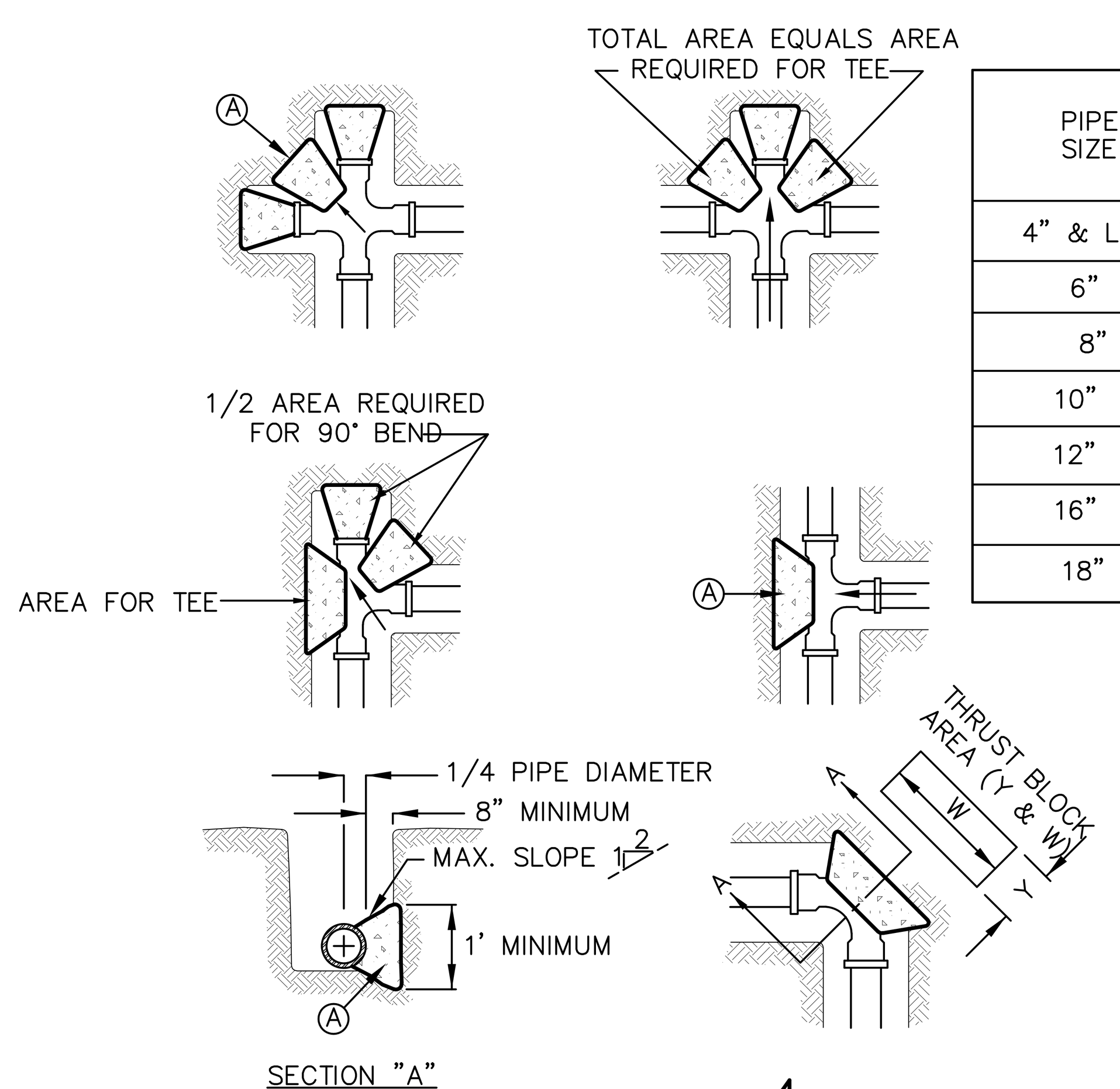
BEDDING MATERIAL
THE BEDDING MATERIAL SHALL BE COMPOSED OF WELL-GRADED, CRUSHED STONE OR GRAVEL CONFORMING TO THE FOLLOWING REQUIREMENTS:

SIEVE	PERCENT RETAINED
1/2"	0
3/8"	0 TO 5
NO. 4	20 TO 80
NO. 10	75 TO 100
NO. 20	98 TO 100

INITIAL BACKFILL
INITIAL BACKFILL SHALL CONSIST OF WELL-GRADED, CRUSHED STONE OR GRAVEL WHICH TO CONFORMS TO THE REQUIREMENTS FOR BEDDING MATERIAL.

SECONDARY BACKFILL
SECONDARY BACKFILL SHALL CONSIST OF MATERIAL REMOVED FROM THE TRENCH AND SHALL BE FREE OF BRUSH, DEBRIS AND TRASH. NO ROCK OR STONES HAVING ANY DIMENSION LARGER THAN SIX INCHES (6") AT THE LARGEST DIMENSION SHALL BE USED IN THE SECONDARY BACKFILLING ZONE. SECONDARY BACKFILL SHALL BE PRIMARILY COMPOSED OF COMPACTIBLE SOIL MATERIALS.

3 TYPICAL TRENCH BACKFILL DETAIL (SAWS)
NOT TO SCALE

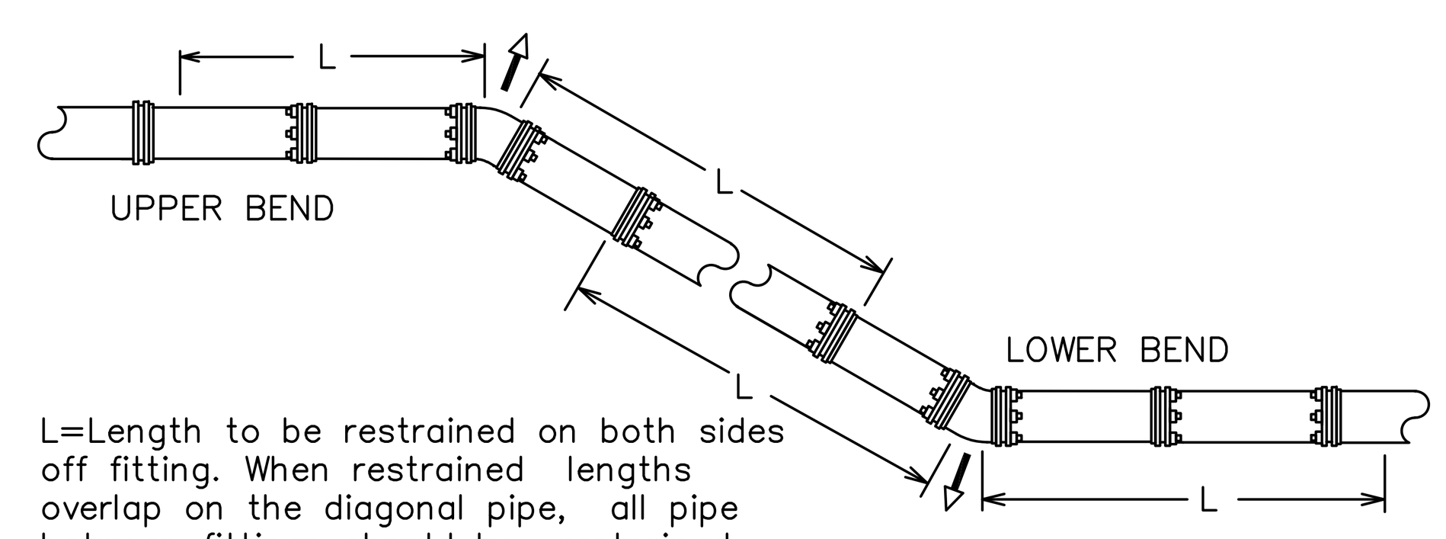


PIPE SIZE	WATER PIPE	
	TEE, DEAD END 90° BEND	45° AND 22 1/2° BENDS
4" & LESS	3 SQ. FEET	3 SQ. FEET
6"	4 SQ. FEET	3 SQ. FEET
8"	6 SQ. FEET	3 SQ. FEET
10"	9 SQ. FEET	5 SQ. FEET
12"	13 SQ. FEET	7 SQ. FEET
16"	23 SQ. FEET	12 SQ. FEET
18"	29 SQ. FEET	15 SQ. FEET

GENERAL NOTES:
1. TABLE IS BASED ON 2000#/SQ. FT. SOIL. IF CONDITIONS ARE FOUND TO INDICATE SOIL BEARING IS LESS, THE AREAS SHALL BE INCREASED ACCORDINGLY.
2. AREAS FOR PIPE LARGER THAN 18" SHALL BE CALCULATED.
3. CONCRETE SHALL HAVE A MINIMUM COMPRESSION STRENGTH OF 2500 PSI.
4. THRUST BLOCK IS TO EXTEND TO UNDISTURBED SOIL.
5. SIZE MAY BE DECREASED FOR LESSER DEGREE BENDS AS DETERMINED BY ENGINEER.
6. KEEP CONCRETE CLEAR OF M.J. OR BELL AND SPIGOT JOINTS.
7. BLOCK IN A SIMILAR MANNER AT TEES, HYDRANTS, PLUG OR OTHER LOCATIONS AS REQUIRED.
8. IF CONCRETE BLOCKS CANNOT BE POURED, THEN USE TIE-RODS OR OTHER APPROVED METHOD TO RESTRAIN THRUST.

CONSTRUCTION KEY NOTES
A. LENGTH "Y & W" AS REQUIRED TO OBTAIN BEARING AREA AGAINST UNDISTURBED SOIL.
B. ADDITIONAL EXCAVATION IF NECESSARY TO OBTAIN REQUIRED BEARING AREA.
C. MINIMUM THRUST BLOCK AREA REQUIREMENTS FOR (Y & W) AS FOLLOWS:

4 THRUST BLOCKING DETAILS
NOT TO SCALE

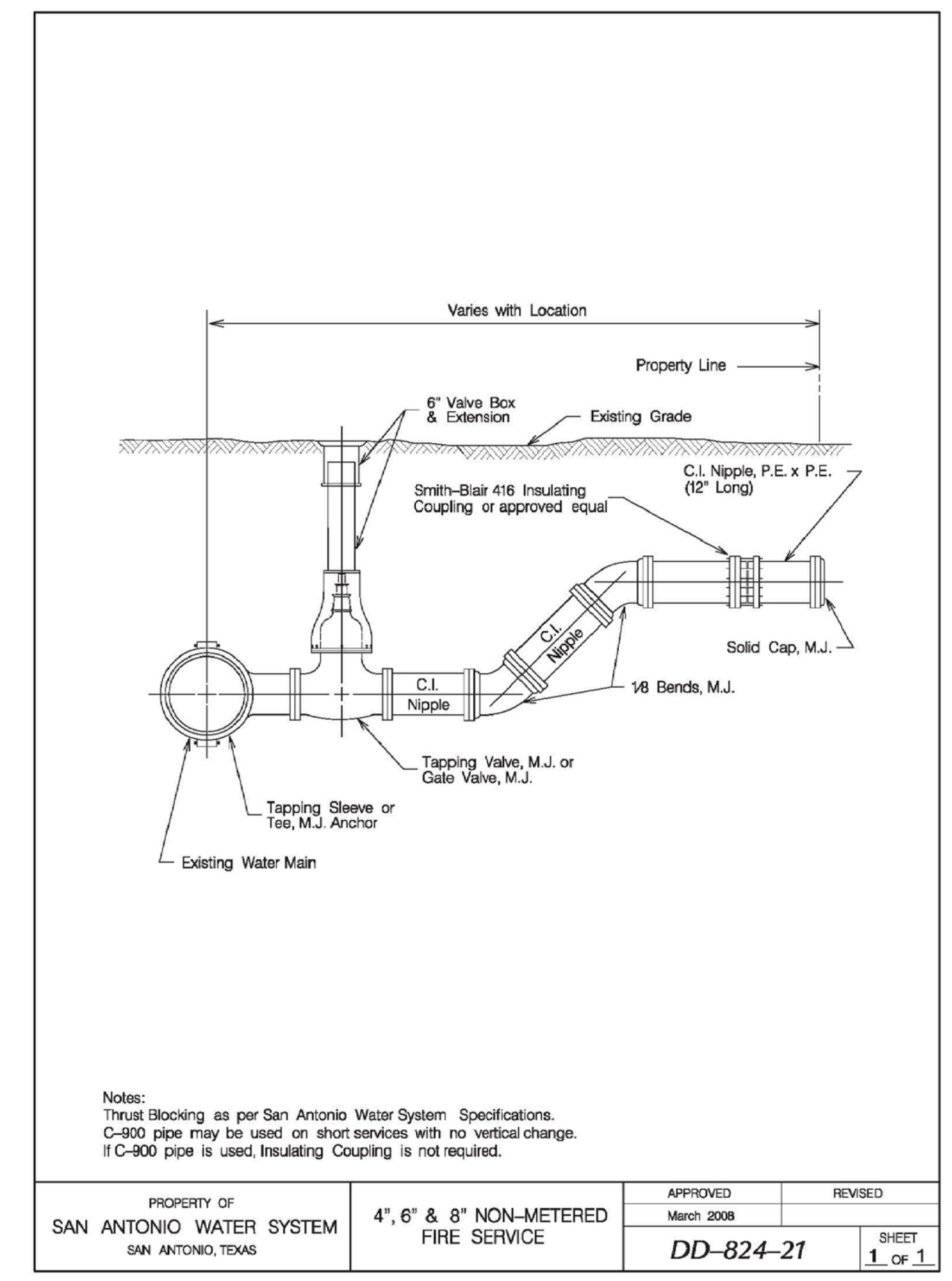


L=Length to be restrained on both sides off fitting. When restrained lengths overlap on the diagonal pipe, all pipe between fittings should be restrained.

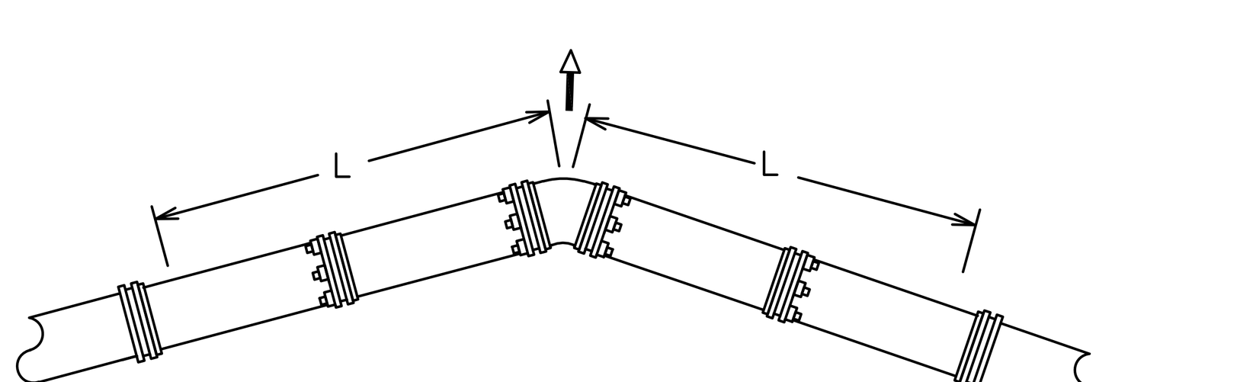
PIPE SIZE (inch)	BEND ANGLE (deg.)	LOW SIDE DEPTH (ft)	TEST PRESSURE=200 psi		TEST PRESSURE=150 psi	
			UPPER BEND RESTRAINED LENGTH (ft)	LOWER BEND RESTRAINED LENGTH (ft)	UPPER BEND RESTRAINED LENGTH (ft)	LOWER BEND RESTRAINED LENGTH (ft)
6	45	5	24	8	18	6
6	22.5	5	12	4	9	3
6	11.25	5	6	2	4	1
6	45	10	24	5	18	4
6	22.5	10	12	2	9	2
6	11.25	10	6	1	4	1
8	45	5	32	11	24	8
8	22.5	5	15	5	11	4
8	11.25	5	8	3	6	2
8	45	10	32	7	24	5
8	22.5	10	15	3	11	2
8	11.25	10	8	2	6	1
12	45	5	45	16	34	12
12	22.5	5	22	7	16	6
12	11.25	5	11	4	8	3
12	45	10	45	10	34	7
12	22.5	10	22	5	16	3
12	11.25	10	11	2	8	2

RESTRAINED LENGTH DESIGN
Restrained length calculations are for P.V.C pipe bedded in compacted granular material extending to the top of the pipe. The native soil material is assumed to be inorganic clay of high plasticity. Depth of bury is assumed to be 4 feet.
Note:
These calculations are provided for reference. The restrained length shall be designed based upon the conditions encountered during the installation.

5 RESTRAINED LENGTHS FOR VERITCAL OFFSETS
NOT TO SCALE



6 NON–METERED FIRE SERVICE
NOT TO SCALE

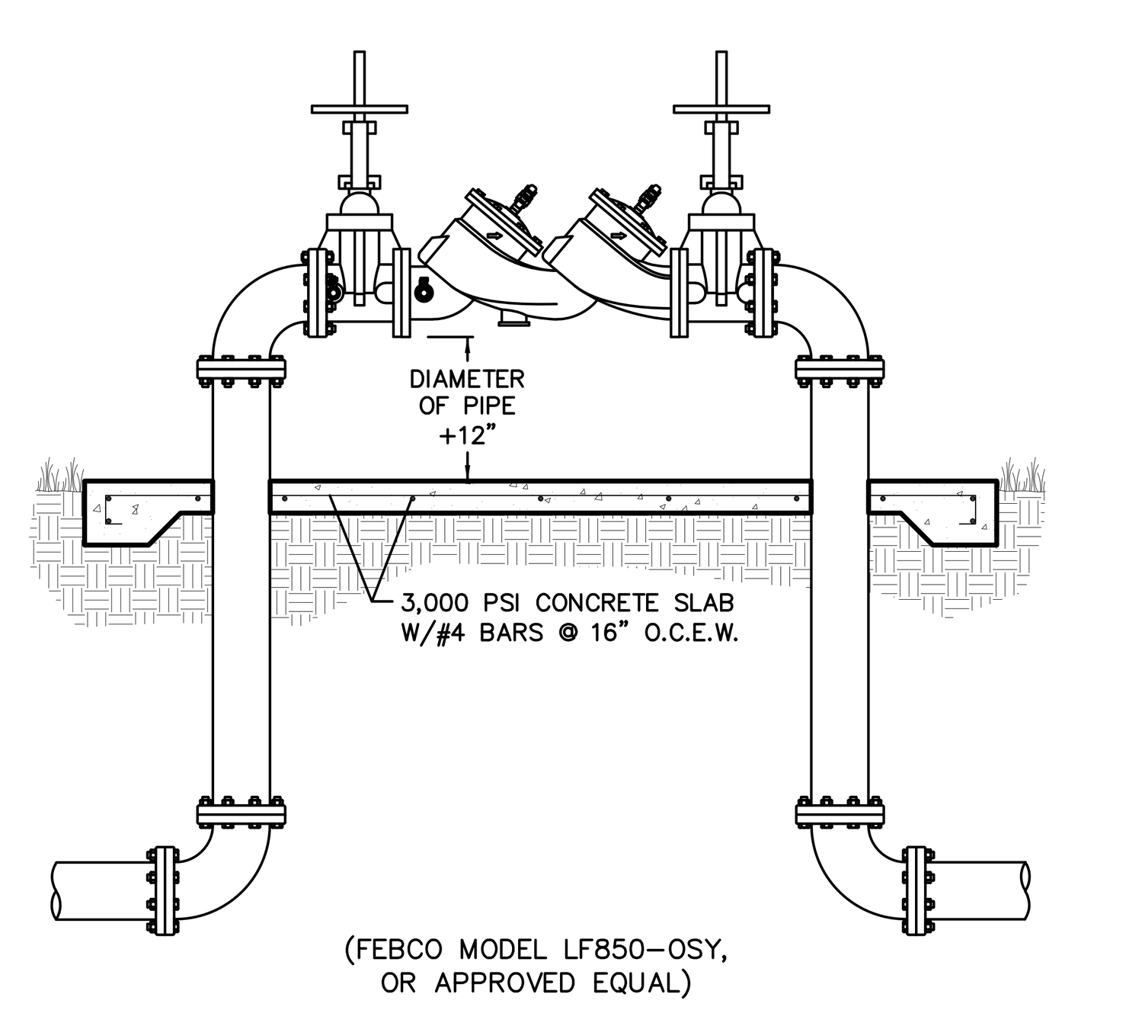


L=LENGTH TO BE RESTRAINED ON BOTH SIDES OF FITTING

PIPE SIZE (inch)	BEND ANGLE (deg)	RESTRAINED LENGTH IN FEET, WHEN	
		TEST PRESSURE=200 psi	TEST PRESSURE=150 psi
6	90	23	17
6	45	9	7
6	22.5	5	3
6	11.25	2	2
8	90	30	22
8	45	12	9
8	22.5	6	4
8	11.25	3	2
12	90	43	32
12	45	18	13
12	22.5	8	6
12	11.25	4	3

RESTRAINED LENGTH DESIGN
Restrained length calculations are for P.V.C pipe bedded in compacted granular material extending to the top of the pipe. The native soil material is assumed to be inorganic clay of high plasticity. Depth of bury is assumed to be 4 feet.
Note:
These calculations are provided for reference. The restrained length shall be designed based upon the conditions encountered during the installation.

7 RESTRAINED LENGTHS FOR HORIZONTAL BENDS
NOT TO SCALE



NOTE:
INSULATE EXPOSED DCVA & PIPING W/ SIMILAR MATERIAL ON-SITE

8 DOUBLE CHECK VALVE ASSEMBLY ABOVE GROUND INSTALLATION
NOT TO SCALE

SAWS GENERAL CONSTRUCTION NOTES:

1. ALL MATERIALS AND CONSTRUCTION PROCEDURES WITHIN THE SCOPE OF THIS CONTRACT SHALL BE APPROVED BY THE SAN ANTONIO WATER SYSTEM (SAWS) AND COMPLY WITH THE PLANS, SPECIFICATIONS, GENERAL CONDITIONS AND WITH THE FOLLOWING AS APPLICABLE:
   A. CURRENT TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ) "DESIGN CRITERIA FOR DOMESTIC WASTEWATER SYSTEM", TEXAS ADMINISTRATIVE CODE (TAC) TITLE 30 PART 1 CHAPTER 217 AND "PUBLIC DRINKING WATER", TAC TITLE 30 PART 1 CHAPTER 290.
   B. CURRENT TXDOT "STANDARD SPECIFICATIONS FOR CONSTRUCTION OF HIGHWAYS, STREETS AND DRAINAGE".
   C. CURRENT "SAN ANTONIO WATER SYSTEM STANDARD SPECIFICATIONS FOR WATER AND SANITARY SEWER CONSTRUCTION".
   D. CURRENT CITY OF SAN ANTONIO "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION".
   E. CURRENT CITY OF SAN ANTONIO "UTILITY EXCAVATION CRITERIA MANUAL" (UECM).
2. THE CONTRACTOR SHALL NOT PROCEED WITH ANY PIPE INSTALLATION WORK UNTIL THEY OBTAIN A COPY OF THE APPROVED COUNTER PERMIT OR GENERAL CONSTRUCTION PERMIT (GCP) FROM THE CONSULTANT AND HAS BEEN NOTIFIED BY SAWS CONSTRUCTION INSPECTION DIVISION TO PROCEED WITH THE WORK AND HAS ARRANGED A MEETING WITH THE INSPECTOR AND CONSULTANT FOR THE WORK REQUIREMENTS. WORK COMPLETED BY THE CONTRACTOR WITHOUT AN APPROVED COUNTER PERMIT AND/OR A GCP WILL BE SUBJECT TO REMOVAL AND REPLACEMENT AT THE EXPENSE OF THE CONTRACTORS AND/OR THE DEVELOPER.
3. THE CONTRACTOR SHALL OBTAIN THE SAWS STANDARD DETAILS FROM THE SAWS WEBSITE, HTTP://WWW.SAWS.ORG/BUSINESS_CENTER/SPECS. UNLESS OTHERWISE NOTED WITHIN THE DESIGN PLANS.
4. THE CONTRACTOR IS TO MAKE ARRANGEMENTS WITH THE SAWS CONSTRUCTION INSPECTION DIVISION AT (210) 233-2973, ON NOTIFICATION PROCEDURES THAT WILL BE USED TO NOTIFY AFFECTED HOME RESIDENTS AND/OR PROPERTY OWNERS 48 HOURS PRIOR TO BEGINNING ANY WORK.
5. LOCATION AND DEPTH OF EXISTING UTILITIES AND SERVICE LATERALS SHOWN ON THE PLANS ARE UNDERSTOOD TO BE APPROXIMATE. ACTUAL LOCATIONS AND DEPTHS MUST BE FIELD VERIFIED BY THE CONTRACTOR AT LEAST 1 WEEK PRIOR TO CONSTRUCTION. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO LOCATE UTILITY SERVICE LINES AS REQUIRED FOR CONSTRUCTION AND TO PROTECT THEM DURING CONSTRUCTION AT NO COST TO SAWS.
6. THE CONTRACTOR SHALL VERIFY THE EXACT LOCATION OF UNDERGROUND UTILITIES AND DRAINAGE STRUCTURES AT LEAST 1-2 WEEKS PRIOR TO CONSTRUCTION WHETHER SHOWN ON PLANS OR NOT. PLEASE ALLOW UP TO 7 BUSINESS DAYS FOR LOCATES REQUESTING PIPE LOCATION MARKERS ON SAWS FACILITIES. THE FOLLOWING CONTACT INFORMATION ARE SUPPLIED FOR VERIFICATION PURPOSES:
   - SAWS UTILITY LOCATES: HTTP://WWW.SAWS.ORG/SERVICE/LOCATES
   - COSA DRAINAGE 210-207-0724 OR 210-207-6026
   - COSA TRAFFIC SIGNAL OPERATIONS 210-206-8480
   - COSA TRAFFIC SIGNAL DAMAGES 210-207-3951
   - TEXAS STATE WIDE ONE CALL LOCATOR 800-545-6005 OR 811
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING EXISTING FENCES, CURBS, STREETS, DRIVEWAYS, SIDEWALKS, LANDSCAPING AND STRUCTURES TO ITS ORIGINAL OR BETTER CONDITION IF DAMAGES ARE MADE AS A RESULT OF THE PROJECT'S CONSTRUCTION.
8. ALL WORK IN TEXAS DEPARTMENT OF TRANSPORTATION (TXDOT) AND/OR BEXAR COUNTY RIGHT-OF-WAY SHALL BE DONE IN ACCORDANCE WITH RESPECTIVE CONSTRUCTION SPECIFICATIONS AND PERMIT REQUIREMENTS.
9. THE CONTRACTOR SHALL COMPLY WITH CITY OF SAN ANTONIO OR OTHER GOVERNING MUNICIPALITY'S TREE ORDINANCES WHEN EXCAVATING NEAR TREES.
10. THE CONTRACTOR SHALL NOT PLACE ANY WASTE MATERIALS IN THE 100-YEAR FLOOD PLAIN WITHOUT FIRST OBTAINING AN APPROVED FLOOD PLAIN PERMIT.
11. HOLIDAY WORK: CONTRACTORS WILL NOT BE ALLOWED TO PERFORM SAWS WORK ON SAWS RECOGNIZED HOLIDAYS. REQUEST SHOULD BE SENT TO CONSTWORKREQ@SAWS.ORG.

    WEEKEND WORK: CONTRACTORS ARE REQUIRED TO NOTIFY THE SAWS INSPECTION CONSTRUCTION DEPARTMENT 48 HOURS IN ADVANCE TO REQUEST WEEKEND WORK. REQUEST SHOULD BE SENT TO CONSTWORKREQ@SAWS.ORG.

    ANY AND ALL SAWS UTILITY WORK INSTALLED WITHOUT HOLIDAY/WEEKEND APPROVAL WILL BE SUBJECT TO BE UNCOVERED FOR PROPER INSPECTION.
12. COMPACTION NOTE (ITEM 804): THE CONTRACTOR SHALL BE RESPONSIBLE FOR MEETING THE COMPACTION REQUIREMENTS ON ALL TRENCH BACKFILL AND FOR PAYING FOR THE TESTS PERFORMED BY A THIRD PARTY. COMPACTION TESTS WILL BE DONE AT ONE LOCATION POINT RANDOMLY SELECTED, OR AS INDICATED BY THE SAWS INSPECTOR AND/OR THE TEST ADMINISTRATOR, PER EACH 12-INCH LOOSE LIFT PER 400 LINEAR FEET AT A MINIMUM. THIS PROJECT WILL NOT BE ACCEPTED AND FINALIZED BY SAWS WITHOUT THIS REQUIREMENT BEING MET AND VERIFIED BY PROVIDING ALL NECESSARY DOCUMENTED TEST RESULTS.
13. A COPY OF ALL TESTING REPORTS SHALL BE FORWARDED TO SAWS CONSTRUCTION INSPECTION DIVISION.

INTELLIGENT ENGINEERING SERVICES
ENGINEERING COMMUNITIES FROM THE GROUND UP

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OWNER:
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SAN ANTONIO, TX 78204
T. 210.477.6262

LOCATION:
SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION-PHASE 1
411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS

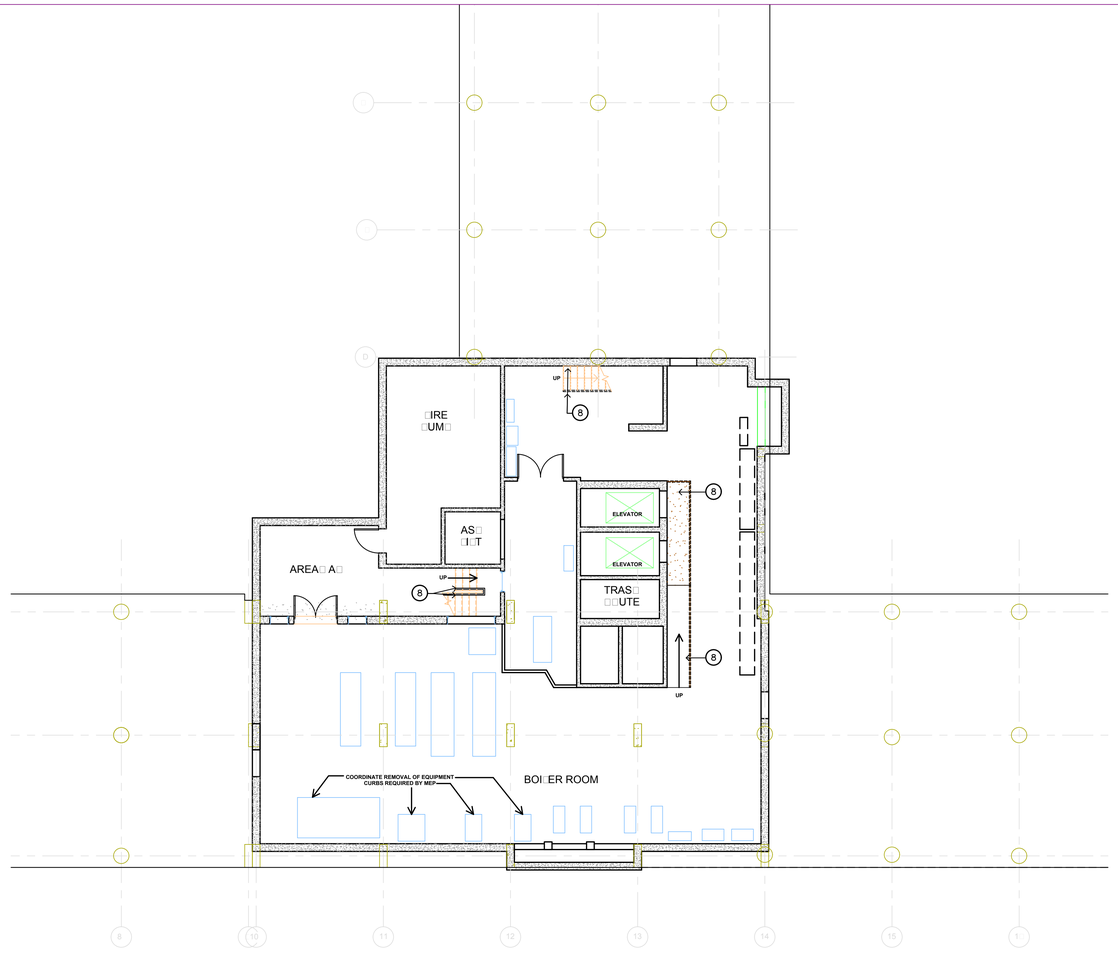
ISSUE	DESCRIPTION	DATE

DONALD N. DACUS
85425
LICENSED PROFESSIONAL ENGINEER

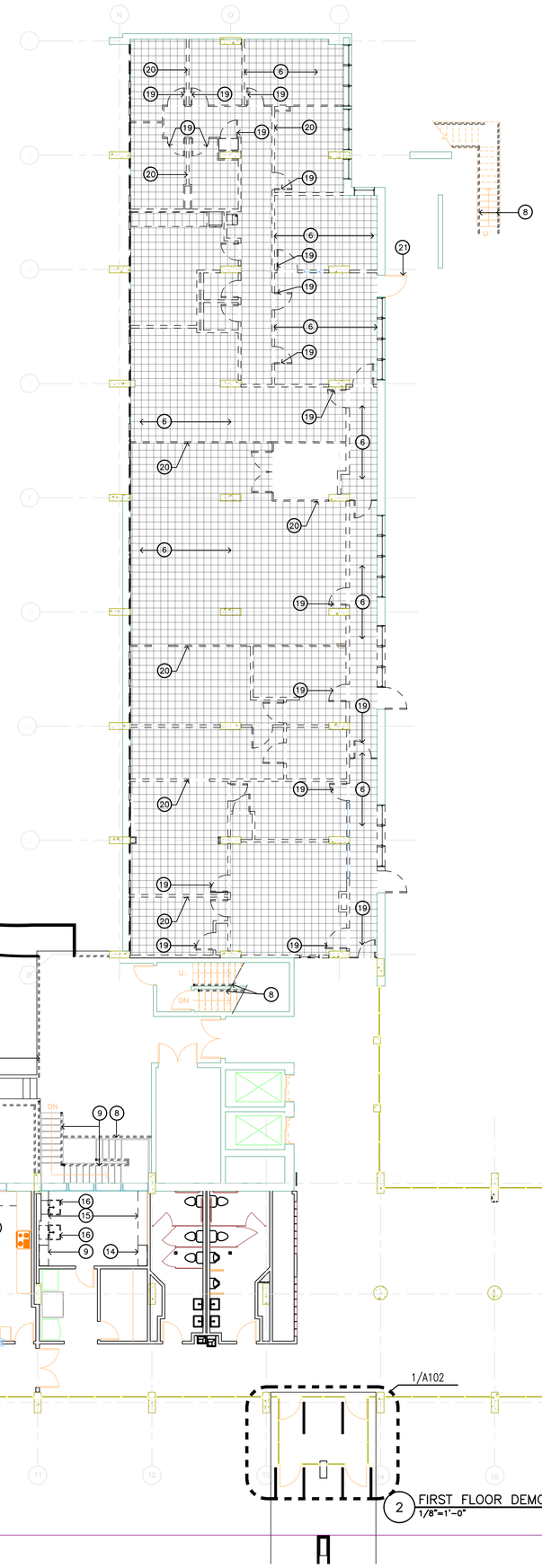
PROJECT ARCHITECT

Civil Details & Notes

SHEET NUMBER
C500



1 BASEMENT DEMOLITION PLAN
1/8"=1'-0"



2 FIRST FLOOR DEMOLITION PLAN
1/8"=1'-0"

□ENERA□ NOTES

1. RE□EREN□E ME□□ANI□A□S□EETS □OR S□E□□□□ E□UI□MENT DEMO□ITION
2. RE□EREN□E E□E□TRI□A□S□EETS □OR S□E□□□□ E□UI□MENT DEMO□ITION
3. RE□EREN□E □□UMBIN□ S□EETS □OR S□E□□□□ E□UI□MENT DEMO□ITION
4. □ENERA□□ONTRA□TOR IS □ERE B□ NOTI□IED T□AT T□ERE ARE SOME A□ARTMENTS T□AT □A□E T□ O□A□ERS O□ □□T, T□E BOTTOM A□ER BEIN□ T□E □A□ER □ IT□ T□E ASBESTOS □ONTAININ□ MASTI□.
5. □ENERA□□ONTRA□TOR IS TO REMO□E A□□ ROO□ □URBS, □ENT □O□ERS, ED□R □AS□IN□, ROO□IN□ AND ROO□IN□ INSU□ATION. □RE□ SUR□A□ES □OR NE□ ROO□IN□.

E□ NOTES

1. REMO□E EXISTIN□ □A□□MOUNT □OT □ ATER RADIATOR
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13. REMO□E □O□ER □ABINET AND U□ ER □ABINET TO □RO□IDE A□□ESS TO □ON□EA□ED □□IN□, □RE□□OR RE□INSTA□□ATION.
14. REMO□E EXISTIN□ □ABINET
15. REMO□E EXISTIN□ □OUNTERTO□
1□. REMO□E EXISTIN□ □□UMBIN□ □IXTURE
17. EXISTIN□ □ANDRAI□S TO REMAIN
18. REMO□E EXISTIN□ □ANDRAI□S AND □RE□ARE □OR EXTENSION AS RE□UIRED □OR ADA
1□. REMO□E EXISTIN□ DOOR AND □RAME
20. REMO□E EXISTIN□ □ARTITION
21. EXISTIN□ E□RESS DOOR TO REMAIN
22. REMO□E EXISTIN□ □IT□□EN E□UI□MENT
23. REMO□E EXISTIN□ □INDO□S
24. REMO□E EXISTIN□ STORE□RONT AND □□A□IN□
25. DEMO EXISTIN□ □OUSE□EE□IN□ □ADS

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DEMO □A□□AND DOOR

EXISTIN□ □A□□AND DOOR TO REMAIN

DURAND–HOLLIS RUPE ARCHITECTS, INC.
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OWNER:
SAHA SAN ANTONIO HOUSING AUTHORITY
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SAN ANTONIO, TX 78204
T. 210.477.6262

LOCATION:
SAN ANTONIO HOUSING AUTHORITY VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS

ISSUE	DESCRIPTION	DATE

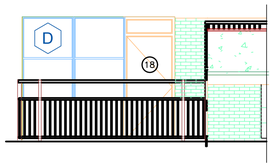
REGISTERED ARCHITECT GABRIEL DURAND-HOLLIS RUPE 10861 STATE OF TEXAS

PERMIT SET 05/25/18

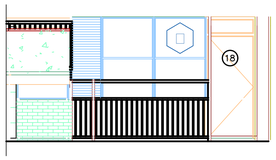
PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-861

FIRST FLOOR DEMOLITION PLAN

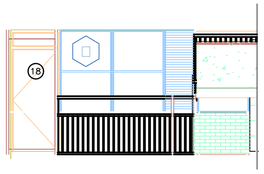
SHEET NUMBER
D-101



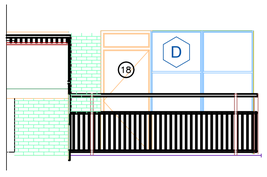
2 2ND TO 9TH FLOOR ELEVATION
1/4"=1'-0"



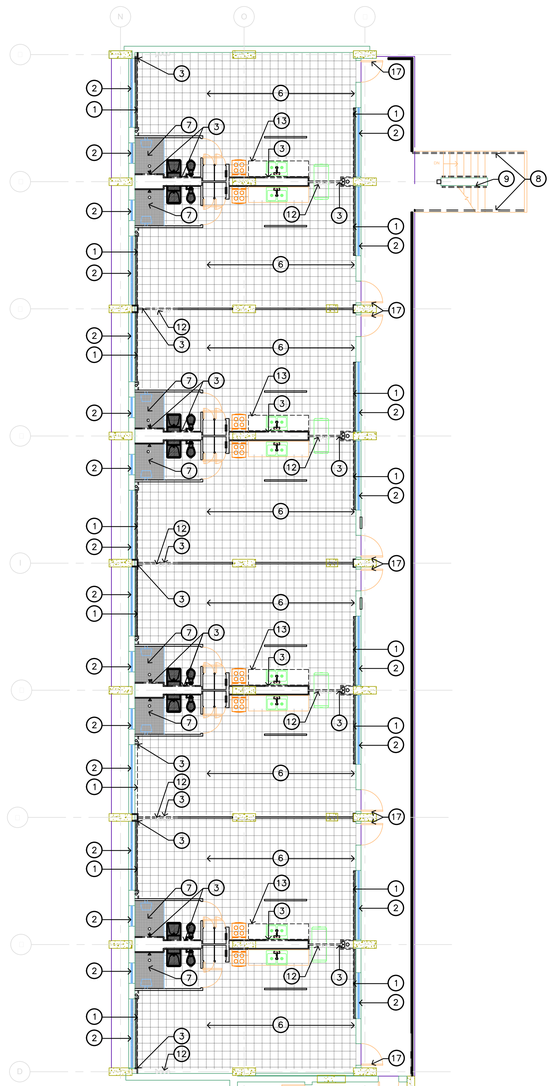
3 2ND TO 9TH FLOOR ELEVATION
1/4"=1'-0"

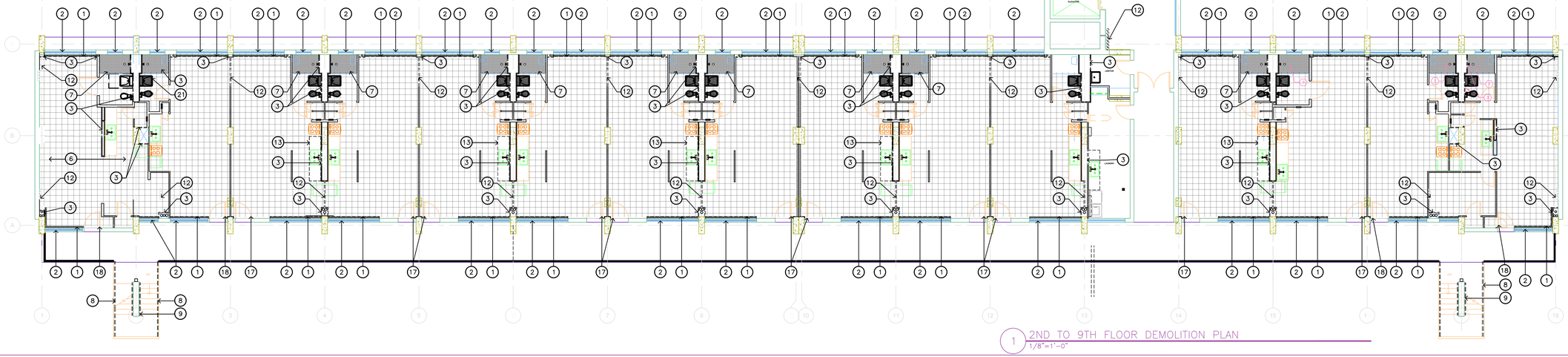


4 2ND TO 9TH FLOOR ELEVATION
1/4"=1'-0"



5 2ND TO 9TH FLOOR ELEVATION
1/4"=1'-0"





1 2ND TO 9TH FLOOR DEMOLITION PLAN
1/8"=1'-0"

GENERAL NOTES

1. REFER TO ARCHITECTURAL SHEETS FOR SPECIFIC DEMOLITION
2. REFER TO ELECTRICAL SHEETS FOR SPECIFIC DEMOLITION
3. REFER TO PLUMBING SHEETS FOR SPECIFIC DEMOLITION
4. GENERAL CONTRACTOR IS REQUIRED TO NOTIFY THE ARCHITECT IF THERE ARE SOME APARTMENTS THAT HAVE BEEN VACATED FOR LONG PERIODS OF TIME AS THERE MAY BE ASBESTOS CONTAINING MASTIC.
5. GENERAL CONTRACTOR IS TO REMOVE ALL ROOFING, VENTILATORS, EDGING AS NEEDED, ROOFING AND ROOFING INSULATION. REPLACE SURFACES ONCE NEW ROOFING.
6. REMOVE EXISTING DOORS FRAMES AT ACCESSIBLE UNITS AND REPLACE ALL DOWNSIZED OR NEW 3'-0" DOORS WITH TRANSOM. REFER TO A-501

KEY NOTES

1. REMOVE EXISTING AIR MOUNTED HOT WATER RADIATOR
2. REMOVE EXISTING WINDOWS, SUB SILLS TO REMAIN
3. REMOVE EXISTING PLASTER PARTITION FOR ACCESS TO CONVENIENCE OUTLETS
4. REMOVE ELECTRICAL AS REQUIRED TO MODIFY SWITCHES
5. REMOVE EXISTING ELECTRICAL PANEL
6. REMOVE EXISTING FLOOR TILE, BASE AND ABATE FLOOR MASTIC
7. REMOVE EXISTING CERAMIC TILE FLOORING AND REPLACE WITH NEW SHEET VINYL AS AN ALTERNATE
8. REMOVE EXISTING METAL GUARDRAIL
9. REMOVE EXISTING METAL HANDRAIL
10. REMOVE ALL INTERIOR LIGHTING SYSTEM TO ACCOMMODATE INSTALLATION OF NEW LIGHTING SYSTEM AND PLUMBING FIXTURES
11. REMOVE PLASTER CEILING AS REQUIRED TO INSTALL NEW LIGHTING SYSTEM AND M.E.P.
12. CORE DRILL CONCRETE SLAB FOR NEW PLUMBING LINES
13. REMOVE LOWER CABINET AND UPPER CABINET TO PROVIDE ACCESS TO CONVENIENCE OUTLETS, REPLACE OR REINSTALLATION.
14. REMOVE EXISTING CABINET
15. REMOVE EXISTING COUNTERTOP
16. REMOVE EXISTING PLUMBING FIXTURE
17. REMOVE EXISTING ALUMINUM DOOR, EXISTING SCREEN DOOR AND FRAME TO REMAIN.
18. REMOVE EXISTING DOOR AND FRAME, MODIFY EXISTING OPENING TO REFIT NEW ADA COMPLIANT DOOR AND FRAME.
19. REMOVE ALL PLUMBING FIXTURE AS NOTED
20. ABATE LEAD BASED PAINT ON EXISTING PLUMBING RISERS AND REPAIR OR ALTERATION

DRAWING LEGEND

- DEMO WALL AND DOOR
- EXISTING WALL AND DOOR TO REMAIN
- CONCRETE COLUMN TO REMAIN
- DEMO FLOOR, REFER NOTE
- DEMO CEILING, REFER NOTE

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REVISIONS

ISSUE	DESCRIPTION	DATE

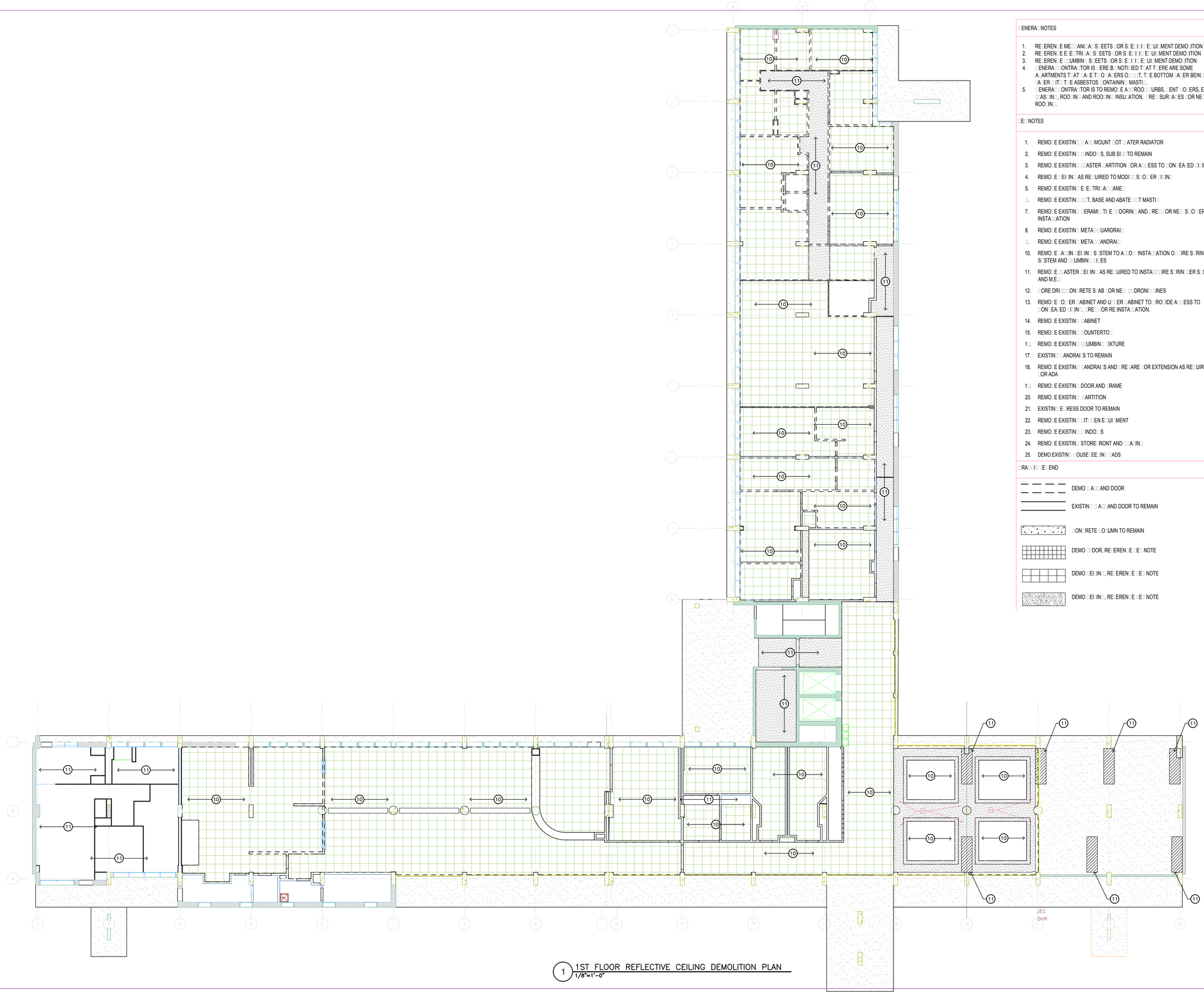
REGISTERED ARCHITECT
GABRIEL DURAND-HOLLIS III
10881
STATE OF TEXAS

PERMIT SET 05/25/18

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
STATE LICENSE NO. 10-10881

2ND - 9TH FLOOR DEMOLITION PLAN

SHEET NUMBER
D-102



1 1ST FLOOR REFLECTIVE CEILING DEMOLITION PLAN
1/8"=1'-0"

GENERAL NOTES

1. REFER TO ME ANICAL SHEETS FOR SPECIFIC EQUIPMENT DEMOLITION
2. REFER TO ELECTRICAL SHEETS FOR SPECIFIC EQUIPMENT DEMOLITION
3. REFER TO PLUMBING SHEETS FOR SPECIFIC EQUIPMENT DEMOLITION
4. GENERAL CONTRACTOR IS HEREBY NOTIFIED THAT THERE ARE SOME APARTMENTS THAT HAVE TO BE VACATED, THE BOTTOM PAPER BEING THE PAPER IT THE ASBESTOS CONTAINING MASTIC.
5. GENERAL CONTRACTOR IS TO REMOVE ALL ROOFING, CEMENT BOARD SIDING, ROOFING AND ROOFING INSULATION. REPLACE WITH NEW ROOFING.

KEY NOTES

1. REMOVE EXISTING PACKAGE MOUNT HOT WATER RADIATOR
2. REMOVE EXISTING WINDOWS, SUB SILLS TO REMAIN
3. REMOVE EXISTING PLASTER PARTITION FOR ACCESS TO CONCEALED PIPING.
4. REMOVE CEILING AS REQUIRED TO MODIFY SPRINKLER HEAD
5. REMOVE EXISTING CERAMIC TILE FLOORING
6. REMOVE EXISTING VINYL, BASE AND ABATE ASBESTOS MASTIC
7. REMOVE EXISTING CERAMIC TILE FLOORING AND REPLACE WITH NEW SPRINKLER HEAD AND INSTALLATION
8. REMOVE EXISTING METAL GUARDRAIL
9. REMOVE EXISTING METAL HANDRAIL
10. REMOVE ALARM CEILING SYSTEM TO ACCOMODATE INSTALLATION OF FIRE SPRINKLER SYSTEM AND PLUMBING FIXTURES
11. REMOVE PLASTER CEILING AS REQUIRED TO INSTALL FIRE SPRINKLER SYSTEM AND M.E.P.
12. CORE DRILL CONCRETE SLAB FOR NEW PLUMBING LINES
13. REMOVE LOWER CABINET AND UPPER CABINET TO PROVIDE ACCESS TO CONCEALED CEILING. REPLACE FOR REINSTALLATION.
14. REMOVE EXISTING CABINET
15. REMOVE EXISTING COUNTERTOP
16. REMOVE EXISTING PLUMBING FIXTURE
17. EXISTING HANDRAILS TO REMAIN
18. REMOVE EXISTING HANDRAILS AND REARRANGE FOR EXTENSION AS REQUIRED FOR ADA
19. REMOVE EXISTING DOOR AND FRAME
20. REMOVE EXISTING PARTITION
21. EXISTING EGRESS DOOR TO REMAIN
22. REMOVE EXISTING LIGHTING EQUIPMENT
23. REMOVE EXISTING WINDOWS
24. REMOVE EXISTING STOREFRONT AND DOORWAY
25. DEMO EXISTING HOUSEKEEPING PADS

LEGEND

- DEMO WALL AND DOOR
- EXISTING WALL AND DOOR TO REMAIN
- CONCRETE COLUMN TO REMAIN
- DEMO DOOR, REFER TO NOTE
- DEMO CEILING, REFER TO NOTE
- DEMO CEILING, REFER TO NOTE

JEC
DHR

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REVISIONS

ISSUE	DESCRIPTION	DATE

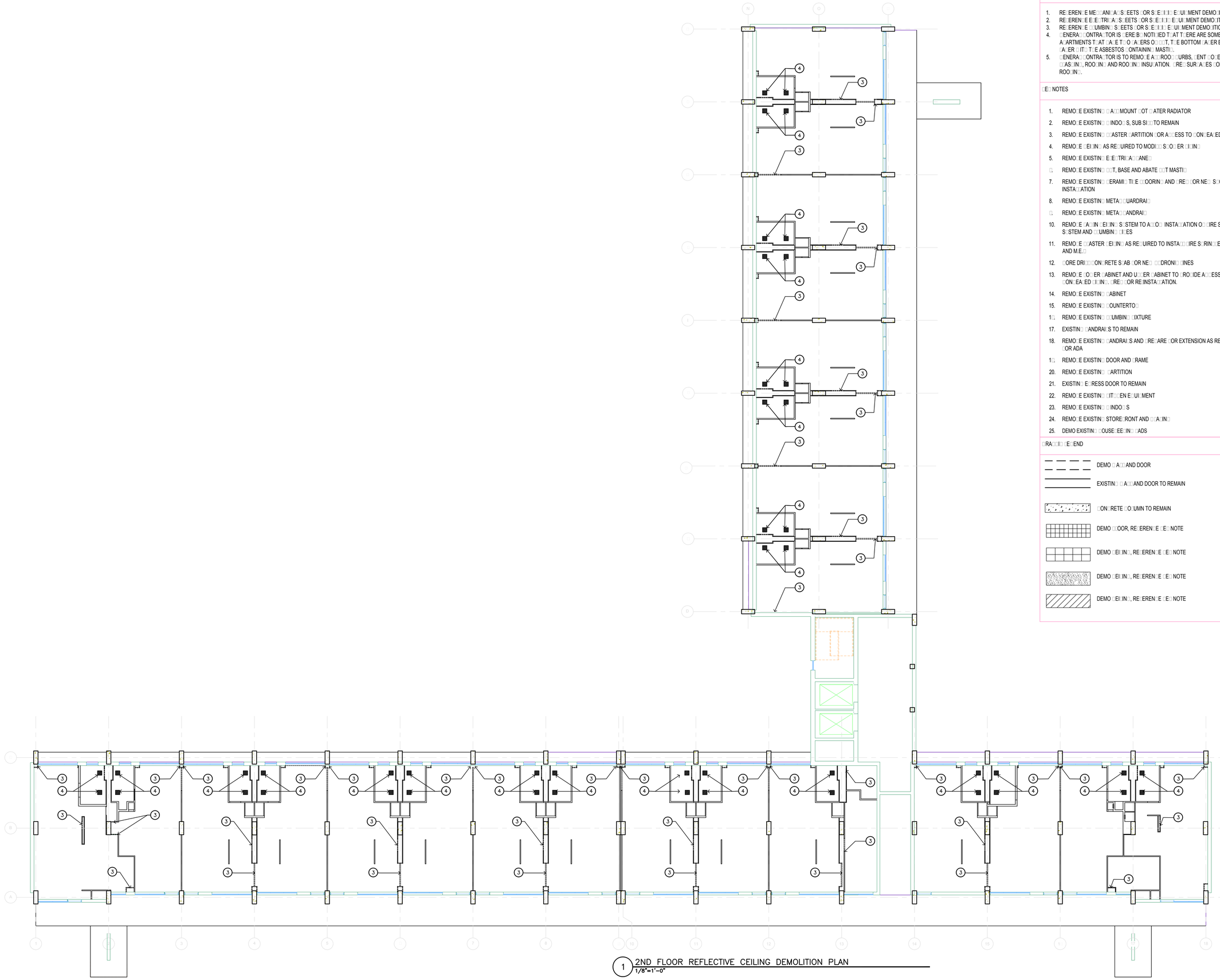
REGISTERED ARCHITECT
GABRIEL DURAND-HOLLIS RUPE
10861
STATE OF TEXAS

PERMIT SET 05/25/18

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
STATE LICENSE NO. 10-10861

1ST FLOOR CEILING DEMOLITION PLAN

SHEET NUMBER
D-103



1 2ND FLOOR REFLECTIVE CEILING DEMOLITION PLAN
1/8"=1'-0"

□ENERA□ NOTES

1. RE□EREN□E ME□□ANI□A□S□EETS □OR S□E□□□□ E□UI□MENT DEMO□ITION
2. RE□EREN□E E□E□TRI□A□S□EETS □OR S□E□□□□ E□UI□MENT DEMO□ITION
3. RE□EREN□E □□UMBIN□ S□EETS □OR S□E□□□□ E□UI□MENT DEMO□ITION
4. □ENERA□□ONTRA□TOR IS □ERE□B□ NOTI□IED T□AT T□ERE ARE SOME A□ARTMENTS T□AT □A□E T□ O□A□ERS O□ □□T, T□T□E BOTTOM □A□ER BEIN□ T□E □A□ER □T□T□E ASBESTOS □ONTAININ□ MASTI□.
5. □ENERA□□ONTRA□TOR IS TO REMO□E A□□ ROO□□URBS, □ENT □O□ERS, ED□R □AS□IN□, ROO□IN□ AND ROO□IN□ INSU□ATION. □RE□ SUR□A□ES □OR NE□ ROO□IN□.

□E□ NOTES

1. REMO□E EXISTIN□ □A□□MOUNT □OT □ATER RADIATOR
2. REMO□E EXISTIN□ □INDO□S, SUB SI□□ TO REMAIN
3. REMO□E EXISTIN□ □□ASTER □ARTITION □OR A□□ESS TO □ON□EA□ED □□IN□.
4. REMO□E □EI□IN□ AS RE□UIRED TO MODI□□ S□O□ER □□IN□
5. REMO□E EXISTIN□ E□E□TRI□A□□ANE□
6. REMO□E EXISTIN□ □□T, BASE AND ABATE □□T MASTI□
7. REMO□E EXISTIN□ □ERAMI□ TI□E □□OORIN□ AND □RE□ □OR NE□ S□O□ER □AN INSTA□ATION
8. REMO□E EXISTIN□ META□□UARDRAI□
9. REMO□E EXISTIN□ META□□ANDRAI□
10. REMO□E □A□IN □EI□IN□ S□STEM TO A□□O□ INSTA□ATION O□ □IRE S□RIN□ER S□STEM AND □□UMBIN□ □□ES
11. REMO□E □□ASTER □EI□IN□ AS RE□UIRED TO INSTA□□ □IRE S□RIN□ER S□STEM AND M.E.□
12. □ORE DRI□□□ON□RETE S□AB □OR NE□ □□DRONI□ □INES
13. REMO□E □O□ER □ABINET AND U□ ER □ABINET TO □RO□IDE A□□ESS TO □ON□EA□ED □□IN□□, □RE□□OR RE□INSTA□ATION.
14. REMO□E EXISTIN□ □ABINET
15. REMO□E EXISTIN□ □OUNTERTO□
16. REMO□E EXISTIN□ □□UMBIN□ □IXTURE
17. EXISTIN□ □ANDRAI□S TO REMAIN
18. REMO□E EXISTIN□ □ANDRAI□S AND □RE□ARE □OR EXTENSION AS RE□UIRED □OR ADA
19. REMO□E EXISTIN□ DOOR AND □RAME
20. REMO□E EXISTIN□ □ARTITION
21. EXISTIN□ E□RESS DOOR TO REMAIN
22. REMO□E EXISTIN□ □IT□□EN E□UI□MENT
23. REMO□E EXISTIN□ □INDO□S
24. REMO□E EXISTIN□ STORE□RONT AND □□A□IN□
25. DEMO EXISTIN□ □OUSE□EE□IN□ □ADS

□RA□□I□ □E□END

- DEMO □□A□□AND DOOR
- EXISTIN□ □□A□□AND DOOR TO REMAIN
- □ON□RETE □O□UMN TO REMAIN
- DEMO □□OOR, RE□EREN□E □E□ NOTE
- DEMO □EI□IN□, RE□EREN□E □E□ NOTE
- DEMO □EI□IN□, RE□EREN□E □E□ NOTE
- DEMO □EI□IN□, RE□EREN□E □E□ NOTE

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REVISIONS

ISSUE	DESCRIPTION	DATE

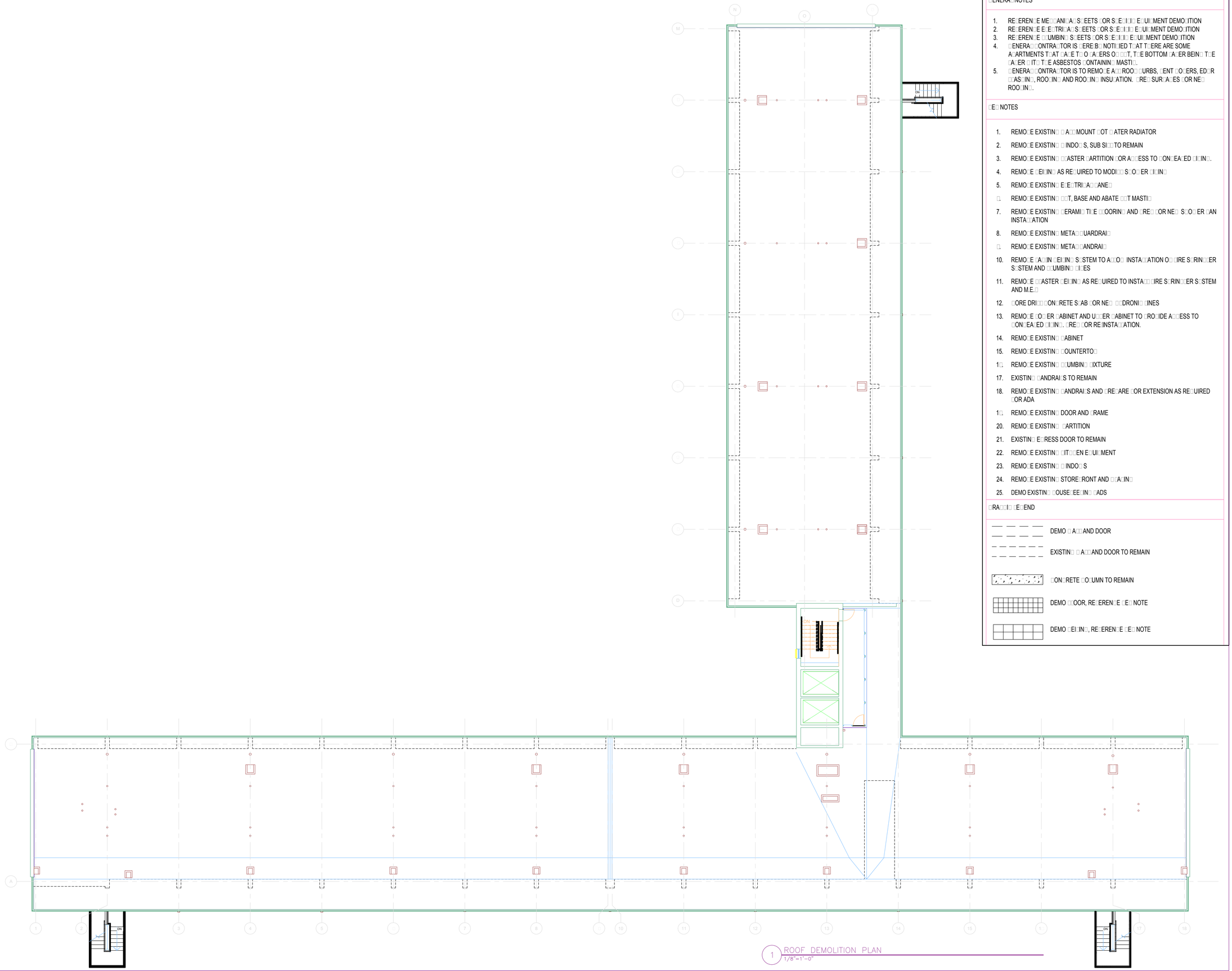
REGISTERED ARCHITECT DARREL WAYNE HOLLIS 10861 STATE OF TEXAS

PERMIT SET 08/25/18

PROJECT ARCHITECT
DARREL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10-861

2ND - 9TH FLOOR CEILING DEMOLITION PLAN

SHEET NUMBER
D-104



1 ROOF DEMOLITION PLAN
1/8"=1'-0"

GENERAL NOTES

1. REFER TO MECHANICAL SHEETS FOR SPECIFICATIONS FOR EQUIPMENT DEMOLITION
2. REFER TO ELECTRICAL SHEETS FOR SPECIFICATIONS FOR EQUIPMENT DEMOLITION
3. REFER TO PLUMBING SHEETS FOR SPECIFICATIONS FOR EQUIPMENT DEMOLITION
4. GENERAL CONTRACTOR IS REQUIRED NOTIFIED THAT THERE ARE SOME APARTMENTS THAT HAVE TO BE VACATED THAT THERE BOTTOM HAVER BEING THE HAVER IT THE ASBESTOS CONTAINING MASTIC.
5. GENERAL CONTRACTOR IS TO REMOVE ALL ROOFING, CEMENT COVERS, EDGER FLASHING, ROOFING AND ROOFING INSULATION. REPLACE WITH NEW ROOFING.

KEY NOTES

1. REMOVE EXISTING HVAC MOUNTED UNIT AND ASSOCIATED EQUIPMENT
2. REMOVE EXISTING WINDOWS, SUB SILL TO REMAIN
3. REMOVE EXISTING PARTITION FOR ACCESS TO CONDENSER UNIT.
4. REMOVE CEILING AS REQUIRED TO MODIFY SOFFIT AND CEILING
5. REMOVE EXISTING ELEVATOR CABLE
6. REMOVE EXISTING ROOF, BASE AND ABATE ROOF MASTIC
7. REMOVE EXISTING PERIMETER FLASHING AND REPLACE WITH NEW SOFFIT AND INSTALLATION
8. REMOVE EXISTING METAL GUARDRAIL
9. REMOVE EXISTING METAL HANDRAIL
10. REMOVE FAN COILING SYSTEM TO ALLOW INSTALLATION OF FIRE SPRINKLER SYSTEM AND PLUMBING LINES
11. REMOVE PARTITION CEILING AS REQUIRED TO INSTALL FIRE SPRINKLER SYSTEM AND M.E.P.
12. CORE DRILL CONCRETE SLAB FOR NEW PLUMBING LINES
13. REMOVE FOUNTAIN AND UNDER CABINET TO PROVIDE ACCESS TO CONCEALED COILING. REPLACE FOR REINSTALLATION.
14. REMOVE EXISTING CABINET
15. REMOVE EXISTING COUNTERTOP
16. REMOVE EXISTING PLUMBING FIXTURE
17. EXISTING HANDRAILS TO REMAIN
18. REMOVE EXISTING HANDRAILS AND REPLACE FOR EXTENSION AS REQUIRED FOR ADA
19. REMOVE EXISTING DOOR AND FRAME
20. REMOVE EXISTING PARTITION
21. EXISTING EGRESS DOOR TO REMAIN
22. REMOVE EXISTING KITCHEN EQUIPMENT
23. REMOVE EXISTING WINDOWS
24. REMOVE EXISTING STOREFRONT AND CURTAIN
25. DEMO EXISTING HOUSEKEEPING PADS

LEGEND

- DEMO DOOR AND DOOR
- EXISTING DOOR AND DOOR TO REMAIN
- CONCRETE COLUMN TO REMAIN
- DEMO DOOR, REFERENCE NOTE
- DEMO CEILING, REFERENCE NOTE

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REVISIONS

ISSUE	DESCRIPTION	DATE

GABRIEL HOLLIS RUPE 10861 REGISTERED ARCHITECT STATE OF TEXAS

PERMIT SET 05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10-861

ROOF DEMOLITION PLAN

SHEET NUMBER
D-105

GENERAL NOTES

1. FOR LEAD-BASED PAINT REMOVAL REF. LEAD- BASED PAINT REMOVAL AND DISPOSAL SPECIFICATION OF MAY 18, 2018 BY TERRACON.
2. FOR ASBESTOS REPORT REF. LIMITED ASBESTOS SURVEY REPORT OF APRIL 17, 2018 BY TERRACON.

KEYED NOTES

1. NEW METAL GUARDRAIL
2. NEW METAL HANDRAIL
3. EXISTING METAL CAGE TO REMAIN
4. CONCRETE COLUMNS TO REMAIN (TYP.)
5. ACCESS DOOR TO CRAWL SPACE
6. EXISTING AREAWAY TO REMAIN
7. EXISTING SUMP PIT TO REMAIN
8. EXISTING MAINTENANCE PAD TO REMAIN, TYP
9. EXISTING SUMP TO REMAIN
10. EXISTING FIRE EXTINGUISHER
11. EXISTING RAMP TO REMAIN
12. HANDRAIL 12IN EXTENSIONS
13. L-SHAPED STEEL PLATE FOR RAILING SUPPORT. REFERENCE STRUCTURAL DRAWINGS FOR SIZE AND DETAILS.
14. NOT USED.
15. EXISTING FAN TO BE REMOVED. CONTRACTOR TO PATCH WALL.
16. ANCHOR BOLT TO EXISTING CONCRETE RAMP. REFERENCE STRUCTURAL DRAWINGS FOR SIZES AND DETAILS.

TENANT BROADBAND KEYED NOTES

1. EXTEND PLENUM RATED MICRODUCT FOR BROADBAND SERVICE THRU CRAWISPACE TO MDF LOCATION IN BASEMENAS INDICATED.
2. APPROXIMATE LOCATION OF MDF RACKAND RELATED FXDS PANEL. CONTRACTOR SHALL PROVIDE 23" CHATSWORTH RACK OR APPROVED EQUAL SECURED TO WALL WITH LADDER RACKING. INCLUDE SLACK BASKET. FIELD VERIFY RACK LOCATION AND CABLING ROUTES TO AND FROM THIS LOCATION. COORDINATE POWER REQUIRMENTS WITH MANUFACTURER.
3. MDF RACK TO INCLUDE IST FLOOR IDF MPO BREAKOUT CASSETTE. PROVIDE BASEMENT CEILING MOUNTED EMT CONDUIT. STUB UP THRU EXISTING FLOOR TO SERVE TERMINATION POINTINDICATED ON A-102 FIRST FLOOR PLAN.
4. CONTRACTOR SHALL PROVIDE AN MPO BREAKOUT CASSETTE FOR EACH FLOOR. 2 HIGH, SC APC,24 PORTS STANDARD DENSITY. DISTRIBUTION AT EACH FLOOR LEVEL SHALL UTILIZE SINGLEMODE FIBER PATCHCORDS, 24 FIBER, 1X24 MPO FEMALE TO 1X24 PUSHABLE MPO FEMALE. REFETO SHEET A-102 FOR CONTINUATION

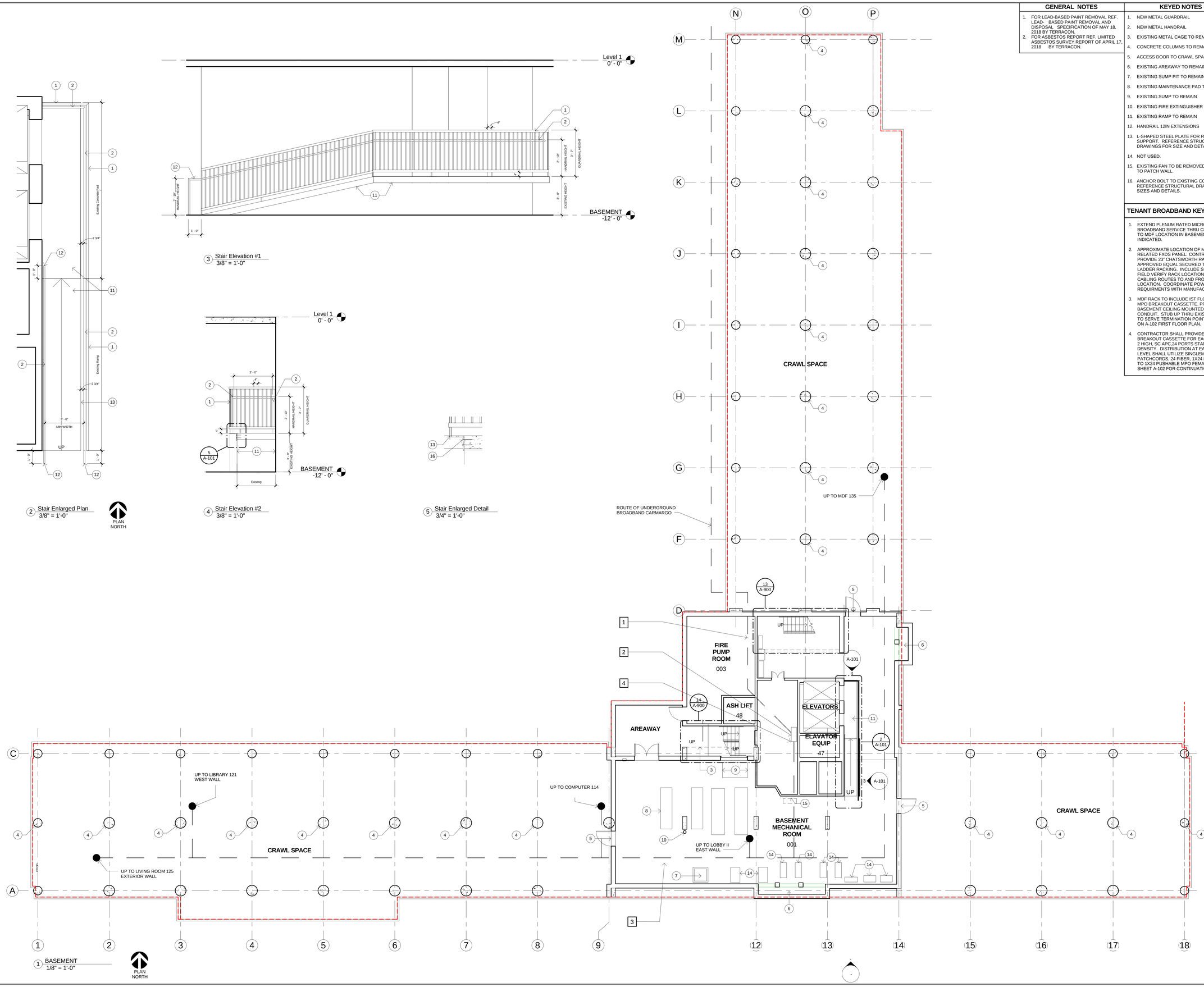
2 Stair Enlarged Plan
3/8" = 1'-0"

3 Stair Elevation #1
3/8" = 1'-0"

4 Stair Elevation #2
3/8" = 1'-0"

5 Stair Enlarged Detail
3/4" = 1'-0"

PLAN NORTH



1 BASEMENT
1/8" = 1'-0"

PLAN NORTH

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LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

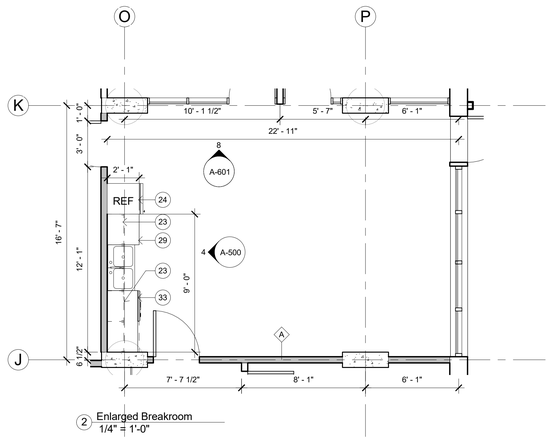
05/25/18

PERMIT SET

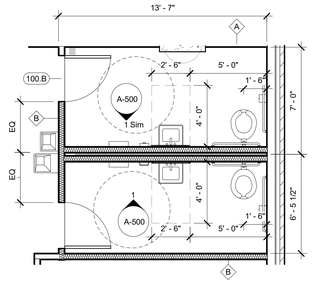
PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

BASEMENT PLAN

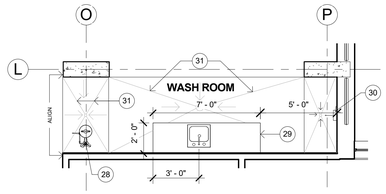
SHEET NUMBER
A-101



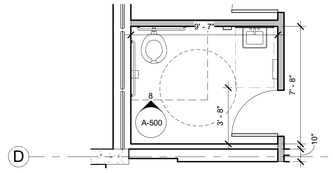
2 Enlarged Breakroom
1/4" = 1'-0"



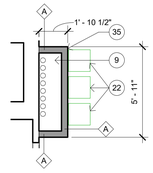
15 Enlarged Plan Restrooms
1/4" = 1'-0"



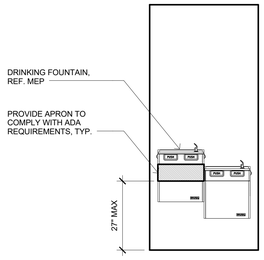
4 Employee Wash Room
1/4" = 1'-0"



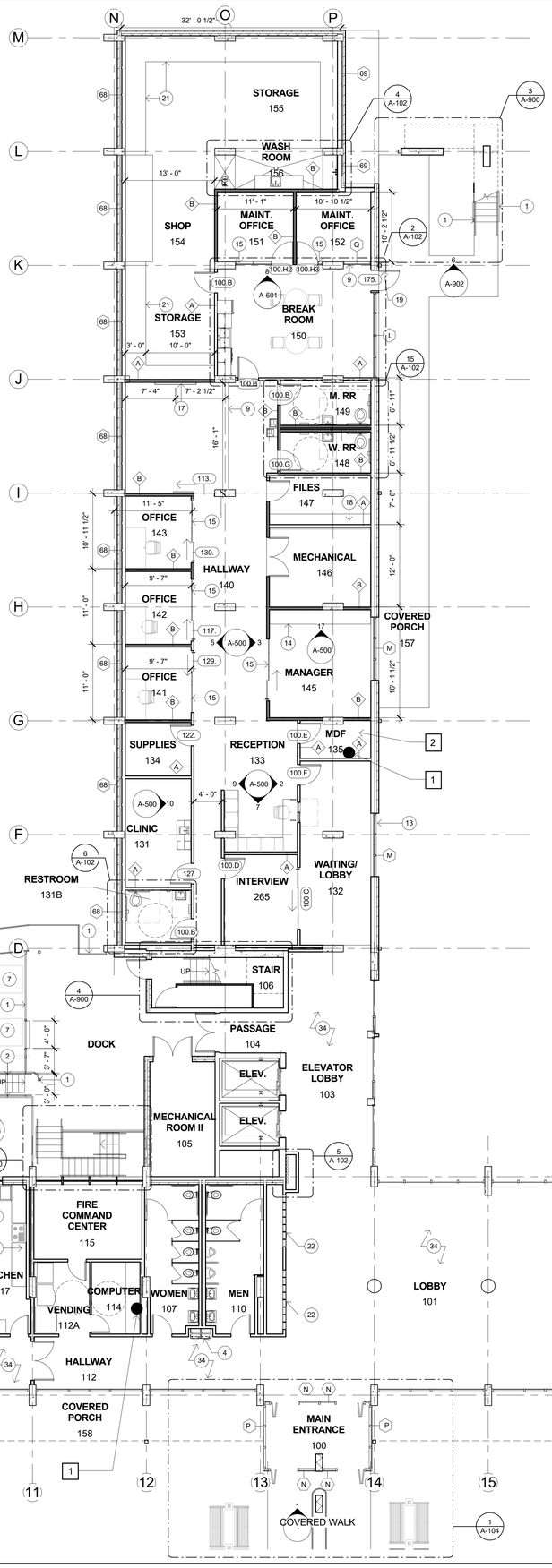
6 Enlarged Plan Restrooms lobby
1/4" = 1'-0"



5 New Pipe Chase
1/4" = 1'-0"



3 Typical Drinking Fountain Elevation
1/2" = 1'-0"



1 Level 1
1/8" = 1'-0"

PLAN NORTH

BROADBAND KEYED NOTES

1. PROVIDE BROADBAND TERMINATIONS AT AREAS OF THE FIRST FLOOR AS INDICATED DIRECTLY FROM BASEMENT MDF RACK LOCATION USING 900UM STRONG FIBER PATCHCORD REELS LOADED WITH SC/APC ADAPTERS AND SIMPLEX SC/APC TO PULLABLE SC/APC SINGLEMODE. REFERENCE ELECTRICAL FOR SSOCIATED POWER REQUIRMENTS.
2. CONTRACTOR SHALL COORDINATE BROADBAND TERMINATION AT OFFICE SUITE MDF ROOM 135 WITH OWNER.

WALL LEGEND

- EXISTING WALL
- NEW WALL
- NEW, INSULATED WALL

FLOOR PLAN GENERAL NOTES

1. FOR DOOR REPLACEMENT DETAILS, REFERENCE SHEET 1-601. **PLEASE NOTE: ONLY TAGGED DOORS ARE BEING REPLACED.**
2. FOR WINDOW REPLACEMENT DETAILS, REFERENCE SHEETS A-600 AND A-600.1. **PLEASE NOTE: ONLY TAGGED WINDOWS ARE BEING REPLACED.**
3. ALL FURNITURE ILLUSTRATIONS ARE FOR REFERENCE ONLY. FURNITURE PROVIDED BY THE OWNER.
4. FOR NEW PLUMBING FIXTURES, SINKS AND TOILETS, REFERENCE PLUMBING DRAWINGS.
5. CONTRACTOR TO INSULATE ALL EXPOSED PIPES.
6. CONTRACTOR TO PROVIDE BLOCKING WHERE NECESSARY.
7. CONTRACTOR TO PROTECT ALL EXISTING MILLWORK DURING CONSTRUCTION.
8. REFERENCE SHEET A-700 FOR WALL TYPES.
9. CONTRACTOR SHALL PROVIDE 1" OPERABLE BLINDS AT ALL WINDOW OPENINGS UNLESS NOTED OTHERWISE.
10. PROVIDE DRINKING FOUNTAIN APRON AS REQUIRED TO COMPLY WITH ADA REQUIREMENTS.
11. FOR PLUMBING PLANS REFER TO MEP DRAWINGS
12. CONTRACTOR SHALL PROVIDE 1" OPERABLE BLINDS AT ALL WINDOW OPENINGS EXCEPT WINDOW TYPES "P" AND "N".
13. CONTRACTOR SHALL FILL WITH INSULATION ALL EXTERIOR WALL OR FLOOR CAVITIES EXPOSED DURING CONSTRUCTION.
14. FOR LEAD-BASED PAINT REMOVAL REF. LEAD-BASED PAINT REMOVAL AND DISPOSAL SPECIFICATION OF MAY 18, 2018 BY TERRACON.
15. FOR ASBESTOS REPORT REF. LIMITED ASBESTOS SURVEY REPORT OF APRIL 17, 2018 BY TERRACON.

KEYED NOTES

1. NEW METAL GUARDRAIL
2. NEW METAL HANDRAIL
3. NEW INTERIOR SLIDING GLASS WINDOW WITH COUNTER, REFERENCE INTERIOR ELEVATIONS
4. EXISTING DRINKING FOUNTAINS TO REMAIN
5. EXISTING RAILING TO REMAIN
6. NEW DOOR, REFERENCE DOOR SCHEDULE
7. EXISTING DUMPSTERS TO REMAIN
8. NOT USED.
9. TEMPERED GLASS PARTITIONS IN ALUMINUM FRAME AS SCHEDULED
10. MODIFY EXISTING PARTITION TO FIT NEW DOOR
11. BUILT-IN CABINET / SHELVING, REFERENCE INTERIOR ELEVATIONS
12. NEW BUILDING NORTH WING ACCESS/EGRESS
13. NEW WINDOW LOCATION
14. BUILT-IN DESK / CABINENTS, REFERENCE INTERIOR ELEVATIONS
15. ALUMINUM INTERIOR DOOR & FRAME PARTITION, ANODIZED
16. NEW DRINKING FOUNTAINS AS SCHEDULED, REFERENCE PLUMBING DRAWINGS
17. NEW PROJECTOR SCREEN AS SCHEDULED
18. FILE STORAGE BY OWNER
19. EXISTING EGRESS DOOR TO REMAIN
20. NEW PLUMBING FIXTURES, REFERENCE TOILET ACCESSORY LEGEND ON A-102.
21. MAINTENANCE SHELVING PROVIDED BY OWNER
22. EXISTING MAIL BOXES TO REMAIN
23. SAHA STANDARD UPPER AND LOWER CABINETS. REFERENCE A701 MILLWORK DETAILS.
24. REFRIGERATOR AND FREEZER. OFOI.
25. NEW 3 COMPARTMENT SINK, REF. MEP
26. NEW HAND SINK, REF. MEP
27. EXISTING MILLWORK TO REMAIN
28. DRENCH SHOWER WITH EYE STATION AND SINK REFERENCE PLUMBING DRAWINGS
29. SOLID SURFACE COUNTER AS SCHEDULED.
30. MOP SINK AREA WITH WALL FAUCET. REFERENCE PLUMBING DRAWINGS.
31. FLOOR SLOPES 4% TO THE DRAIN, REFERENCE PLUMBING DRAWINGS FOR DETAILS ON DRAIN
32. NEW FUR-OUT, METAL STUD WITH 5/8 GYPSUM BOARD ON THE OUTSIDE.
33. NEW DISHWASHER, OFOI.
34. CONTRACTOR TO REPAIR AND RE-FINISH THE TERRAZZO FLOORING AS PER SPECIFICATIONS.
35. EXPAND EXISTING CHASE AS INDICATED.

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SAN ANTONIO HOUSING AUTHORITY VICTORIA PLAZA MODERNIZATION

LOCATION: 411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT — GABRIEL DURAND-HOLLIS — 19891 — STATE OF TEXAS

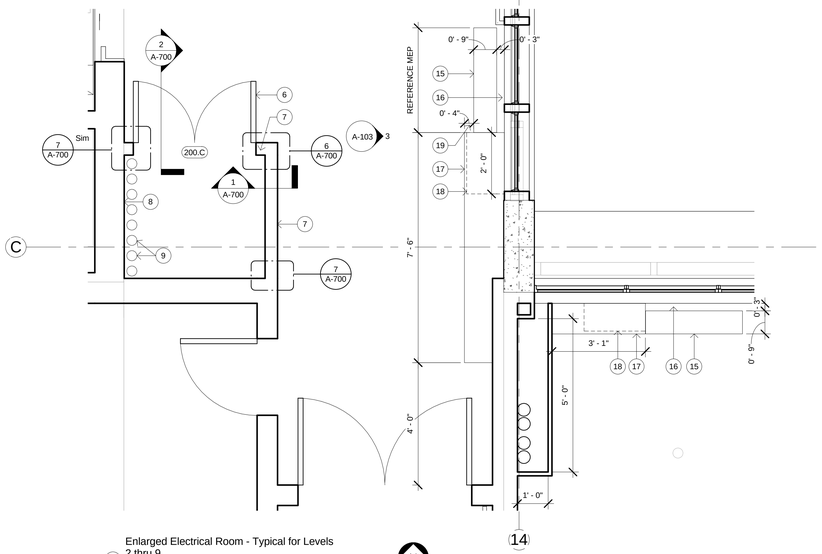
05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENCE NO. 19-681

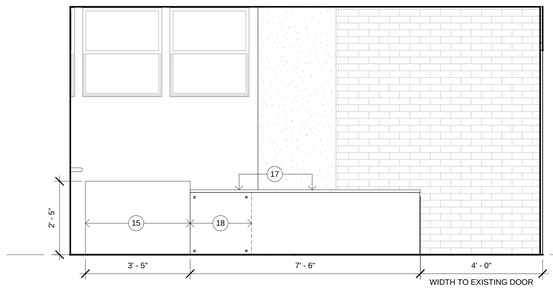
FIRST FLOOR PLAN

SHEET NUMBER
A-102



2 Enlarged Electrical Room - Typical for Levels 2 thru 9
1/2" = 1'-0"

PLAN NORTH



Level 2
14' - 8"

3 Elevation - Lobby Coil Unit
1/2" = 1'-0"

UNIT TYPE H ON 2, 3, 4, 5, 6, 7, 8 & 9

UNIT TYPE G ON 2, 3, 4, 5, 6, 7, 8 & 9

UNIT TYPE H ON 2, 3, 4, 5, 6, 7, 8 & 9

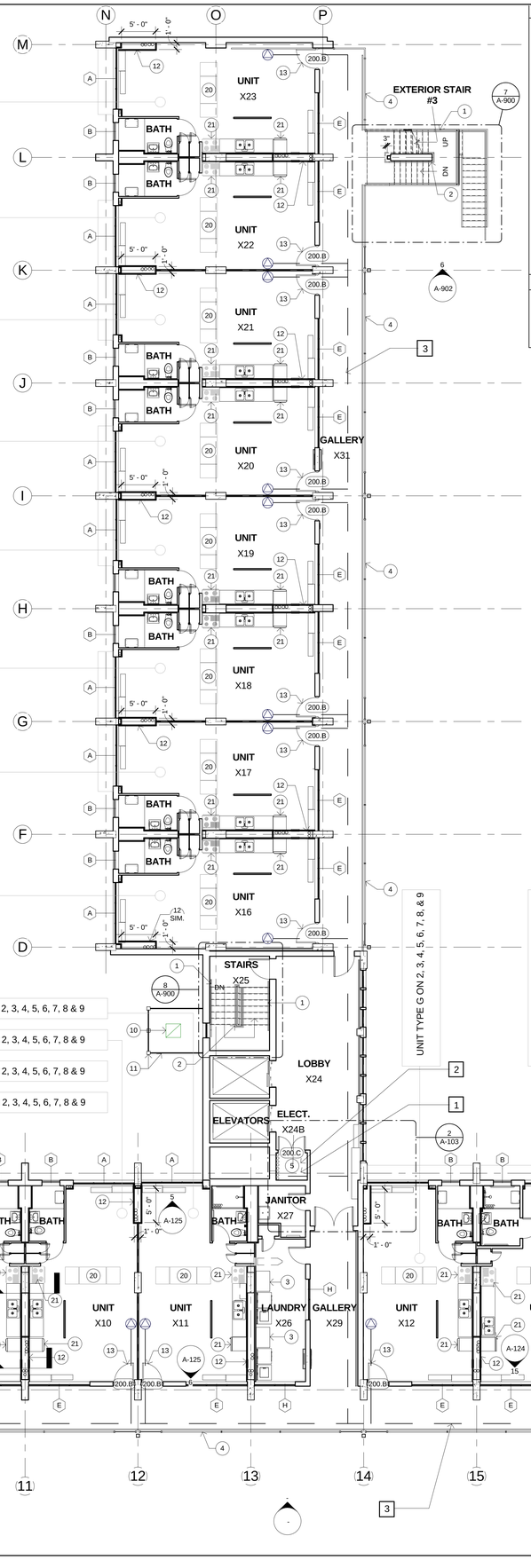
UNIT TYPE G ON 2, 3, 4, 5, 6, 7, 8 & 9

UNIT TYPE H ON 2, 3, 4, 5, 6, 7, 8 & 9

UNIT TYPE I ON 5TH FLOOR ONLY
UNIT TYPE H ON 2, 3, 4, 5, 6, 7, 8 & 9

UNIT TYPE H ON 2, 3, 4, 5, 6, 7, 8 & 9

UNIT TYPE G ON 2, 4, 5, 6, 7, 8 & 9
UNIT TYPE I ON 3RD FLOOR ONLY



UNIT TYPE A ON 3, 4, 5, 6, 7, 8 & 9
UNIT TYPE C ON 2ND FLOOR ONLY
REF. SHEET A-120 & A-121

UNIT TYPE E ON 2, 3, 4, 5, 6, 7, 8 & 9
REF. SHEET A-122

UNIT TYPE G ON 2, 3, 5, 6, 7, 8 & 9
UNIT TYPE I ON 4TH FLOOR ONLY
REF. SHEET A-123 & A-124

UNIT TYPE H 2, 3, 4, 6, 7, 8, & 9
UNIT TYPE J ON 5TH FLOOR ONLY
REF. SHEET A-123 & A-124

UNIT TYPE G ON 2, 3, 4, 5, 6, 7, 8 & 9
REF. SHEET A-123

UNIT TYPE H ON 2, 3, 4, 5, 6, 7, 8 & 9
REF. SHEET A-123

UNIT TYPE G ON 2, 3, 4, 6, 7, 8 & 9
UNIT TYPE J ON 5TH FLOOR ONLY
REF. SHEET A-123 & A-124

UNIT TYPE K ON 2, 3, 4, 5, 6, 7, 8 & 9

UNIT TYPE H ON 2, 3, 4, 5, 6, 7, 8 & 9

UNIT TYPE H ON 2, 3, 4, 5, 6, 7, 8 & 9

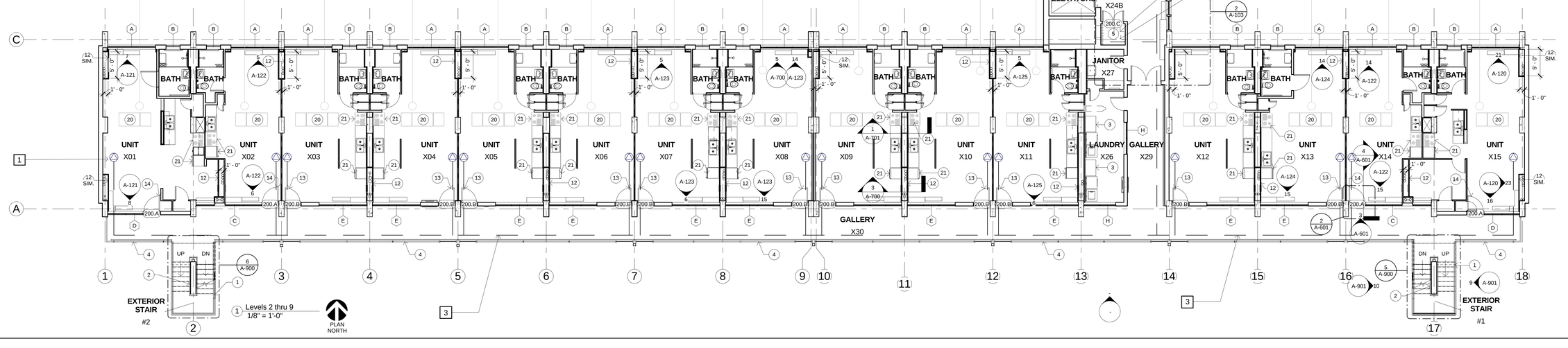
UNIT TYPE G ON 2, 3, 4, 5, 6, 7, 8 & 9

UNIT TYPE G ON 2, 3, 4, 5, 6, 7, 8 & 9

UNIT TYPE H ON 3, 4, 5, 6, 7, 8, & 9
UNIT TYPE J ON 2ND FLOOR ONLY

UNIT TYPE F ON 2, 3, 4, 5, 6, 7, 8, & 9

UNIT TYPE B ON 2, 4, 5, 6, 7, 8 & 9
UNIT TYPE D ON 3RD FLOOR ONLY



1 Levels 2 thru 9
1/8" = 1'-0"

PLAN NORTH

BROADBAND KEYED NOTES

1. CONTRACTOR SHALL PROVIDE ONE SINGLEMODE FIBER PATCHCORD TO EACH FLOOR LEVEL. 24 FIBER, 1X24 MPO FEMALE TO 1X24 PUSHABLE MPO FEMALE.
2. APPROXIMATE LOCATION OF IDF MPO BREAKOUT CASSETTE. COORDINATE WALL MOUNTING LOCATION WITH ELECTRICAL.
3. ROUTE FIBER FROM IDF PANEL LOCATION ON EACH FLOOR IN EXPOSED ¾" EMT ATTACHED TO CONCRETE CEILING OF EXTERIOR WALKWAYS AS INDICATED. COORDINATE PATHWAY FOR NEW WITH EXISTING EXPOSED CONDUITS TO REMAIN WHILE MAINTAINING ALL SPECIFIED SEPARATION AND BENDING RADIUS REQUIRMENTS.
4. PROVIDE BROADBAND TERMINATIONS AND RELATED SIMPLEX POWER OUTLET WALL BOXES AT EACH APARTMENT UNIT. COORDINATE FINAL LOCATIONS WITH OWNER. REFERENCE ELECTRICAL FOR ASSOCIATED POWER REQUIRMENTS.

WALL LEGEND

- EXISTING WALL
- NEW WALL
- NEW, INSULATED WALL

FLOOR PLAN GENERAL NOTES

1. FOR DOORS REPLACEMENT DETAILS REFERENCE SHEET A-601. **PLEASE NOTE: ONLY TAGGED DOORS ARE BEING REPLACED.**
2. FOR WINDOWS REPLACEMENT DETAILS REFERENCE SHEETS A-600 & A-600.1. **PLEASE NOTE: ONLY TAGGED WINDOWS ARE BEING REPLACED.**
3. ALL FURNITURE ILLUSTRATED ARE FOR REFERENCE ONLY. FURNITURE PROVIDED BY OWNER.
4. FOR NEW PLUMBING FIXTURES, SINKS & TOILETS REFERENCE PLUMBING DRAWINGS.
5. CONTRACTOR TO INSULATE ALL EXPOSED PIPES
6. CONTRACTOR TO PROVIDE BLOCKING WHERE NECESSARY.
7. CONTRACTOR TO PROTECT ALL EXISTING MILLWORK DURING CONSTURCTION
8. REFERENCE ROOM FINISH SCHEDULE FOR INTERIOR FINISH WORK, SHEETS A-120 THRU A-126
9. REFERENCE SHEET A-120 THRU A-126 FOR APARTMENT LAYOUTS.
10. INFILL PLASTER PARTITIONS WHERE REQUIRED TO PROVIDE 1 HOUR RATING.
11. CONTRACTOR SHALL COORDINATE THIS WORK WITH THAT REQUIRED FOR ASBESTOS AND LEAD BASED PAINT ABATEMENT.
12. CONTRACTOR SHALL PROVIDE 1" OPERABLE BLINDS AT ALL WINDOW OPENINGS EXCEPT WINDOW TYPES "P" AND "N".
13. CONTRACTOR SHALL FILL WITH INSULATION ALL EXTERIOR WALL OR FLOOR CAVITIES EXPOSED DURING CONSTRUCTION.
14. FOR LEAD-BASED PAINT REMOVAL REF. LEAD-BASED PAINT REMOVAL AND DISPOSAL SPECIFICATION OF MAY 18, 2018 BY TERRACON.
15. FOR ASBESTOS REPORT REF. LIMITED ASBESTOS SURVEY REPORT OF APRIL 17, 2018 BY TERRACON.

KEYED NOTES

1. NEW METAL GUARDRAIL
2. NEW METAL HANDRAIL
3. NEW COUNTERTOP, REF. SPECIFICATIONS
4. EXISTING GUARDRAIL/HANDRAIL TO REMAIN COORDINATE WTIHE LEAD BASE PAINT ABATEMENT
5. NEW ELECTRICAL ROOM, REPEATS ON EVERY FLOOR 2 THRU 9. REFERENCE DOOR SCHEDULE FOR NEW DOUBLE DOORS.
6. NEW DOUBLE- DOOR AT ELECTRICAL ROOM. REFERENCE, 3/A103 DOOR ELEVATION.
7. NEW INTERIOR PARTITION, REF. 1/A700
8. TRASH CHUTE ON THE WALL TO BE REMOVED AND WALL CLOSED.
9. 2 INCH HOLE WITH 1 1/2 INCH DIAMETER PIECE OF CONDUIT
10. STAIR PRESSURIZATION, REFERENCE MEP DRAWINGS FOR DETAILS
11. NEW ENCLOSURE: 6X6 CHANNEL WITH PERFORATED PANELS ENCLOSURE FOR EXTERIOR MECHANICAL SYSTEM
12. NEW PLASTER PARTITION CHASE. REFERENCE 3/A700
13. NEW 34" EXTERIOR DOOR PANEL. **EXISTING 1-3/8" DOOR FRAME TO REMAIN.** REFERENCE DOOR SCHEDULE ON SHEET A-601. PANEL REPLACEMENT APPLIES TO ALL NON-ACCESSIBLE UNITS ON ALL LEVELS.
14. NEW 36" EXTERIOR DOOR AND 1-3/4" DOOR FRAME. **THE REPLACEMENT APPLIES TO ACCESSIBLE UNITS #141, 213, 316, 403, 504, 507, AND 518 ONLY.** REFERENCE DOOR SCHEDULE ON SHEET A-601.
15. NEW FAN COIL UNIT. REFERENCE MEP.
16. 3" FALSE BACK PANEL INSTALLED WITH 3" CLEARANCE FOR ELECTRICAL. REF. MEP.
17. NEW FURR-OUT TO SEAL FAN COIL PIPES. REFERENCE TYPICAL DETAIL 4/A700.
18. 24" REMOVABLE ACCESS PANEL. REFERENCE TYPICAL DETAIL 5/A700.
19. WIDTH FOR FURR-OUT CONTRACTOR TO COORDINATE IN RELATIONSHIP WITH INSOLATION PIPES
20. ALL EXISTING CLOSETS ON LEVELS 2-9 TO REMAIN AND BE PROTECTED WITH MYLAR DURING CONSTRUCTION AND STORED AT SAFE PLACE.
21. ALL EXISTING KITCHEN EQUIPMENT ON LEVELS 2-9 TO REMAIN AND BE PROTECTED WITH MYLAR DURING CONSTRUCTION AND STORED AT SAFE PLACE.

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VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

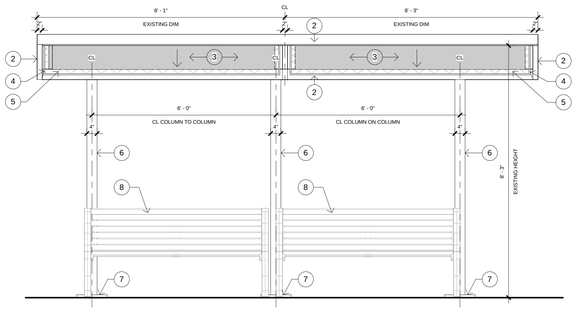
REGISTERED ARCHITECT GABRIEL DURAND-HOLLIS 20881 STATE OF TEXAS
05/25/18

PERMIT SET

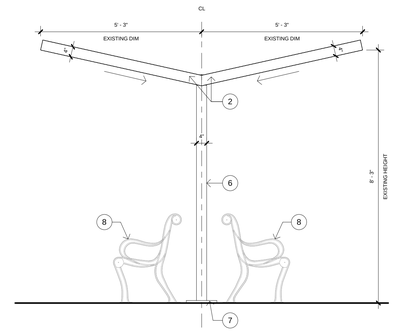
PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

FLOOR PLAN LEVEL 2 TO 9

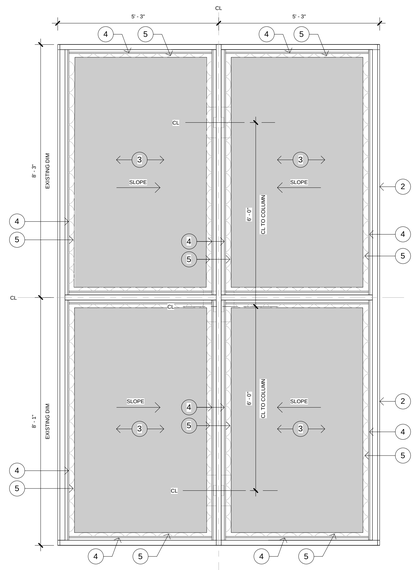
SHEET NUMBER
A-103



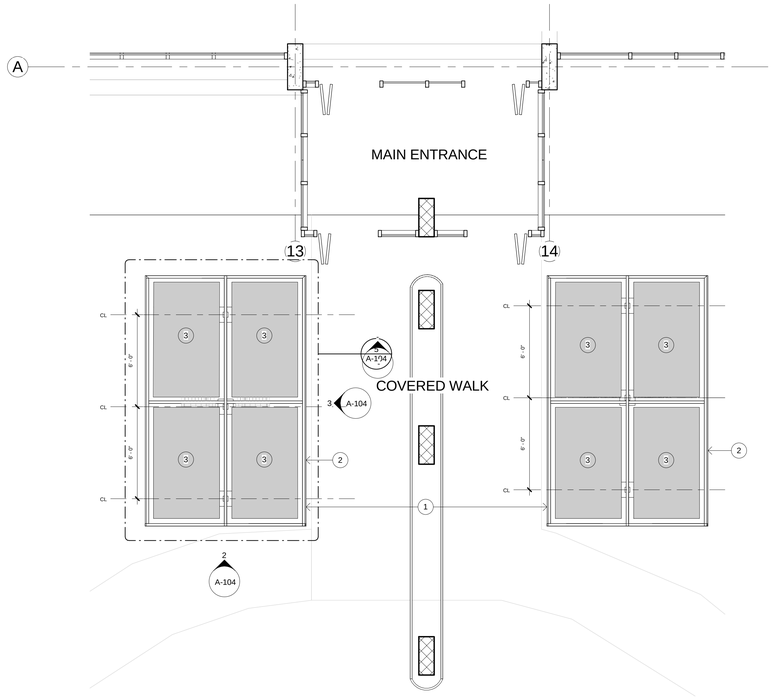
3 Side Canopy Elevation
1/2" = 1'-0"



2 Front Canopy Elevation
1/2" = 1'-0"

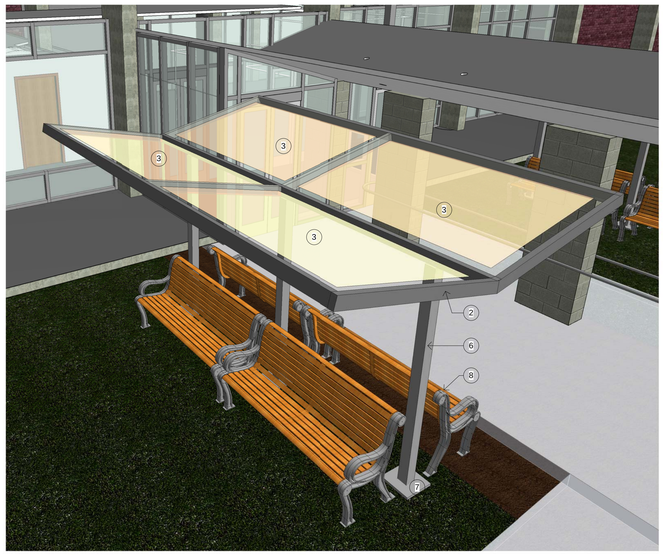


5 Enlarged Canopy - Plan View
1/2" = 1'-0"



1 Plan View - Front Canopies
1/4" = 1'-0"

Existing canopy condition



4 Isometric View of Canopy

KEYED NOTES

1. CANOPIES ON BOTH SIDES OF MAIN ENTRANCE.
2. EXISTING 2X4 STEEL FRAME CONTINUOUS TO REMAIN. NEW PAINT AS SCHEDULED.
3. NEW FABRIC SHADE AS SCHEDULED FOR BOTH CANOPIES. FIELD VERIFY SHADE SIZE.
4. EXISTING 1/2" STEEL ROD FOR SHADE CONNECTION TO REMAIN, NEW PAINT AS SCHEDULED.
5. NEW CABLES AS SCHEDULED FOR NEW SHADE CONNECTION TO EXISTING STRUCTURE.
6. EXISTING 4X4 STEEL TUBE COLUMN TO REMAIN, PAINTED AS SCHEDULED.
7. EXSITING STEEL PLATE CONNECTING STEEL COLUMN TO GROUND, PAINTED AS SCHEDULED.
8. EXISTING FLOOR MOUNTED BENCHES TO REMAIN.

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SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION

LOCATION: 411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT
GABRIEL DURAND-HOLLIS
JD881-1
STATE OF TEXAS

05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

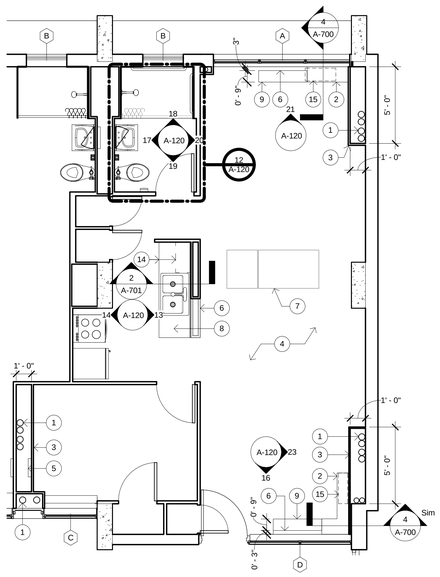
ENLARGED PLAN - FRONT CANOPIES

SHEET NUMBER
A-104

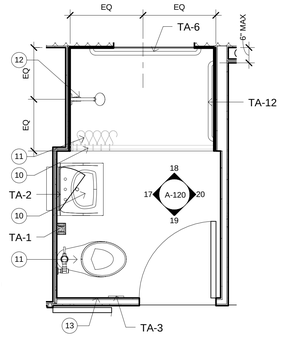
5/25/2018 1:24:12 PM C:\Users\gabriel.durand\Desktop\SAHA - Victoria Plaza - PERMIT SET_05-04-18\Revit\my1.rvt

UNIT TYPE B

(UNIT TOTAL AREA: 555 SF)



11 Type B - Bedroom Floor Plan
1/4" = 1'-0"



12 Type B - Enlarged Bath
1/2" = 1'-0"

PLAN NORTH

13 Elevation - Unit Type B - Kitchen #1
3/8" = 1'-0"

14 Elevation - Unit Type B - Kitchen #2
3/8" = 1'-0"

21 Elevation - Unit Type B - Bedroom North
3/8" = 1'-0"

16 Elevation - Unit Type B - Bedroom South
3/8" = 1'-0"

17 Elevation - Unit Type B - Bathroom #1
3/8" = 1'-0"

18 Elevation - Unit Type B - Bathroom #3
3/8" = 1'-0"

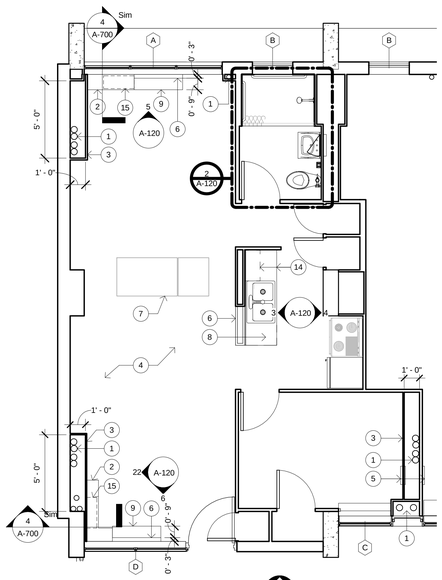
19 Elevation - Unit Type B - Bathroom #2
3/8" = 1'-0"

20 Elevation - Unit Type B - Bathroom #4
3/8" = 1'-0"

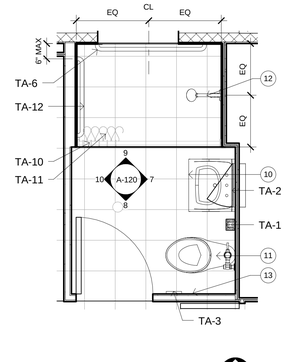
23 Elevation - Unit Type B - Bedroom East
3/8" = 1'-0"

UNIT TYPE A

(UNIT TOTAL AREA: 527 SF)



1 Type A - Bedroom Floor Plan
1/4" = 1'-0"



2 Type A - Enlarged Bath
1/2" = 1'-0"

PLAN NORTH

3 Elevation - Unit Type A - Kitchen #2
3/8" = 1'-0"

4 Elevation - Unit Type A - Kitchen #1
3/8" = 1'-0"

5 Elevation - Unit Type A - Bedroom North
3/8" = 1'-0"

6 Elevation - Unit Type A - Bedroom South
3/8" = 1'-0"

7 Elevation - Unit Type A - Bath #1
3/8" = 1'-0"

8 Elevation - Unit Type A - Bath #2
3/8" = 1'-0"

9 Elevation - Unit Type A - Bath #3
3/8" = 1'-0"

10 Elevation - Unit Type A - Bath #4
3/8" = 1'-0"

22 Elevation - Unit Type A - Bedroom West
3/8" = 1'-0"

WALL LEGEND	
	EXISTING WALL
	NEW WALL
	NEW, INSULATED WALL

ENLARGED PLAN GENERAL NOTES

1. REFERENCE PLUMBING SHEETS FOR ALL PLUMBING FIXTURES SPECIFICATIONS.
2. CONTRACTOR TO PROVIDE BLOCKING IN THE WALL AS NECESSARY.
3. REFERENCE A020 AND A021 FOR ACCESSIBLE INSTALLATION HEIGHTS.

KEYED NOTES

1. NEW HYDRONIC LINES. REFERENCE MEP DRAWINGS FOR DETAILS & SPECIFICATIONS.
2. NEW FURR-OUT TO SEAL FAN COIL PIPES. REFERENCE DETAIL 4/A700.
3. NEW CHASE FLOOR TO CEILING, REF. 3/A700 SIMILAR.
4. NEW FLOOR, VCT-1 - REFERENCE ROOM SCHEDULE FOR SPECIFICATIONS
5. NEW ELECTRICAL PANEL. REFERENCE MEP DRAWINGS FOR DETAILS & SPECIFICATIONS
6. 3" FALSE BACK PANEL INSTALLED WITH 3" CLEARANCE FOR ELECTRICAL. REF. MEP.
7. EXISTING FREE STANDING CLOSET TO REMAIN. PROTECT DURING NEW FLOOR INSTALLATION
8. EXISTING COUNTERTOP TO REMAIN. FOR SINK REFERENCE MEP.
9. NEW FAN COIL UNIT. REFERENCE MEP. (CENTER BETWEEN WINDOW MULLIONS).
10. NEW WALL HUNG LAVATORY . REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
11. NEW TOILET WITH GPF FLUSHOMETER REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
12. NEW SHOWER HEAD AND CONTROL. REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
13. EXISTING GRAB BAR & NURSE CALL BUTTON TO REMAIN
14. EXISTING MILLWORK TO REMAIN.
15. 24" REMOVABLE ACCESS PANEL. REFERENCE DETAIL 5/A700.
16. NEW WALL PAINT AS SCHEDULED.
17. NEW 12X12 WALL TILE
18. EXISTING EQUIPMENT TO REMAIN, AND PROTECTED WITH MYLAR DURING CONSTRUCTION.

ROOM FINISH SCHEDULE

UNIT TYPE	NAME	FLOOR	WALLS BASE	WALLS ALL	N	S	E	W	Countertop	Millwork	CEILING FIN	CEILING HGT	NOTES
TYPE A	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE A	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE A	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE B	BEDROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE B	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE B	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE C	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE C	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE D	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE D	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE E	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE E	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE F	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE F	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE G	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE G	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE H	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE H	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE I	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE I	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE J	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE J	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	

TOILET ACCESSORY LEGEND

BOBRICK FIXTURES LISTED AS BASIS OF DESIGN

TA-1	WALL MOUNTED SOAP DISH - BOBRICK B-680
TA-2	RECESSED MEDICINE CABINET B398
TA-3	TOILET PAPER DISPENSER - BOBRICK B-543
TA-4	TOWEL BAR - BOBRICK B-674x24"
TA-5	36" STAINLESS STEEL GRAB BAR MOUNTED 33"-36" A.F.F B-6806X36"
TA-6	42" STAINLESS STEEL GRAB BAR MOUNTED 33" 36" A.F.F B-6806X42"
TA-7	COAT HOOK MOUNTED 48" A.F.F. (SEE PLAN FOR LOCATION) B-670
TA-8	SOLID PHENOLIC FOLD-DOWN SHOWER SEAT - BOBRICK B-5191
TA-9	24" L-SHAPED STAINLESS STEEL GRAB BARS @ SHOWER MOUNTED 33"-36" A.F.F
TA-10	SHOWER CURTAIN ROD - BOBRICK B207
TA-11	VINYL SHOWER CURTAIN - 204-2
TA-12	30" STAINLESS STEEL GRAB BAR MOUNTED 33"-36" A.F.F B-5806X30"

UNIT TYPE B		UNIT TYPE A	
ALL UNITS WITH LAYOUT B		ALL UNITS WITH LAYOUT B	
LEVEL	NUMBER	LEVEL	NUMBER
LEVEL 2	215	LEVEL 2	-
LEVEL 3	-	LEVEL 3	301
LEVEL 4	415	LEVEL 4	401
LEVEL 5	515	LEVEL 5	501
LEVEL 6	615	LEVEL 6	601
LEVEL 7	715	LEVEL 7	701
LEVEL 8	815	LEVEL 8	801
LEVEL 9	915	LEVEL 9	901

DURAND–HOLLIS RUPE ARCHITECTS, INC.
14603 HUEBNER ROAD
BUILDING 18
SAN ANTONIO, TEXAS 78230
TEL. 210 308–0080
FAX. 210 697–3309
eMAIL OFFICE@DHRARCHITECTS.COM

OWNER:

SAN ANTONIO HOUSING AUTHORITY
818 SOUTH FLORES STREET
SAN ANTONIO, TX 78204
T: 210.477.6262

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT — JOSEPH E. DURAND-HOLLIS — 10881 — STATE OF TEXAS

05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10-881

ENLARGED UNIT FLOOR PLANS TYPE A & B

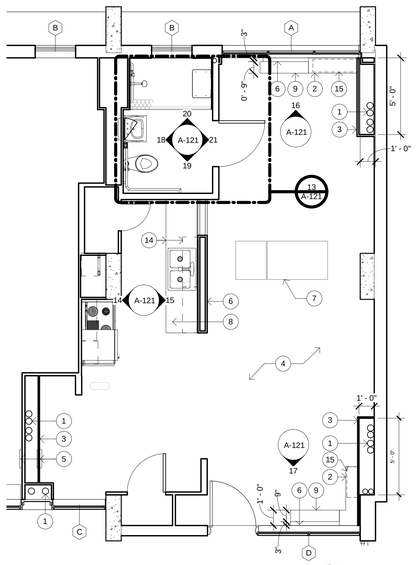
SHEET NUMBER

A-120

5/24/2018 12:25:47 PM C:\Users\g.perez\Documents\SAHA - Victoria Plaza - PERMIT SET_05-04-18_R2central_v.rvt

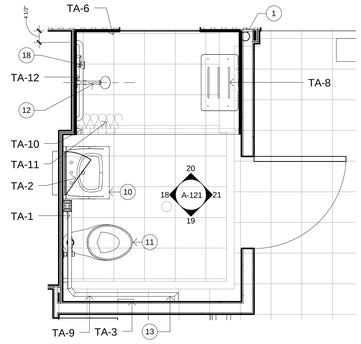
UNIT TYPE D

(UNIT TOTAL AREA: 555 SF)



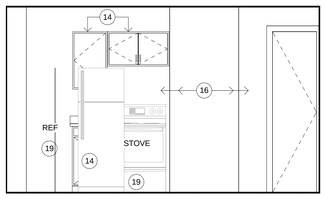
11 Type D - Bedroom ADA Floor Plan
1/4" = 1'-0"

PLAN NORTH

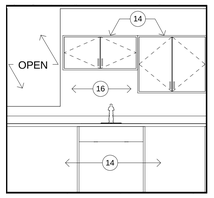


13 Type D - Enlarged Bath
1/2" = 1'-0"

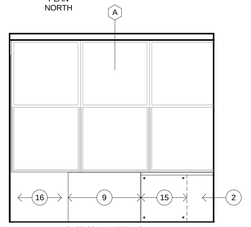
PLAN NORTH



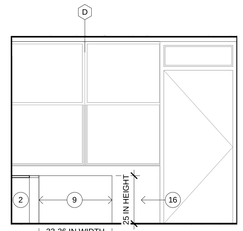
14 Elevation - Unit Type D - Kitchen #1
3/8" = 1'-0"



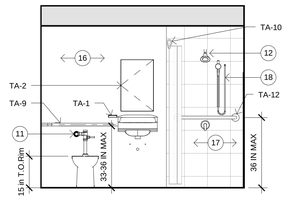
15 Elevation - Unit Type D - Kitchen #2
3/8" = 1'-0"



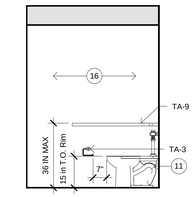
16 Elevation - Unit Type D - Bedroom North
3/8" = 1'-0"



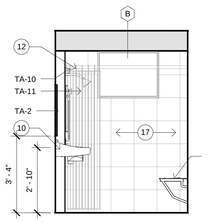
17 Elevation - Unit Type D - Bedroom South
3/8" = 1'-0"



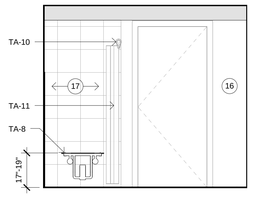
18 Elevation - Unit Type D - Bathroom #1
3/8" = 1'-0"



19 Elevation - Unit Type D - Bathroom #2
3/8" = 1'-0"



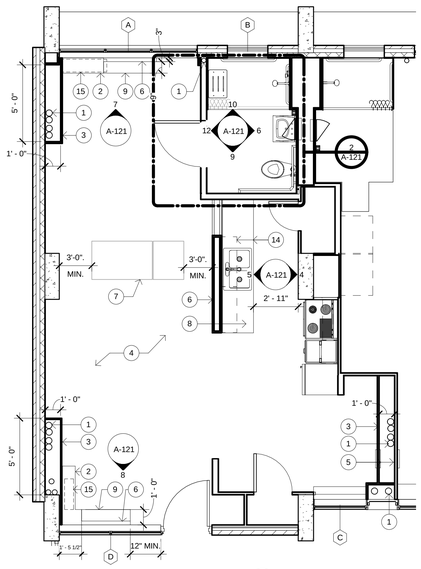
20 Elevation - Unit Type D - Bathroom #3
3/8" = 1'-0"



21 Elevation - Unit Type D - Bathroom #4
3/8" = 1'-0"

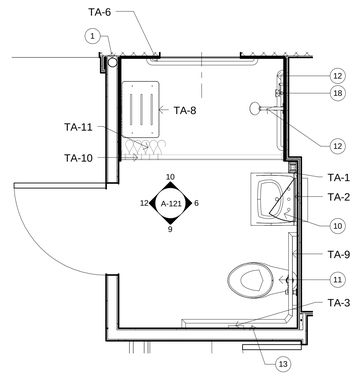
UNIT TYPE C

(UNIT TOTAL AREA: 527 SF)



1 Type C - Bedroom ADA Floor Plan
1/4" = 1'-0"

PLAN NORTH



2 Type C - Enlarged Bath
1/2" = 1'-0"

PLAN NORTH

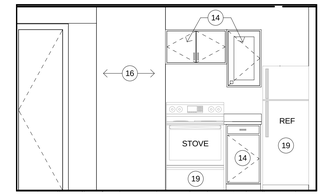
WALL LEGEND	
	EXISTING WALL
	NEW WALL
	NEW, INSULATED WALL

ENLARGED PLAN GENERAL NOTES

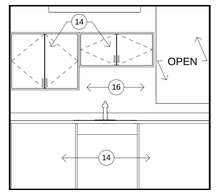
1. REFERENCE PLUMBING SHEETS FOR ALL PLUMBING FIXTURES SPECIFICATIONS.
2. CONTRACTOR TO PROVIDE BLOCKING IN THE WALL AS NECESSARY.
3. REFERENCE A020 AND A021 FOR ACCESSIBLE INSTALLATION HEIGHTS.

KEYED NOTES

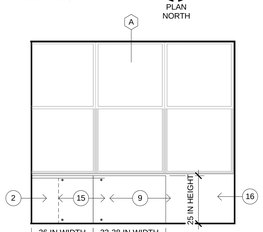
1. NEW HYDRONIC LINES. REFERENCE MEP DRAWINGS FOR DETAILS & SPECIFICATIONS.
2. NEW FURR-OUT TO SEAL FAN COIL PIPES. REFERENCE DETAIL 4/A700.
3. NEW CHASE FLOOR TO CEILING. REF. 3/A700 SIMILAR.
4. NEW FLOOR. VCT-1 - REFERENCE ROOM SCHEDULE FOR SPECIFICATIONS
5. NEW ELECTRICAL PANEL. REFERENCE MEP DRAWINGS FOR DETAILS & SPECIFICATIONS
6. 3" FALSE BACK PANEL INSTALLED WITH 3" CLEARANCE FOR ELECTRICAL. REF. MEP.
7. EXISTING FREE STANDING CLOSET TO REMAIN. PROTECT DURING NEW FLOOR INSTALLATION
8. EXISTING COUNTERTOP TO REMAIN. FOR SINK REFERENCE MEP.
9. NEW FAN COIL UNIT. REFERENCE MEP.
10. NEW WALL HUNG LAVATORY REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
11. NEW TOILET WITH 1.28 GPF FLUSHOMETER REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
12. NEW SHOWER HEAD AND CONTROL, REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
13. EXISTING GRAB BAR & NURSE CALL BUTTON TO REMAIN.
14. EXISTING MILLWORK TO REMAIN.
15. 24" REMOVABLE ACCESS PANEL, REF DETAIL 5/A700.
16. NEW WALL PAINT AS SCHEDULED
17. NEW 12X12 WALL TILE
18. NEW HAND SHOWER BY AMERICAN STANDARD 1662.600 FOR ADA SHOWER
19. EXISTING EQUIPMENT TO REMAIN, AND PROTECTED WITH MYLAR DURING CONSTRUCTION.



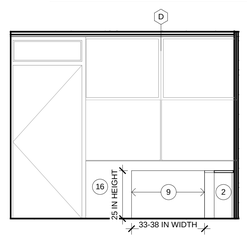
4 Elevation - Unit Type C - Kitchen #1
3/8" = 1'-0"



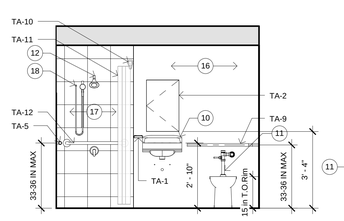
5 Elevation - Unit Type C - Kitchen #2
3/8" = 1'-0"



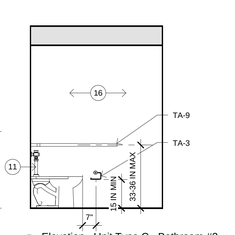
7 Elevation - Unit Type C - Bedroom North
3/8" = 1'-0"



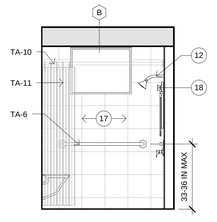
8 Elevation 8 - Unit Type C - Bedroom South
3/8" = 1'-0"



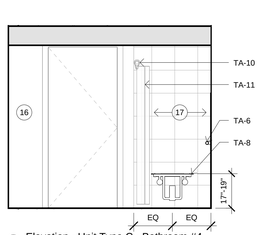
6 Elevation - Unit Type C - Bathroom #1
3/8" = 1'-0"



9 Elevation - Unit Type C - Bathroom #2
3/8" = 1'-0"



10 Elevation - Unit Type C - Bathroom #3
3/8" = 1'-0"



12 Elevation - Unit Type C - Bathroom #4
3/8" = 1'-0"

ROOM FINISH SCHEDULE

UNIT TYPE	NAME	FLOOR	WALLS BASE	WALLS ALL	N	S	E	W	Countertop	Millwork	CEILING FIN	CEILING HGT	NOTES
TYPE A	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE A	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE A	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE B	BEDROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE B	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE B	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE C	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE C	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE D	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE D	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE E	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE E	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE F	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE F	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE G	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE G	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE H	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE H	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE I	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE I	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE J	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE J	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	

TOILET ACCESSORY LEGEND

BOBRICK FIXTURES LISTED AS BASIS OF DESIGN

TA-1	WALL MOUNTED SOAP DISH - BOBRICK B-680
TA-2	RECESSED MEDICINE CABINET B398
TA-3	TOILET PAPER DISPENSER - BOBRICK B-543
TA-4	TOWEL BAR - BOBRICK B-674x24"
TA-5	36" STAINLESS STEEL GRAB BAR MOUNTED 33"-36" A.F.F B-6806X36"
TA-6	42" STAINLESS STEEL GRAB BAR MOUNTED 33" 36" A.F.F B-6806X42"
TA-7	COAT HOOK MOUNTED 48" A.F.F. (SEE PLAN FOR LOCATION) B-670
TA-8	SOLID PHENOLIC FOLD-DOWN SHOWER SEAT - BOBRICK B-5191
TA-9	24" L-SHAPED STAINLESS STEEL GRAB BARS @ SHOWER MOUNTED 33"-36" A.F.F
TA-10	SHOWER CURTAIN ROD - BOBRICK B207
TA-11	VINYL SHOWER CURTAIN - 204-2
TA-12	30" STAINLESS STEEL GRAB BAR MOUNTED 33"-36" A.F.F B-5806X30"

UNIT TYPE D		UNIT TYPE C	
ALL UNITS WITH LAYOUT D		ALL UNITS WITH LAYOUT C	
LEVEL	NUMBER	LEVEL	NUMBER
LEVEL 2		LEVEL 2	201
LEVEL 3	315	LEVEL 3	
LEVEL 4		LEVEL 4	
LEVEL 5		LEVEL 5	
LEVEL 6		LEVEL 6	
LEVEL 7		LEVEL 7	
LEVEL 8		LEVEL 8	
LEVEL 9		LEVEL 9	

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OWNER:

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818 SOUTH FLORES STREET
SAN ANTONIO, TX 78204
T: 210.477.6262

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT GABRIEL DURAND-HOLLIS JD881-1 STATE OF TEXAS
05/25/18

PERMIT SET

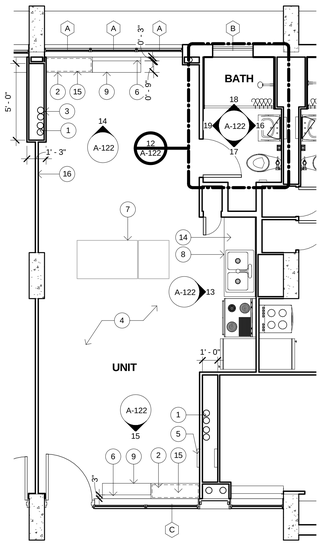
PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

ENLARGED ADA UNIT FLOOR PLANS TYPE C & D

SHEET NUMBER
A-121

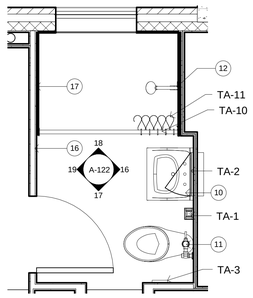
UNIT TYPE F

(UNIT TOTAL AREA: 379 SF)



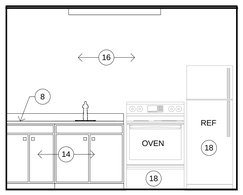
11 Type F - Floor Plan
1/4" = 1'-0"

PLAN NORTH

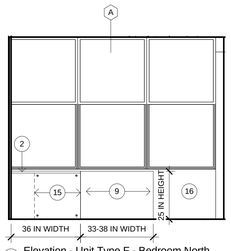


12 Type F - Enlarged Bath
1/2" = 1'-0"

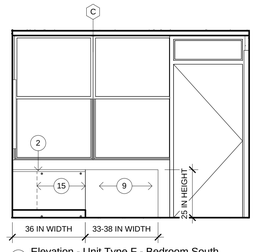
PLAN NORTH



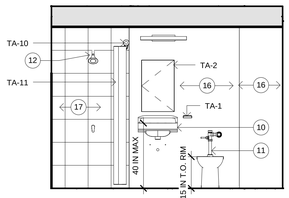
13 Elevation - Unit Type F - Kitchen
3/8" = 1'-0"



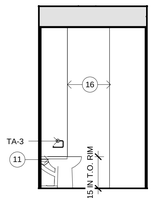
14 Elevation - Unit Type F - Bedroom North
3/8" = 1'-0"



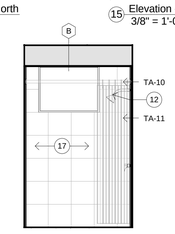
15 Elevation - Unit Type F - Bedroom South
3/8" = 1'-0"



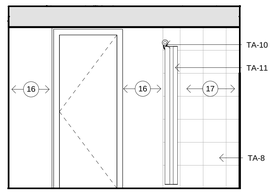
16 Elevation - Unit Type F - Bathroom #1
3/8" = 1'-0"



17 Elevation - Unit Type F - Bathroom #2
3/8" = 1'-0"



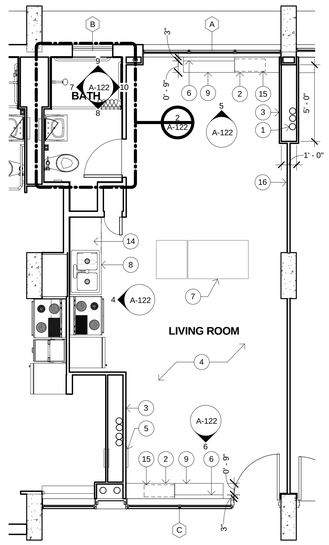
18 Elevation - Unit Type F - Bathroom #3
3/8" = 1'-0"



19 Elevation - Unit Type F - Bathroom #4
3/8" = 1'-0"

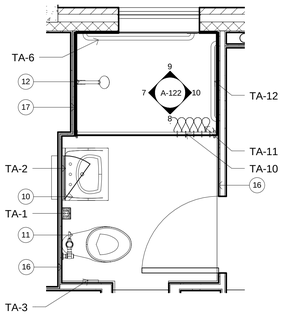
UNIT TYPE E

(UNIT TOTAL AREA: 379 SF)



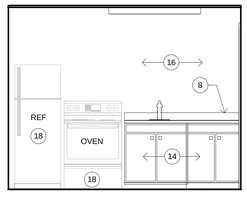
1 Type E - Floor Plan
1/4" = 1'-0"

PLAN NORTH

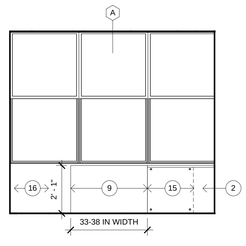


2 Type E - Enlarged Bath
1/2" = 1'-0"

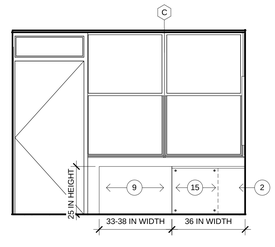
PLAN NORTH



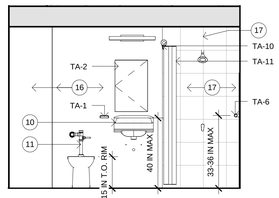
4 Elevation - Unit Type E - Kitchen
3/8" = 1'-0"



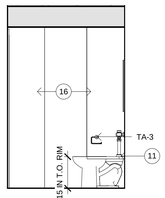
5 Elevation - Unit Type E - Bedroom North
3/8" = 1'-0"



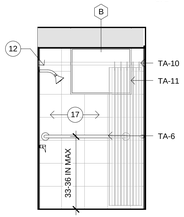
6 Elevation - Unit Type E - Bedroom South
3/8" = 1'-0"



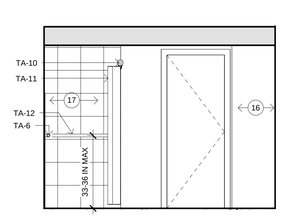
7 Elevation - Unit Type E - Bathroom #1
3/8" = 1'-0"



8 Elevation - Unit Type E - Bathroom #2
3/8" = 1'-0"



9 Elevation - Unit Type E - Bathroom #3
3/8" = 1'-0"



10 Elevation - Unit Type E - Bathroom #4
3/8" = 1'-0"

WALL LEGEND

- EXISTING WALL
- NEW WALL
- NEW, INSULATED WALL

ENLARGED PLAN GENERAL NOTES

1. REFERENCE PLUMBING SHEETS FOR ALL PLUMBING FIXTURES SPECIFICATIONS.
2. CONTRACTOR TO PROVIDE BLOCKING IN THE WALL AS NECESSARY.
3. REFERENCE A020 AND A021 FOR ACCESSIBLE INSTALLATION HEIGHTS.

KEYED NOTES

1. NEW HYDRONIC LINES. REFERENCE MEP DRAWINGS FOR DETAILS & SPECIFICATIONS.
2. NEW FURR-OUT TO SEAL FAN COIL PIPES. REFERENCE DETAIL 4/A700.
3. NEW CHASE FLOOR TO CEILING. REF. 3/A700.
4. NEW FLOOR, VCT-1 - REFERENCE ROOM SCHEDULE FOR SPECIFICATIONS
5. NEW ELECTRICAL PANEL. REFERENCE MEP DRAWINGS FOR DETAILS & SPECIFICATIONS
6. 3" FALSE BACK PANEL INSTALLED WITH 3" CLEARANCE FOR ELECTRICAL. REF. MEP.
7. EXISTING FREE STANDING CLOSET TO REMAIN. PROTECT DURING NEW FLOOR INSTALLATION
8. EXISTING COUNTERTOP. FOR SINK REFERENCE MEP.
9. NEW FAN COIL UNIT. REFERENCE MEP.
10. NEW WALL HUNG LAVATORY REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
11. NEW TOILET WITH 1.28 GPF FLUSHOMETER REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
12. NEW SHOWER HEAD AND CONTROL, REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
13. EXISTING GRAB BAR & NURSE CALL BUTTON TO REMAIN.
14. EXISTING MILLWORK TO REMAIN. REFERENCE DETAIL 6/A700 FOR MILLWORK DETAIL INSTALLATIONS AS NEEDED.
15. 24" REMOVABLE ACCESS PANEL, REFERENCE DETAIL 5/A700.
16. NEW WALL PAINT AS SCHEDULED
17. NEW 12X12 WALL TILE
18. EXISTING EQUIPMENT TO REMAIN, AND PROTECTED WITH MYLAR DURING CONSTRUCTION.

ROOM FINISH SCHEDULE

UNIT TYPE	NAME	FLOOR	WALLS BASE	WALLS ALL	WALLS N	WALLS S	WALLS E	WALLS W	Countertop	Millwork	CEILING FIN	CEILING HGT	NOTES
TYPE A	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE A	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE A	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE B	BEDROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE B	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE B	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE C	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE C	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE D	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE D	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE E	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE E	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE F	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE F	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE G	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE G	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE H	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE H	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE I	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE I	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE J	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE J	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	

TOILET ACCESSORY LEGEND

BOBRICK FIXTURES LISTED AS BASIS OF DESIGN

TA-1	WALL MOUNTED SOAP DISH - BOBRICK B-680
TA-2	RECESSED MEDICINE CABINET B398
TA-3	TOILET PAPER DISPENSER - BOBRICK B-543
TA-4	TOWEL BAR - BOBRICK B-674x24"
TA-5	36" STAINLESS STEEL GRAB BAR MOUNTED 33"-36" A.F.F B-6806X36"
TA-6	42" STAINLESS STEEL GRAB BAR MOUNTED 33" 36" A.F.F B-6806X42"
TA-7	COAT HOOK MOUNTED 48" A.F.F. (SEE PLAN FOR LOCATION) B-670
TA-8	SOLID PHENOLIC FOLD-DOWN SHOWER SEAT - BOBRICK B-5191
TA-9	24" L-SHAPED STAINLESS STEEL GRAB BARS @ SHOWER MOUNTED 33"-36" A.F.F
TA-10	SHOWER CURTAIN ROD - BOBRICK B207
TA-11	VINYL SHOWER CURTAIN - 204-2
TA-12	30" STAINLESS STEEL GRAB BAR MOUNTED 33"-36" A.F.F B-5806X30"

UNIT TYPE F		UNIT TYPE E	
ALL UNITS WITH LAYOUT F		ALL UNITS WITH LAYOUT E	
LEVEL	NUMBER	LEVEL	NUMBER
LEVEL 2	214	LEVEL 2	202
LEVEL 3	314	LEVEL 3	302
LEVEL 4	414	LEVEL 4	402
LEVEL 5	514	LEVEL 5	502
LEVEL 6	614	LEVEL 6	602
LEVEL 7	714	LEVEL 7	702
LEVEL 8	814	LEVEL 8	802
LEVEL 9	914	LEVEL 9	902

DURAND–HOLLIS RUPE ARCHITECTS, INC.
14603 HUEBNER ROAD
BUILDING 18
SAN ANTONIO, TEXAS 78230
TEL. 210 308–0080
FAX. 210 697–3309
eMAIL OFFICE@DHRARCHITECTS.COM

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SAN ANTONIO, TX 78204
T: 210.477.6262

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION

LOCATION: 411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT GABRIEL DURAND-HOLLIS 10881-1 STATE OF TEXAS

05/25/18

PERMIT SET

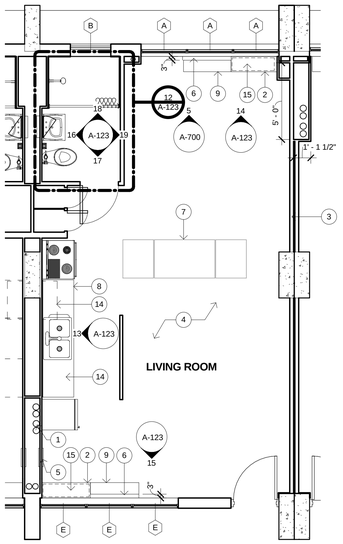
PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

ENLARGED UNIT FLOOR PLANS TYPE E & F

SHEET NUMBER
A-122

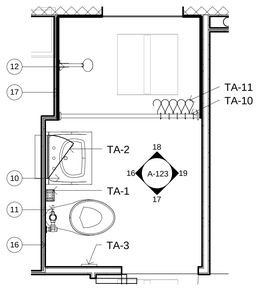
UNIT TYPE H

(UNIT TOTAL AREA: 447 SF)



11 Type H - Floor Plan
1/4" = 1'-0"

PLAN NORTH



12 Type H - Enlarged Bath
1/2" = 1'-0"

PLAN NORTH

13 Elevation - Unit Type H - Kitchen
3/8" = 1'-0"

14 Elevation - Unit Type H - Bedroom North
3/8" = 1'-0"

15 Elevation - Unit Type H - Bedroom South
3/8" = 1'-0"

16 Elevation - Unit Type H - Bathroom #1
3/8" = 1'-0"

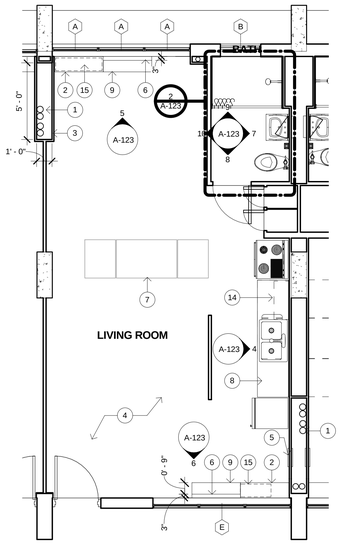
17 Elevation - Unit Type H - Bathroom #2
3/8" = 1'-0"

18 Elevation - Unit Type H - Bathroom #3
3/8" = 1'-0"

19 Elevation - Unit Type H - Bathroom #4
3/8" = 1'-0"

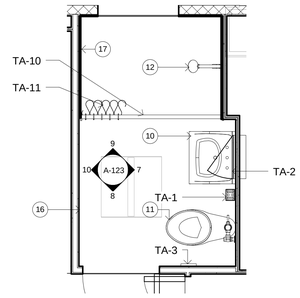
UNIT TYPE G

(UNIT TOTAL AREA: 447 SF)



1 Type G - Floor Plan
1/4" = 1'-0"

PLAN NORTH



2 Type G - Enlarged Bath
1/2" = 1'-0"

PLAN NORTH

4 Elevation - Unit Type G - Kitchen
3/8" = 1'-0"

5 Elevation - Unit Type G - Bedroom North
3/8" = 1'-0"

6 Elevation - Unit Type G - Bedroom South
3/8" = 1'-0"

7 Elevation - Unit Type G - Bathroom #1
3/8" = 1'-0"

8 Elevation - Unit Type G - Bathroom #2
3/8" = 1'-0"

9 Elevation - Unit Type G - Bathroom #3
3/8" = 1'-0"

10 Elevation - Unit Type G - Bathroom #4
3/8" = 1'-0"

WALL LEGEND

	EXISTING WALL
	NEW WALL
	NEW, INSULATED WALL

ENLARGED PLAN GENERAL NOTES

1. REFERENCE PLUMBING SHEETS FOR ALL PLUMBING FIXTURES SPECIFICATIONS.
2. CONTRACTOR TO PROVIDE BLOCKING IN THE WALL AS NECESSARY.
3. REFERENCE A020 AND A021 FOR ACCESSIBLE INSTALLATION HEIGHTS.

KEYED NOTES

1. NEW HYDRONIC LINES. REFERENCE MEP DRAWINGS FOR DETAILS & SPECIFICATIONS.
2. NEW FURR-OUT TO SEAL FAN COIL PIPES. REFERENCE DETAIL 4/A700.
3. NEW CHASE FLOOR TO CEILING. REF. 3/A700
4. NEW FLOOR, VCT-1 - REFERENCE ROOM SCHEDULE FOR SPECIFICATIONS
5. NEW ELECTRICAL PANEL. REFERENCE MEP DRAWINGS FOR DETAILS & SPECIFICATIONS
6. 3" FALSE BACK PANEL INSTALLED WITH 3" CLEARANCE FOR ELECTRICAL. REF MEP.
7. EXISTING FREE STANDING CLOSET TO REMAIN. PROTECT DURING NEW FLOOR INSTALLATION
8. EXISTING COUNTERTOP TO REMAIN. FOR SINK REFERENCE MEP.
9. NEW FAN COIL UNIT. REFERENCE MEP.
10. NEW WALL HUNG LAVATORY. REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
11. NEW TOILET WITH 1.28 GPF FLUSHOMETER REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
12. NEW SHOWER HEAD AND CONTROL. REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
13. EXISTING GRAB BAR & NURSE CALL BUTTON TO REMAIN.
14. EXISTING MILLWORK TO REMAIN. REF DETAIL 6/A700 FOR MILLWORK DETAIL INSTALLATIONS AS NEEDED.
15. 24" REMOVABLE ACCESS PANEL. REFERENCE DETAIL 5/A700.
16. NEW WALL PAINT AS SCHEDULED
17. NEW 12X12 WALL TILE
18. NEW HAND SHOWER BY AMERICAN STANDARD 1662.600 FOR ADA SHOWER
19. EXISTING EQUIPMENT TO REMAIN, AND PROTECTED WITH MYLAR DURING CONSTRUCTION.

ROOM FINISH SCHEDULE

UNIT TYPE	NAME	FLOOR	WALLS BASE	WALLS ALL	N	S	E	W	Countertop	Millwork	CEILING FIN	CEILING HGT	NOTES
TYPE A	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE A	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE A	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE B	BEDROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE B	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE B	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE C	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE C	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE D	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE D	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE E	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE E	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE F	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE F	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE G	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE G	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE H	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE H	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE I	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE I	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE J	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE J	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	

TOILET ACCESSORY LEGEND

BOBRICK FIXTURES LISTED AS BASIS OF DESIGN

TA-1	WALL MOUNTED SOAP DISH - BOBRICK B-680
TA-2	RECESSED MEDICINE CABINET B398
TA-3	TOILET PAPER DISPENSER - BOBRICK B-543
TA-4	TOWEL BAR - BOBRICK B-674x24"
TA-5	36" STAINLESS STEEL GRAB BAR MOUNTED 33"-36" A.F.F B-6806X36"
TA-6	42" STAINLESS STEEL GRAB BAR MOUNTED 33" 36" A.F.F B-6806X42"
TA-7	COAT HOOK MOUNTED 48" A.F.F. (SEE PLAN FOR LOCATION) B-670
TA-8	SOLID PHENOLIC FOLD-DOWN SHOWER SEAT - BOBRICK B-5191
TA-9	24" L-SHAPED STAINLESS STEEL GRAB BARS @ SHOWER MOUNTED 33"-36" A.F.F
TA-10	SHOWER CURTAIN ROD - BOBRICK B207
TA-11	VINYL SHOWER CURTAIN - 204-2
TA-12	30" STAINLESS STEEL GRAB BAR MOUNTED 33"-36" A.F.F B-5806X30"

UNIT TYPE H		UNIT TYPE G	
ALL UNITS WITH LAYOUT H		ALL UNITS WITH LAYOUT G	
LEVEL	NUMBER	LEVEL	NUMBER
LEVEL 2	204, 206, 208, 210, 217, 219, 221, 223	LEVEL 2	203, 205, 207, 209, 212, 216, 218, 220, 222
LEVEL 3	304, 306, 308, 310, 313, 317, 319, 321, 323	LEVEL 3	303, 305, 307, 309, 312, 318, 320, 322
LEVEL 4	404, 406, 408, 410, 413, 417, 419, 421, 423	LEVEL 4	405, 407, 409, 412, 416, 418, 420, 422
LEVEL 5	506, 508, 510, 513, 517, 519, 521, 523	LEVEL 5	503, 505, 509, 512, 520, 522
LEVEL 6	604, 606, 608, 610, 613, 617, 619, 621, 623	LEVEL 6	603, 605, 607, 609, 612, 616, 618, 620, 622
LEVEL 7	704, 706, 708, 710, 713, 717, 719, 721, 723	LEVEL 7	703, 705, 707, 709, 712, 716, 718, 720, 722
LEVEL 8	804, 806, 808, 810, 813, 817, 819, 821, 823	LEVEL 8	803, 805, 807, 809, 812, 816, 818, 820, 822
LEVEL 9	904, 906, 908, 910, 913, 917, 919, 921, 923	LEVEL 9	903, 905, 907, 909, 912, 916, 918, 920, 922

DURAND–HOLLIS RUPE ARCHITECTS, INC.
14603 HUEBNER ROAD
BUILDING 18
SAN ANTONIO, TEXAS 78230
TEL. 210 308–0080
FAX. 210 697–3309
eMAIL OFFICE@DHRARCHITECTS.COM

OWNER:

SAN ANTONIO HOUSING AUTHORITY
818 SOUTH FLORES STREET
SAN ANTONIO, TX 78204
T: 210.477.6262

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION

LOCATION: 411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS

ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT — DURAND HOLLIS — 10881-1 — STATE OF TEXAS

05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

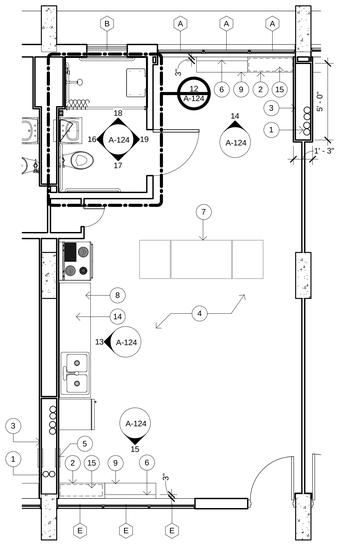
ENLARGED UNIT FLOOR PLANS TYPE G & H

SHEET NUMBER

A-123

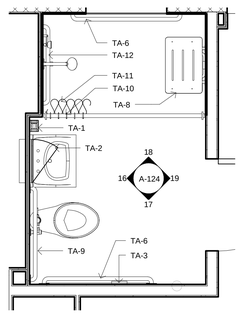
UNIT TYPE J - ACCESSIBLE

(UNIT TOTAL AREA: 447 SF)



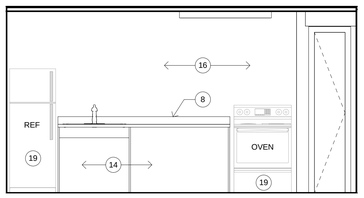
11 Type J - ADA Floor Plan
1/4" = 1'-0"

PLAN NORTH

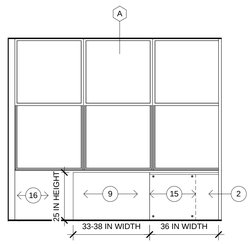


12 Type J - Enlarged Bath
1/2" = 1'-0"

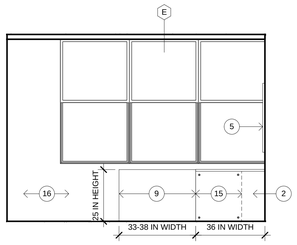
PLAN NORTH



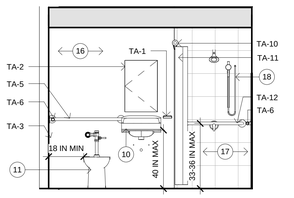
13 Elevation - Unit Type J - Kitchen
3/8" = 1'-0"



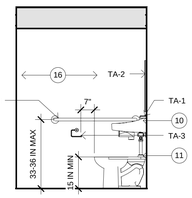
14 Elevation - Unit Type J - Bedroom North
3/8" = 1'-0"



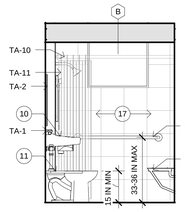
15 Elevation - Unit Type J - Bedroom South
3/8" = 1'-0"



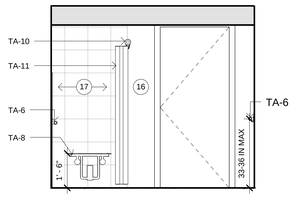
16 Elevation - Unit Type J - Bathroom #1
3/8" = 1'-0"



17 Elevation - Unit Type J - Bathroom #2
3/8" = 1'-0"



18 Elevation - Unit Type J - Bathroom #3
3/8" = 1'-0"



19 Elevation - Unit Type J - Bathroom #4
3/8" = 1'-0"

UNIT TYPE I - ACCESSIBLE

(UNIT TOTAL AREA: 447 SF)

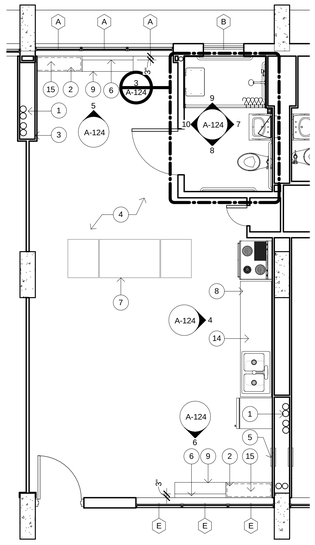
WALL LEGEND	
	EXISTING WALL
	NEW WALL
	NEW, INSULATED WALL

ENLARGED PLAN GENERAL NOTES

1. REFERENCE PLUMBING SHEETS FOR ALL PLUMBING FIXTURES SPECIFICATIONS.
2. CONTRACTOR TO PROVIDE BLOCKING IN THE WALL AS NECESSARY.
3. REFERENCE A020 AND A021 FOR ACCESSIBLE INSTALLATION HEIGHTS.

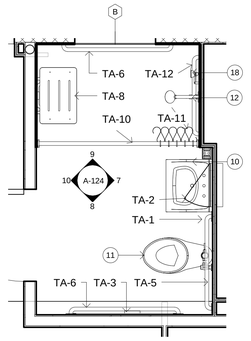
KEYED NOTES

1. NEW HYDRONIC LINES. REFERENCE MEP DRAWINGS FOR DETAILS & SPECIFICATIONS.
2. NEW FURR-OUT TO SEAL FAN COIL PIPES. REFERENCE DETAIL 4/A700.
3. NEW CHASE FLOOR TO CEILING. REF. 3/A700.
4. NEW FLOOR, VCT-1 - REFERENCE ROOM SCHEDULE FOR SPECIFICATIONS
5. NEW ELECTRICAL PANEL. REFERENCE MEP DRAWINGS FOR DETAILS & SPECIFICATIONS
6. 3" FALSE BACK PANEL INSTALLED WITH 3" CLEARANCE FOR ELECTRICAL. REF MEP
7. EXISTING FREE STANDING CLOSET TO REMAIN. PROTECT DURING NEW FLOOR INSTALLATION
8. EXISTING COUNTERTOP TO REMAIN. FOR SINK REFERENCE MEP.
9. NEW FAN COIL UNIT. REFERENCE MEP.
10. NEW WALL HUNG LAVATORY REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
11. NEW TOILET WITH 1.28 GPF FLUSHOMETER REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
12. NEW SHOWER HEAD AND CONTROL. REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
13. EXISTING GRAB BAR & NURSE CALL BUTTON TO REMAIN.
14. EXISTING MILLWORK TO REMAIN. REFERENCE DETAIL 6/A700 FOR MILLWORK DETAIL INSTALLATIONS AS NEEDED.
15. 24" REMOVABLE ACCESS PANEL, REFERENCE DETAIL 5/A700.
16. NEW WALL PAINT AS SCHEDULED
17. NEW 12X12 WALL TILE
18. NEW HAND SHOWER BY AMERICAN STANDARD 1662.600 FOR ADA SHOWER
19. EXISTING EQUIPMENT TO REMAIN, AND PROTECTED WITH MYLAR DURING CONSTRUCTION.



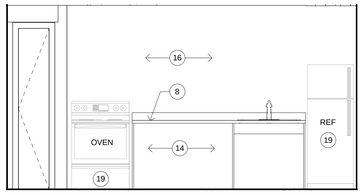
2 Type I - ADA Floor Plan
1/4" = 1'-0"

PLAN NORTH

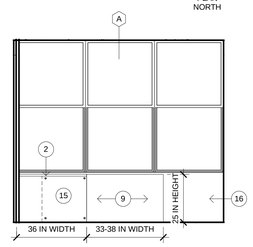


3 Type I - Enlarged Bath
1/2" = 1'-0"

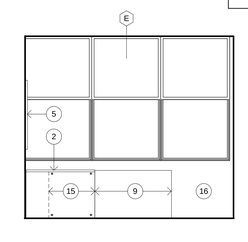
PLAN NORTH



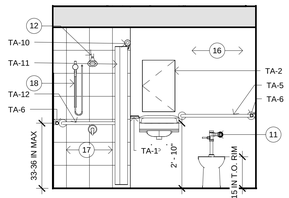
4 Elevation - Unit Type I - Kitchen
3/8" = 1'-0"



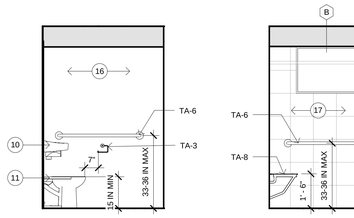
5 Elevation - Unit Type I - Bedroom North
3/8" = 1'-0"



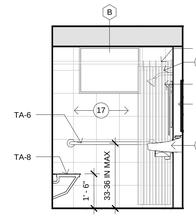
6 Elevation - Unit Type I - Bedroom South
3/8" = 1'-0"



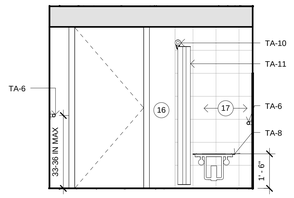
7 Elevation - Unit Type I - Bathroom #1
3/8" = 1'-0"



8 Elevation - Unit Type I - Bathroom #2
3/8" = 1'-0"



9 Elevation - Unit Type I - Bathroom #3
3/8" = 1'-0"



10 Elevation - Unit Type I - Bathroom #4
3/8" = 1'-0"

ROOM FINISH SCHEDULE

UNIT TYPE	NAME	FLOOR	WALLS BASE	WALLS ALL	N	S	E	W	Countertop	Millwork	CEILING FIN	CEILING HGT	NOTES
TYPE A	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE A	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE A	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE B	BEDROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE B	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE B	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE C	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE C	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE D	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE D	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE E	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE E	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE F	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE F	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE G	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE G	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE H	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE H	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE I	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE I	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE J	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE J	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	

TOILET ACCESSORY LEGEND

BOBRICK FIXTURES LISTED AS BASIS OF DESIGN

TA-1	WALL MOUNTED SOAP DISH - BOBRICK B-680
TA-2	RECESSED MEDICINE CABINET B398
TA-3	TOILET PAPER DISPENSER - BOBRICK B-543
TA-4	TOWEL BAR - BOBRICK B-674x24"
TA-5	36" STAINLESS STEEL GRAB BAR MOUNTED 33"-36" A.F.F B-6806X36"
TA-6	42" STAINLESS STEEL GRAB BAR MOUNTED 33" 36" A.F.F B-6806X42"
TA-7	COAT HOOK MOUNTED 48" A.F.F. (SEE PLAN FOR LOCATION) B-670
TA-8	SOLID PHENOLIC FOLD-DOWN SHOWER SEAT - BOBRICK B-5191
TA-9	24" L-SHAPED STAINLESS STEEL GRAB BARS @ SHOWER MOUNTED 33"-36" A.F.F
TA-10	SHOWER CURTAIN ROD - BOBRICK B207
TA-11	VINYL SHOWER CURTAIN - 204-2
TA-12	30" STAINLESS STEEL GRAB BAR MOUNTED 33"-36" A.F.F B-5806X30"

UNIT TYPE J		UNIT TYPE I	
ALL UNITS WITH LAYOUT J		ALL UNITS WITH LAYOUT I	
LEVEL	NUMBER	LEVEL	NUMBER
LEVEL 2	213	LEVEL 2	
LEVEL 3		LEVEL 3	316
LEVEL 4		LEVEL 4	403
LEVEL 5	504, 507	LEVEL 5	518
LEVEL 6		LEVEL 6	
LEVEL 7		LEVEL 7	
LEVEL 8		LEVEL 8	
LEVEL 9		LEVEL 9	

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Opportunity Lives Here

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SAN ANTONIO, TX 78204
T: 210.477.6262

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT GABRIEL DURAND-HOLLIS 10681-1 STATE OF TEXAS

05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

ENLARGED UNIT FLOOR PLANS TYPE I & J

SHEET NUMBER

A-124

UNIT TYPE K

(UNIT TOTAL AREA: 447 SF)

WALL LEGEND

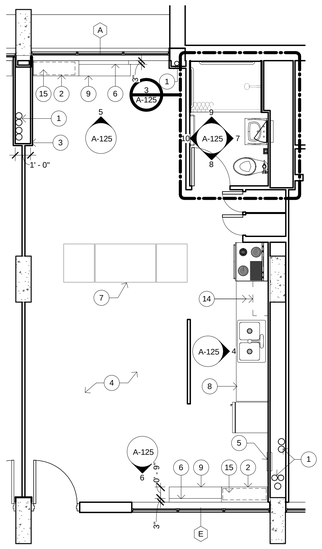
- EXISTING WALL
- NEW WALL
- NEW, INSULATED WALL

ENLARGED PLAN GENERAL NOTES

1. REFERENCE PLUMBING SHEETS FOR ALL PLUMBING FIXTURES SPECIFICATIONS.
2. CONTRACTOR TO PROVIDE BLOCKING IN THE WALL AS NECESSARY.
3. REFERENCE A020 AND A021 FOR ACCESSIBLE INSTALLATION HEIGHTS.

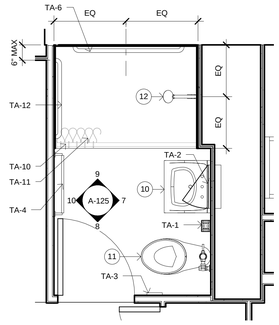
KEYED NOTES

1. NEW HYDRONIC LINES. REFERENCE MEP DRAWINGS FOR DETAILS & SPECIFICATIONS.
2. NEW FURR-OUT TO SEAL FAN COIL PIPES. REFERENCE DETAIL 4/A700.
3. NEW CHASE FLOOR TO CEILING. REF. 3/A700 SIMILAR.
4. NEW FLOOR. VCT-1 - REFERENCE ROOM SCHEDULE FOR SPECIFICATIONS
5. NEW ELECTRICAL PANEL. REFERENCE MEP DRAWINGS FOR DETAILS & SPECIFICATIONS
6. 3" FALSE BACK PANEL INSTALLED WITH 3" CLEARANCE FOR ELECTRICAL. REF MEP
7. EXISTING FREE STANDING CLOSET TO REMAIN. PROTECT DURING NEW FLOOR INSTALLATION
8. EXISTING COUNTERTOP TO REMAIN. FOR SINK REFERENCE MEP.
9. NEW FAN COIL UNIT. REFERENCE MEP.
10. NEW WALL HUNG LAVATORY REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
11. NEW TOILET WITH 1.28 GPF FLUSHOMETER REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
12. NEW SHOWER HEAD AND CONTROL, REFERENCE PLUMBING DRAWINGS FOR DETAILS & PECIFICATIONS.
13. EXISTING GRAB BAR & NURSE CALL BUTTON TO REMAIN.
14. EXISTING MILLWORK TO REMAIN. REFERENCE DETAIL 6/A700 FOR MILLWORK DETAIL INSTALLATIONS AS NEEDED.
15. 24" REMOVABLE ACCESS PANEL. REFERENCE DETAIL 5/A700.
16. NEW WALL PAINT AS SCHEDULED
17. NEW 12X12 WALL TILE
18. NEW HAND SHOWER BY AMERICAN STANDARD 1662.600 FOR ADA SHOWER
19. EXISTING EQUIPMENT TO REMAIN, AND PROTECTED WITH MYLAR DURING CONSTRUCTION.



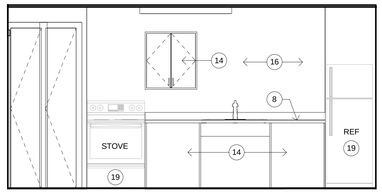
2 Type K - Floor Plan
1/4" = 1'-0"

PLAN NORTH

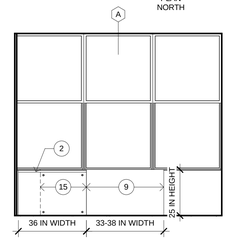


3 Type K - Enlarged Bath
1/2" = 1'-0"

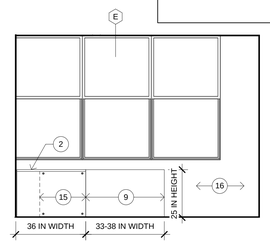
PLAN NORTH



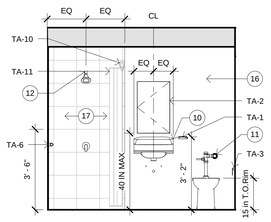
4 Elevation - Unit Type K - Kitchen
3/8" = 1'-0"



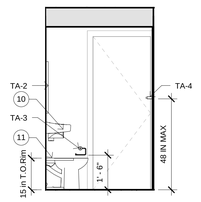
5 Elevation - Unit Type K - Bedroom North
3/8" = 1'-0"



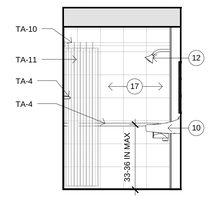
6 Elevation - Unit Type K - Bedroom South
3/8" = 1'-0"



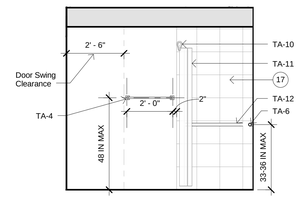
7 Elevation - Unit Type K - Bathroom #1
3/8" = 1'-0"



8 Elevation - Unit Type K - Bathroom #2
3/8" = 1'-0"



9 Elevation - Unit Type K - Bathroom #3
3/8" = 1'-0"



10 Elevation - Unit Type K - Bathroom #4
3/8" = 1'-0"

ROOM FINISH SCHEDULE

UNIT TYPE	NAME	FLOOR	WALLS BASE	WALLS ALL	N	S	E	W	Countertop	Millwork	CEILING FIN	CEILING HGT	NOTES
TYPE A	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE A	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE A	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE B	BEDROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE B	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE B	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE C	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE C	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE D	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE D	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE E	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE E	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE F	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE F	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE G	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE G	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE H	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE H	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE I	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE I	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE J	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE J	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	

TOILET ACCESSORY LEGEND

BOBRICK FIXTURES LISTED AS BASIS OF DESIGN

TA-1	WALL MOUNTED SOAP DISH - BOBRICK B-680
TA-2	RECESSED MEDICINE CABINET B398
TA-3	TOILET PAPER DISPENSER - BOBRICK B-543
TA-4	WALL MOUNTED TOWEL BAR - BOBRICK B-674x24"
TA-5	36" STAINLESS STEEL GRAB BAR MOUNTED 33"-36" A.F.F B-6806X36"
TA-6	42" STAINLESS STEEL GRAB BAR MOUNTED 33" 36" A.F.F B-6806X42"
TA-7	COAT HOOK MOUNTED 48" A.F.F. (SEE PLAN FOR LOCATION) B-670
TA-8	SOLID PHENOLIC FOLD-DOWN SHOWER SEAT - BOBRICK B-5191
TA-9	24" L-SHAPED STAINLESS STEEL GRAB BARS @ SHOWER MOUNTED 33"-36" A.F.F
TA-10	SHOWER CURTAIN ROD - BOBRICK B207
TA-11	VINYL SHOWER CURTAIN - 204-2
TA-12	30" STAINLESS STEEL GRAB BAR MOUNTED 33"-36" A.F.F B-5806X30"

UNIT TYPE K	
ALL UNITS WITH LAYOUT K	
LEVEL	NUMBER
LEVEL 2	211
LEVEL 3	311
LEVEL 4	411
LEVEL 5	511
LEVEL 6	611
LEVEL 7	711
LEVEL 8	811
LEVEL 9	911

DURAND–HOLLIS RUPE ARCHITECTS, INC.
14603 HUEBNER ROAD
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SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT — GABRIEL DURAND-HOLLIS — 10881 — STATE OF TEXAS

05/25/18

PERMIT SET

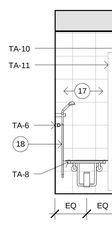
PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

ENLARGED UNIT FLOOR PLANS TYPE K

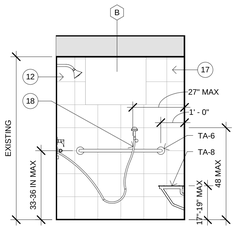
SHEET NUMBER
A-125

UNIT TYPE M - ACCESSIBLE

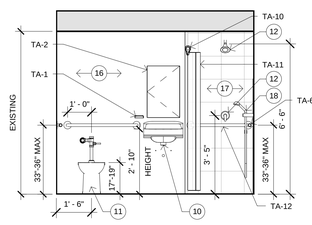
(UNIT TOTAL AREA: 991 SF)



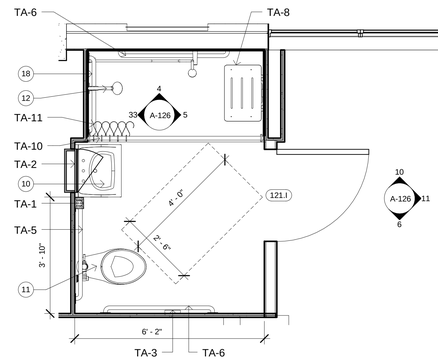
5 Shower Elevation #3
3/8" = 1'-0"



4 Shower Elevation #2
3/8" = 1'-0"

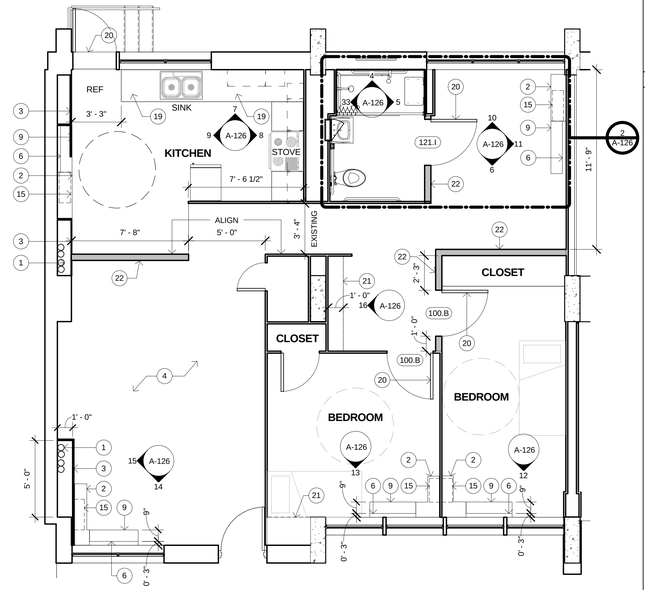


33 Shower Elevation #1
3/8" = 1'-0"



2 Type M - Enlarged Bath
1/2" = 1'-0"

PLAN NORTH



1 Type M - ADA Floor Plan
1/4" = 1'-0"

PLAN NORTH

ENLARGED PLAN GENERAL NOTES

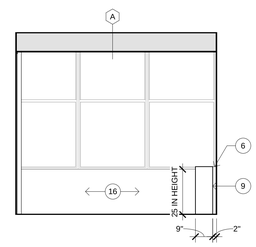
1. REFERENCE PLUMBING SHEETS FOR ALL PLUMBING FIXTURES SPECIFICATIONS.
2. CONTRACTOR TO PROVIDE BLOCKING IN THE WALL AS NECESSARY.
3. REFERENCE A020 AND A021 FOR ACCESSIBLE INSTALLATION HEIGHTS.
4. REFERENCE SHEET A600 FOR WINDOW INFORMATION

KEYED NOTES

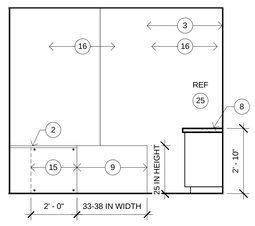
1. NEW HYDRONIC LINES. REFERENCE MEP DRAWINGS FOR DETAILS & SPECIFICATIONS.
2. NEW FURR-OUT TO SEAL FAN COIL PIPES. REFERENCE DETAIL 4/A700.
3. NEW CHASE FLOOR TO CEILING. REF. 3/A700 SIMILAR.
4. NEW FLOOR, VCT-1 - REFERENCE ROOM SCHEDULE FOR SPECIFICATIONS
5. NEW ELECTRICAL PANEL. REFERENCE MEP DRAWINGS FOR DETAILS & SPECIFICATIONS
6. 3" FALSE BACK PANEL INSTALLED WITH 3" CLEARANCE FOR ELECTRICAL. REF. MEP.
7. EXISTING FREE STANDING CLOSET TO REMAIN. PROTECT DURING NEW FLOOR INSTALLATION
8. NEW COUNTERTOP WITH NEW 4" BACKSPLASH TO MATCH SAHA STANDARDS, SHEET A-701. REFERENCE ROOM SCHEDULE FOR DETAILS. NEW SINK, REFERENCE MEP.
9. NEW FAN COIL UNIT. REFERENCE MEP.
10. NEW WALL HUNG LAVATORY. REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
11. NEW TOILET WITH 1.28 GPF FLUSHOMETER REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
12. NEW SHOWER HAND CONTROL, REFERENCE PLUMBING DRAWINGS FOR DETAILS & SPECIFICATIONS.
13. EXISTING GRAB BAR & NURSE CALL BUTTON TO REMAIN.
14. EXISTING MILLWORK TO REMAIN. REF DETAIL 6/A700 FOR MILLWORK DETAIL INSTALLATIONS AS NEEDED.
15. 24" REMOVABLE ACCESS PANEL. REFERENCE DETAIL 5/A700.
16. NEW WALL PAINT
17. NEW 12X12 WALL TILE
18. NEW EXTENDED HAND SHOWER BY AMERICAN STANDARD _____ FOR ADA SHOWER
19. NEW KITCHEN LAYOUT, REFERENCE ELEVATIONS FOR DETAILS
20. NEW WALL ENCLOSURE TO MATCH EXISTING
21. NEW 1" BUILT-IN SHELVES, PLYWOOD, PAINTED
22. NEW INTERIOR PARTITION AS SCHEDULED
23. NEW MILLWORK, REFERENCE A-701 FOR DETAILS
24. SUPPORT BRACKETS FOR SHELVES, REFERENCE SPECIFICATIONS
25. EXISTING EQUIPMENT TO REMAIN, AND PROTECTED WITH MYLAR DURING CONSTRUCTION.

WALL LEGEND

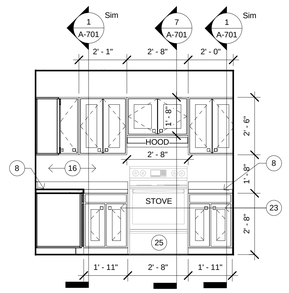
- EXISTING WALL
- NEW WALL
- NEW, INSULATED WALL



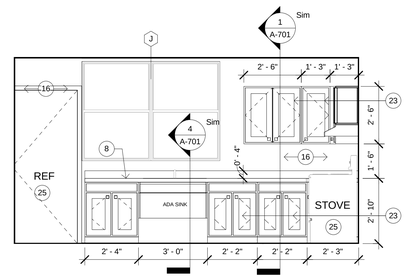
10 Elevation - Unit Type M - Bathroom #2
3/8" = 1'-0"



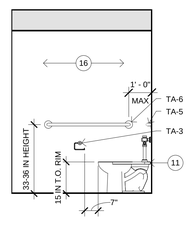
9 Elevation - Unit Type M - Kitchen #3
3/8" = 1'-0"



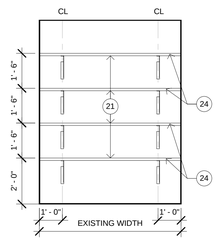
8 Elevation - Unit Type M - Kitchen #2
3/8" = 1'-0"



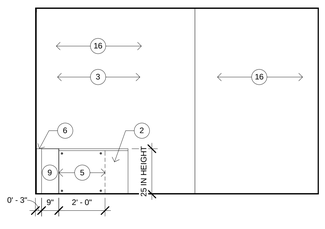
7 Elevation - Unit Type M - Kitchen #1
3/8" = 1'-0"



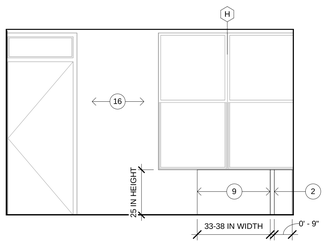
6 Elevation - Unit Type M - Bathroom #4
3/8" = 1'-0"



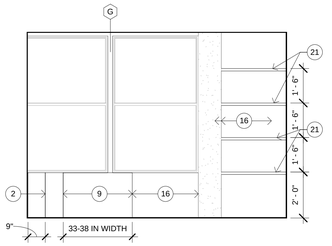
16 Elevation - Shelving
3/8" = 1'-0"



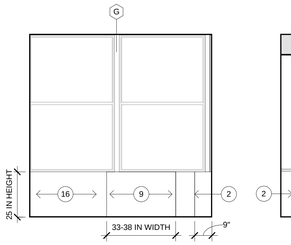
15 Elevation - AC Unit
3/8" = 1'-0"



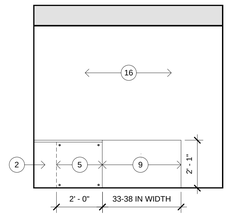
14 Elevation - Bedroom
3/8" = 1'-0"



13 Elevation - Bedroom #1
3/8" = 1'-0"



12 Elevation - Bedroom #2
3/8" = 1'-0"



11 Elevation - Unit Type M - Bathroom #3
3/8" = 1'-0"

ROOM FINISH SCHEDULE

UNIT TYPE	NAME	FLOOR	WALLS BASE	WALLS ALL	N	S	E	W	Countertop	Millwork	CEILING FIN	CEILING HGT	NOTES
TYPE A	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE A	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE A	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE B	BEDROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE B	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE B	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE C	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE C	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE D	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE D	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE E	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE E	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE F	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE F	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE G	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE G	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE H	LIVING ROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE H	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE I	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE I	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE J	LIVINGROOM	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE J	BATH	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	CT-1	CT-1	P-1 / CT-1								7' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	
TYPE M	UNIT	VCT-1	B-1	P-1					PL-1	P-1	P-2	8' - 1"	

TOILET ACCESSORY LEGEND

BOBRICK FIXTURES LISTED AS BASIS OF DESIGN

TA-1	WALL MOUNTED SOAP DISH - BOBRICK B-680
TA-2	RECESSED MEDICINE CABINET B398
TA-3	TOILET PAPER DISPENSER - BOBRICK B-543
TA-4	TOWEL BAR - BOBRICK B-674x24"
TA-5	36" STAINLESS STEEL GRAB BAR MOUNTED 33"-36" A.F.F B-6806X36"
TA-6	42" STAINLESS STEEL GRAB BAR MOUNTED 33" 36" A.F.F B-6806X42"
TA-7	COAT HOOK MOUNTED 48" A.F.F. (SEE PLAN FOR LOCATION) B-670
TA-8	SOLID PHENOLIC FOLD-DOWN SHOWER SEAT - BOBRICK B-5191
TA-9	24" L-SHAPED STAINLESS STEEL GRAB BARS @ SHOWER MOUNTED 33"-36" A.F.F
TA-10	SHOWER CURTAIN ROD - BOBRICK B207
TA-11	VINYL SHOWER CURTAIN - 204-2
TA-12	30" STAINLESS STEEL GRAB BAR MOUNTED 33"-36" A.F.F B-5806X30"

UNIT TYPE M	
ALL UNITS WITH LAYOUT M	
LEVEL	NUMBER
LEVEL 1	141

DURAND–HOLLIS RUPE ARCHITECTS, INC.
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Opportunity Lives Here
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818 SOUTH FLORES STREET
SAN ANTONIO, TX 78204
T: 210.477.6262

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT — DARREL DURANDHOLLIS — 10461 — STATE OF TEXAS

05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10-461

ENLARGED ADA UNIT FLOOR PLANS TYPE M

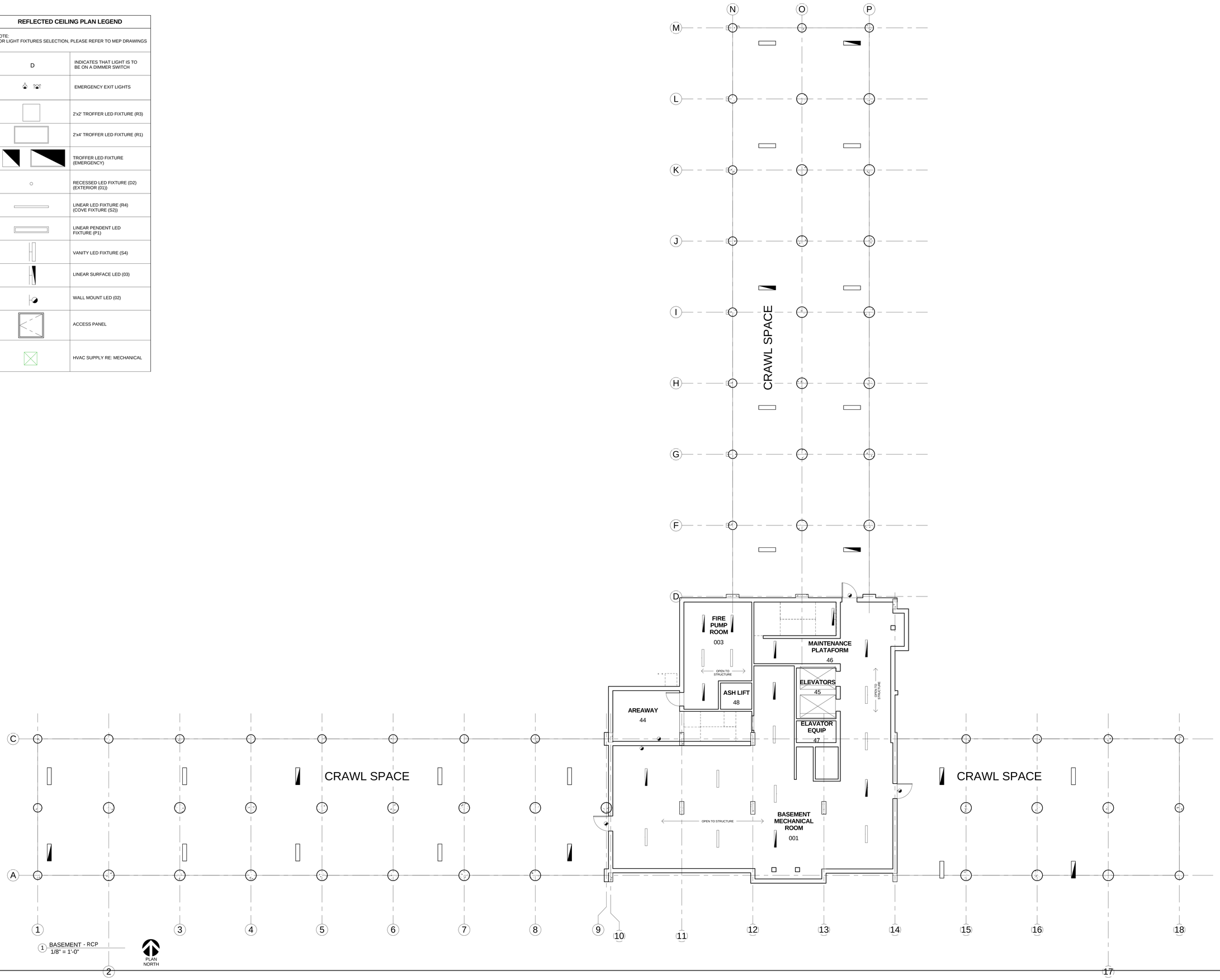
SHEET NUMBER

A-126

REFLECTED CEILING PLAN LEGEND

NOTE:
FOR LIGHT FIXTURES SELECTION, PLEASE REFER TO MEP DRAWINGS

D	INDICATES THAT LIGHT IS TO BE ON A DIMMER SWITCH
	EMERGENCY EXIT LIGHTS
	2'x2' TROFFER LED FIXTURE (R3)
	2'x4' TROFFER LED FIXTURE (R1)
	TROFFER LED FIXTURE (EMERGENCY)
	RECESSED LED FIXTURE (D2) (EXTERIOR (01))
	LINEAR LED FIXTURE (R4) (COVE FIXTURE (S2))
	LINEAR PENDENT LED FIXTURE (P1)
	VANITY LED FIXTURE (S4)
	LINEAR SURFACE LED (03)
	WALL MOUNT LED (02)
	ACCESS PANEL
	HVAC SUPPLY RE: MECHANICAL



1 BASEMENT - RCP
1/8" = 1'-0"

DURAND–HOLLIS RUPE ARCHITECTS, INC.

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SAN ANTONIO, TEXAS
78230

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SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT — GABRIEL DURAND-HOLLIS — 10881-1 — STATE OF TEXAS

05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

REFLECTED CEILING PLAN - BASEMENT

SHEET NUMBER
A-180

REFLECTED CEILING PLAN LEGEND

NOTE:
FOR LIGHT FIXTURES SELECTION, PLEASE REFER TO MEP DRAWINGS

D	INDICATES THAT LIGHT IS TO BE ON A DIMMER SWITCH
	EMERGENCY EXIT LIGHTS
	2'x2' TROFFER LED FIXTURE (R3)
	2'x4' TROFFER LED FIXTURE (R1)
	TROFFER LED FIXTURE (EMERGENCY)
	RECESSED LED FIXTURE (D2) (EXTERIOR (01))
	LINEAR LED FIXTURE (R4) (COVE FIXTURE (S2))
	LINEAR PENDENT LED FIXTURE (P1)
	VANITY LED FIXTURE (S4)
	LINEAR SURFACE LED (03)
	WALL MOUNT LED (02)
	ACCESS PANEL
	HVAC SUPPLY RE: MECHANICAL

ALL DROPPED DRYWALL CEILINGS ARE NEW.
ALL EXISTING DRYWALL IS TO REMAIN.

	LAY IN CEILING SYSTEM
	DRY WALL CEILING
	PLASTER CEILING SYSTEM

1 Level 1 - RCP
1/8" = 1'-0"

PLAN NORTH

KEYED NOTES

1. CEILING OPEN IN AREAS AS INDICATED
2. 12" SLOT LIGHT, REFERENCE ELECTRICAL DRAWINGS
3. NEW CEILING PROJECTOR FOR PROJECTION SCREEN AS SCHEDULED (CENTER WITH SCREEN).
4. NEW PROJECTION SCREEN AS SCHEDULED (CENTERED ON WALL).
5. EXISTING CURTAIN TRACK TO REMAIN
6. PATCH CEILING WHERE REQUIRED

DURAND–HOLLIS RUPE ARCHITECTS, INC.
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OWNER:

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SAN ANTONIO, TX 78204
T: 210.477.6262

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION

LOCATION: 411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT
GABRIEL DURAND-HOLLIS
10881-1
STATE OF TEXAS
05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

REFLECTED CEILING PLAN - LEVEL 1

SHEET NUMBER
A-181

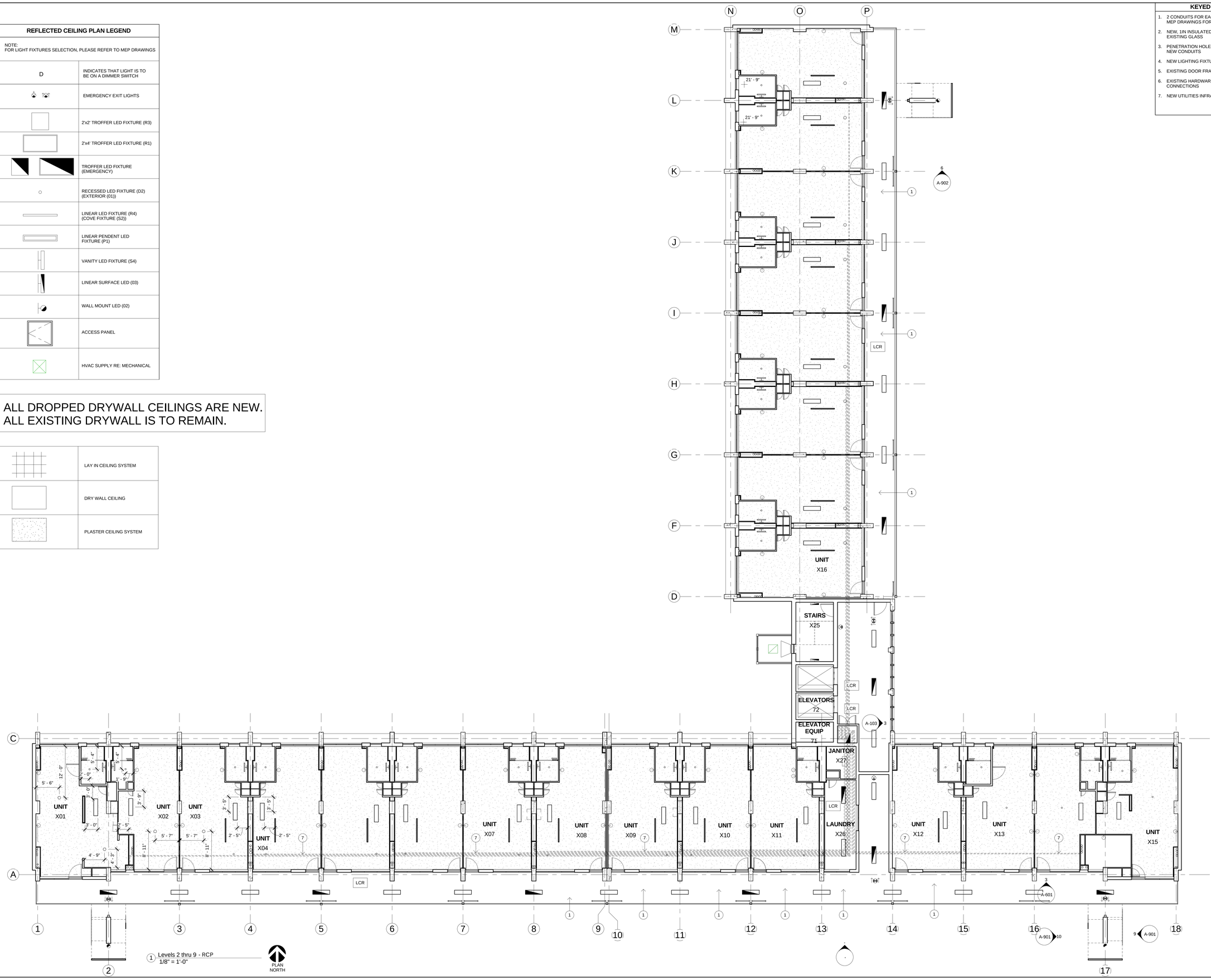
REFLECTED CEILING PLAN LEGEND

NOTE:
FOR LIGHT FIXTURES SELECTION, PLEASE REFER TO MEP DRAWINGS

D	INDICATES THAT LIGHT IS TO BE ON A DIMMER SWITCH
	EMERGENCY EXIT LIGHTS
	2'x2' TROFFER LED FIXTURE (R3)
	2'x4' TROFFER LED FIXTURE (R1)
	TROFFER LED FIXTURE (EMERGENCY)
	RECESSED LED FIXTURE (D2) (EXTERIOR (01))
	LINEAR LED FIXTURE (R4) (COVE FIXTURE (S2))
	LINEAR PENDENT LED FIXTURE (P1)
	VANITY LED FIXTURE (S4)
	LINEAR SURFACE LED (03)
	WALL MOUNT LED (02)
	ACCESS PANEL
	HVAC SUPPLY RE: MECHANICAL

ALL DROPPED DRYWALL CEILINGS ARE NEW.
ALL EXISTING DRYWALL IS TO REMAIN.

	LAY IN CEILING SYSTEM
	DRY WALL CEILING
	PLASTER CEILING SYSTEM



1 Levels 2 thru 9 - RCP
1/8" = 1'-0"

PLAN NORTH

KEYED NOTES

1. 2 CONDUITS FOR EACH LINE. REFERENCE MEP DRAWINGS FOR DETAILS
2. NEW, 1IN INSULATED PANEL TO REPLACE EXISTING GLASS
3. PENETRATION HOLES IN DOOR FRAME FOR NEW CONDUITS
4. NEW LIGHTING FIXTURE
5. EXISTING DOOR FRAME TO REMAIN
6. EXISTING HARDWARE BOX WITH CONNECTIONS
7. NEW UTILITIES INFRASTRUCT. REF. MEP.

DURAND–HOLLIS RUPE ARCHITECTS, INC.
14603 HUEBNER ROAD
BUILDING 18
SAN ANTONIO, TEXAS 78230
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OWNER:

SAN ANTONIO HOUSING AUTHORITY
818 SOUTH FLORES STREET
SAN ANTONIO, TX 78204
T: 210.477.6262

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT — GABRIEL DURAND-HOLLIS — 10881 — STATE OF TEXAS

05/25/18

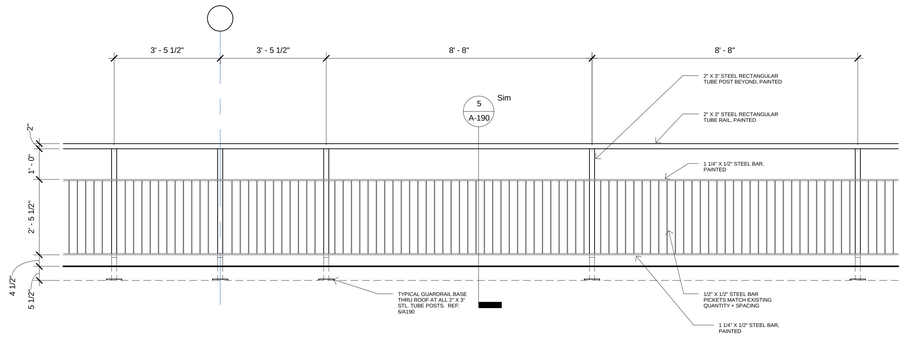
PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10-881

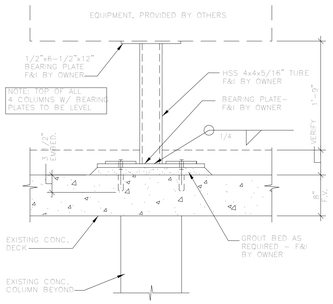
REFLECTED CEILING PLAN - LEVELS 2 THRU 9

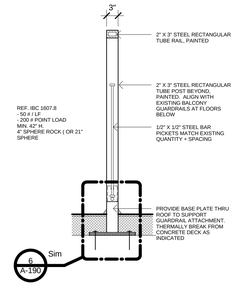
SHEET NUMBER
A-182

5/24/2018 | 2:27:54 PM C:\Users\g.perez\Desktop\SAHA - Victoria Plaza - PERMIT SET_05-04-18\Discovery\.rvt

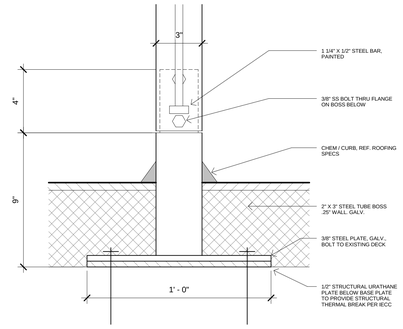


3 TYPICAL GUARDRAIL ELEVATION
1/2" = 1'-0"

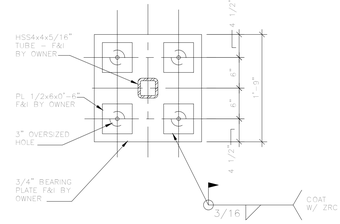




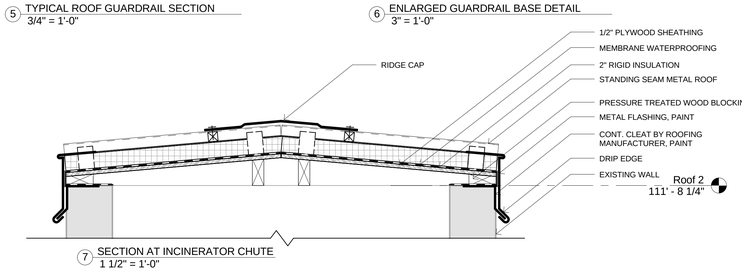
5 TYPICAL ROOF GUARDRAIL SECTION
3/4" = 1'-0"



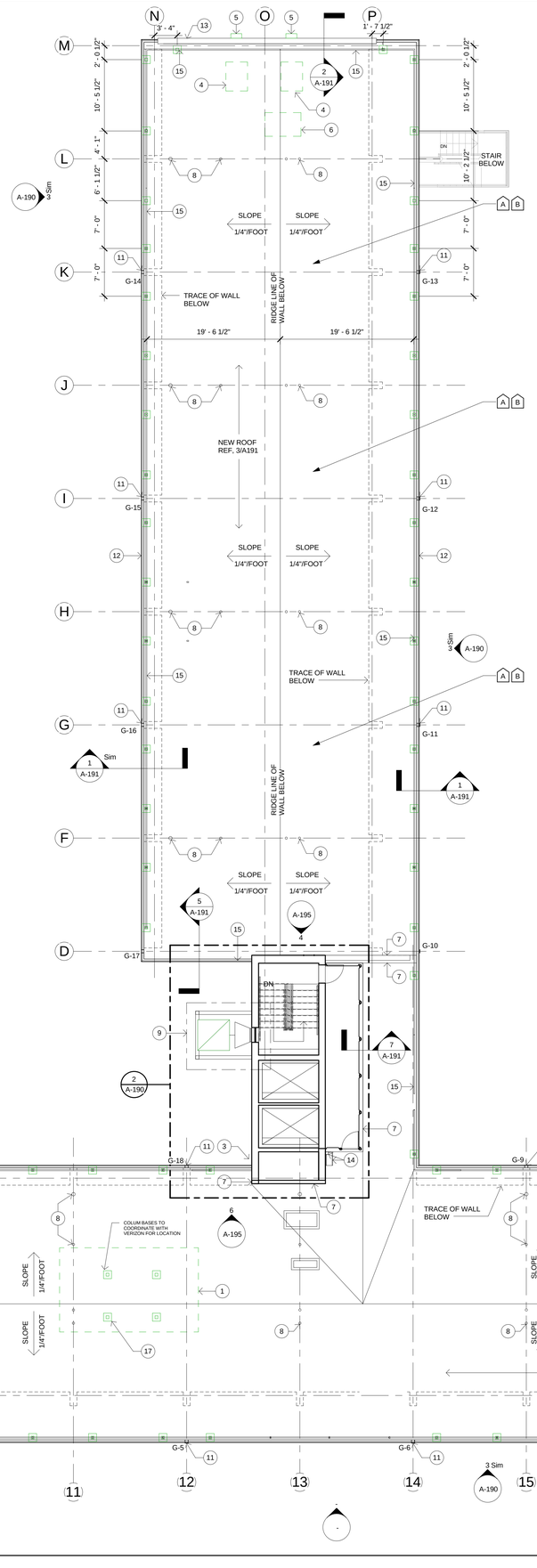
6 ENLARGED GUARDRAIL BASE DETAIL
3" = 1'-0"



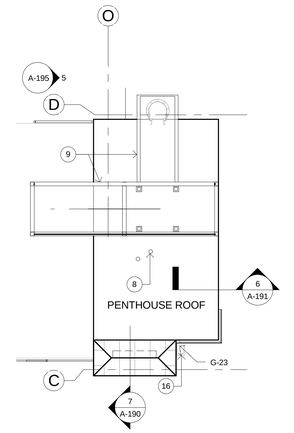
4 EQUIPMENT BASE
1" = 1'-0"



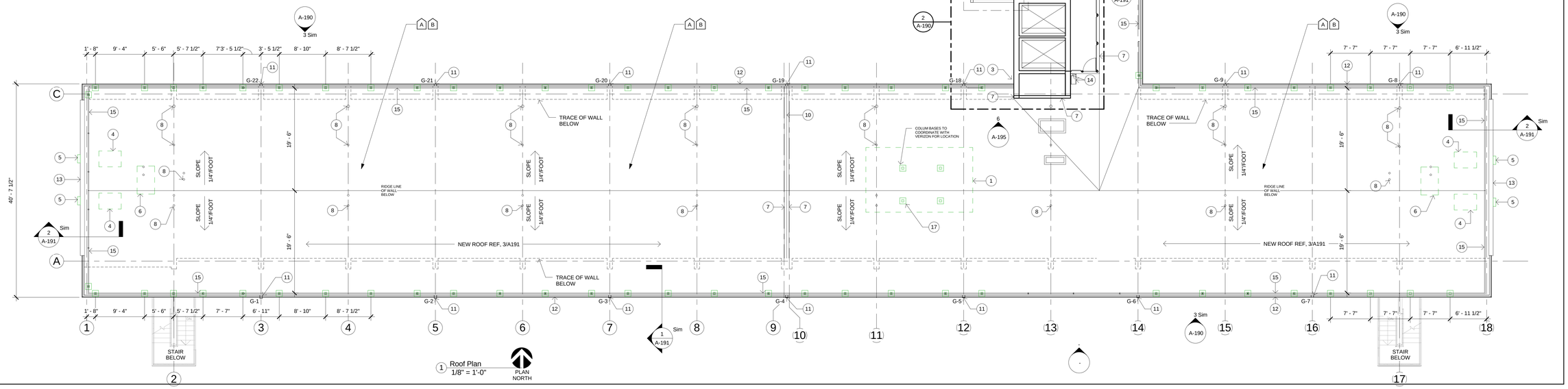
7 SECTION AT INCINERATOR CHUTE
1 1/2" = 1'-0"



1 Roof Plan
1/8" = 1'-0"
PLAN NORTH



2 Penthouse Roof Plan
1/8" = 1'-0"
PLAN NORTH



BUILDING PERFORMANCE NOTES

A. **RIDIG POLYISOCYANURATE ROOF INSULATION CONSISTING OF 2" CONTINUOUS FLATBOARDS (R11.4) + 1/4" TAPERED BOARDS STARTING AT A MINUMUM OF 1/2" AND SLOPING TO 5-1/2" (AVERAGE THICKNESS 2-1/2" X R5.7 PER INCH = R14.25 TAPERED = R25.65)**

ROOF COVER BOARD
1/2" THICK (R VALUE = 0.5)

RIDIG POLYISOCYANURATE ROOF INSULATION
+
ROOF COVER BOARD = **R26.15**

B. **ROOF SOLAR REFLECTANCE + EMITTANCE MODIFIED BITUMEN MEMBRANE ROOFING**
COOL ROOF RATING COUNCIL CRRC-1 RATED
COLOR: WHITE
SRI: 89
EMITTANCE: 0.90
REFLECTIVITY, ASTM C 1549: 73% (0.73)

KEYED NOTES

1. VERIZON SATTELITE ARRAY, REFERENCE PLANS PROVIDED BY VERIZON FOR DETAILS. LOCATED ABOVE BUILDING STRUCTURAL COLUMNS - VIF.
2. NOT USED
3. UTILITIES UP OUTSIDE OF BUILDING
4. BALLASTED ANTENNA MOUNT
5. BETA SECTOR ANTENNAS BY VERIZON.
6. RRH/OVP BALLASTED MOUNT, REF. VERIZON SOW
7. NEW FLASHING, REF. ROOF DETAILS
8. NEW CHEM CURB ON EXISTING VENT PIPE, REF. 4/A191
9. ALTERNATE #2 - DEDUCT TO REMOVE STAIR PRESSURIZATION
10. EXPANSION JOINT
11. DOWNSPOUT LOCATIONS AT GUTTER WITH CONTOL JOINTS. DOWNSPOUTS RUN ALONG ALL BUILDING FLOORS. REFERENCE EXTERIOR ELEVATIONS, SHEETS A-201 THRU A-203
12. STAINLESS STEEL GUTTERS
13. PARAPET
14. DOWNSPOUT WITH CONCRETE SPLASH BLOCK
15. NEW GUARDRAIL AROUND PERIMETER, REFERENCE EXTERIOR ELEVATIONS SHEETS A-200 THRU A-203 AND DETAIL 4/A190. PANEL DIVISIONS TO FOLLOW FACADES' EXISTING HANDRAILS ON BALCONIES.
16. NEW SPLASH PAN
17. STRUCTURAL FOOTINGS FOR ANTENA EQUIPMENT REF. 5/A190

PLEASE NOTE: ALL DOWNSPOUTS LOCATIONS ARE INDICATED AS G-1, G-2 ETC..

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VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT — GABRIEL DURAND-HOLLIS — 10981-1 — STATE OF TEXAS

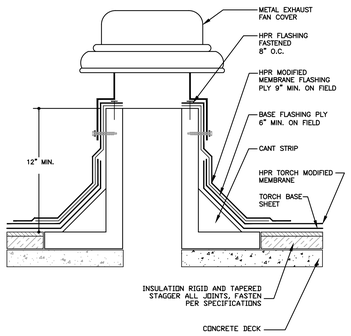
05/25/18

PERMIT SET

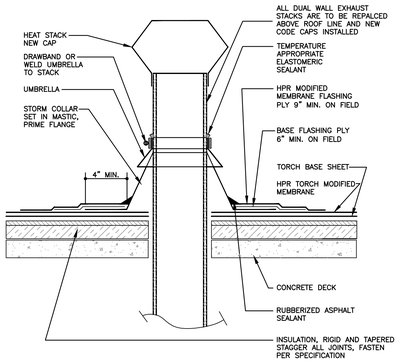
PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–981

ROOF PLAN

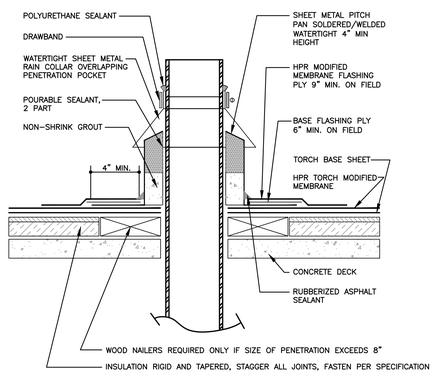
SHEET NUMBER
A-190



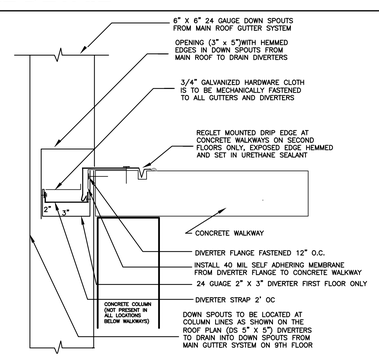
10 TYPICAL DETAIL



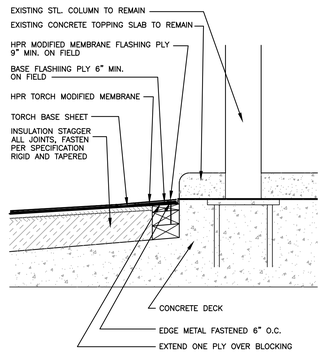
11 TYPICAL DETAIL



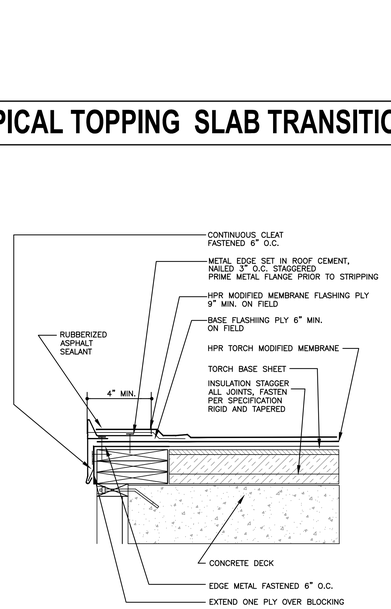
11 TYPICAL DETAIL



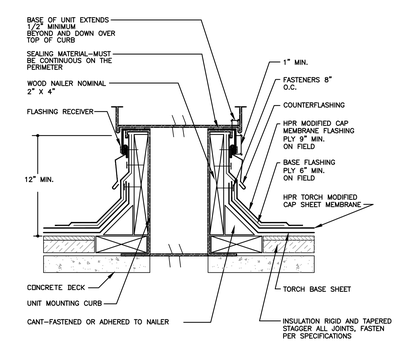
12 TYPICAL DETAIL



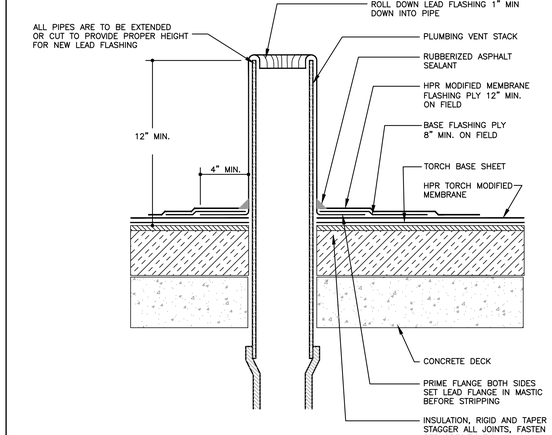
7 TYPICAL TOPPING SLAB TRANSITION



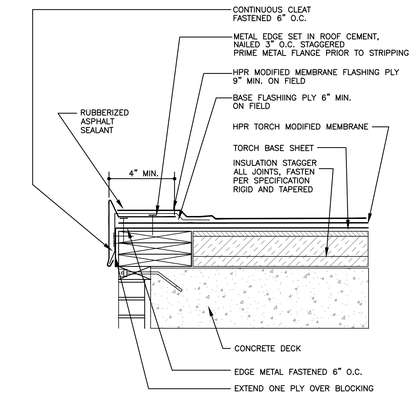
8 TYPICAL EDGE METAL



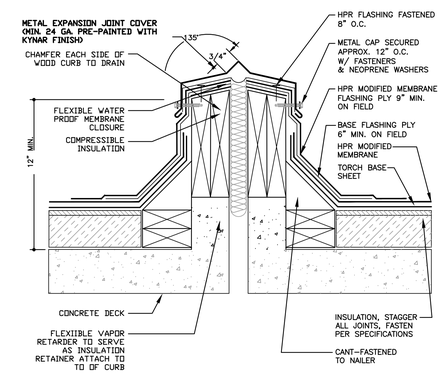
9 TYPICAL DETAIL



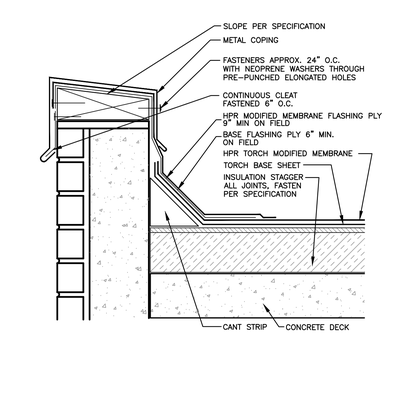
4 TYPICAL PLUMBING STACK



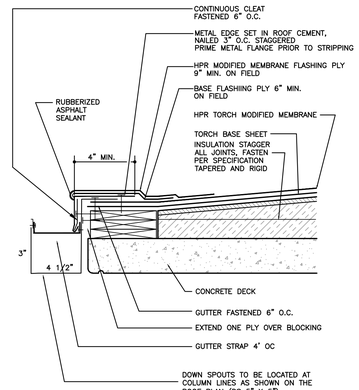
5 TYPICAL EDGE METAL



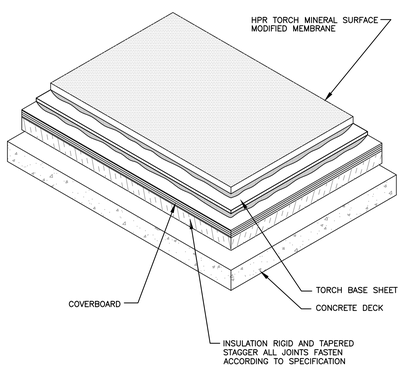
6 TYPICAL RAISED EXPANSION JOINT



2 TYPICAL WALL FLASHING @ COPING



1 ROOF EDGE W/ GUTTER - NO OVERHANG



3 TYPICAL ROOF SECTION

DHR
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OWNER:
SAHA SAN ANTONIO HOUSING AUTHORITY
SAN ANTONIO HOUSING AUTHORITY
818 SOUTH FLORES STREET
SAN ANTONIO, TX 78204
TEL 210.477.6262

LOCATION:
SAN ANTONIO HOUSING AUTHORITY VICTORIA PLAZA MODERNIZATION-PHASE 1
411 BARRERA, SAN ANTONIO, TEXAS 78210

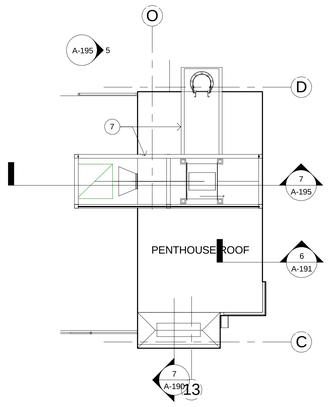
REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT JOSE DURANDHOLLIS RUPE STATE OF TEXAS
05/25/18

PROJECT ARCHITECT
DATE: SUNDAY, JULY 08, 2018
STATE METRO ID: 151387

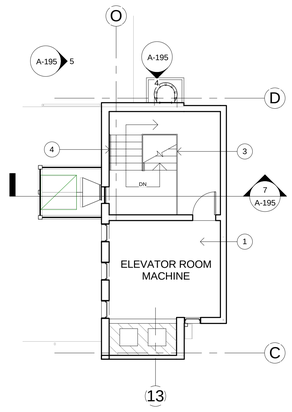
ROOF DETAILS

SHEET NUMBER
A-191



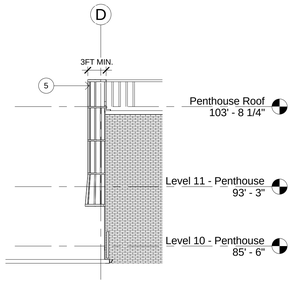
3 Penthouse Roof - REF. Alternate 2 & 3
1/8" = 1'-0"

PLAN NORTH

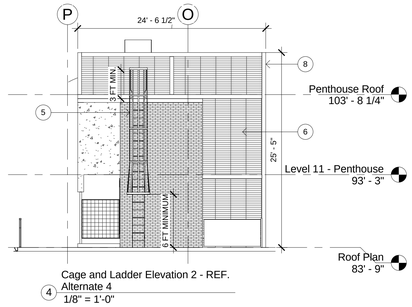


2 Level 11 - Penthouse - REF. Alternate 2 & 3
1/8" = 1'-0"

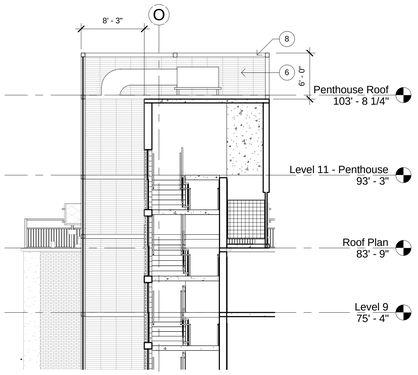
PLAN NORTH



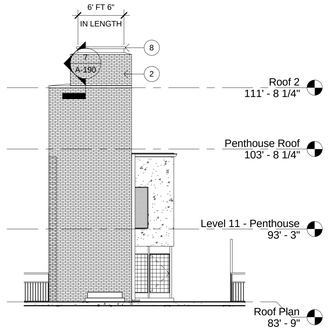
5 Cage Elevation - REF. Alternate 4
1/8" = 1'-0"



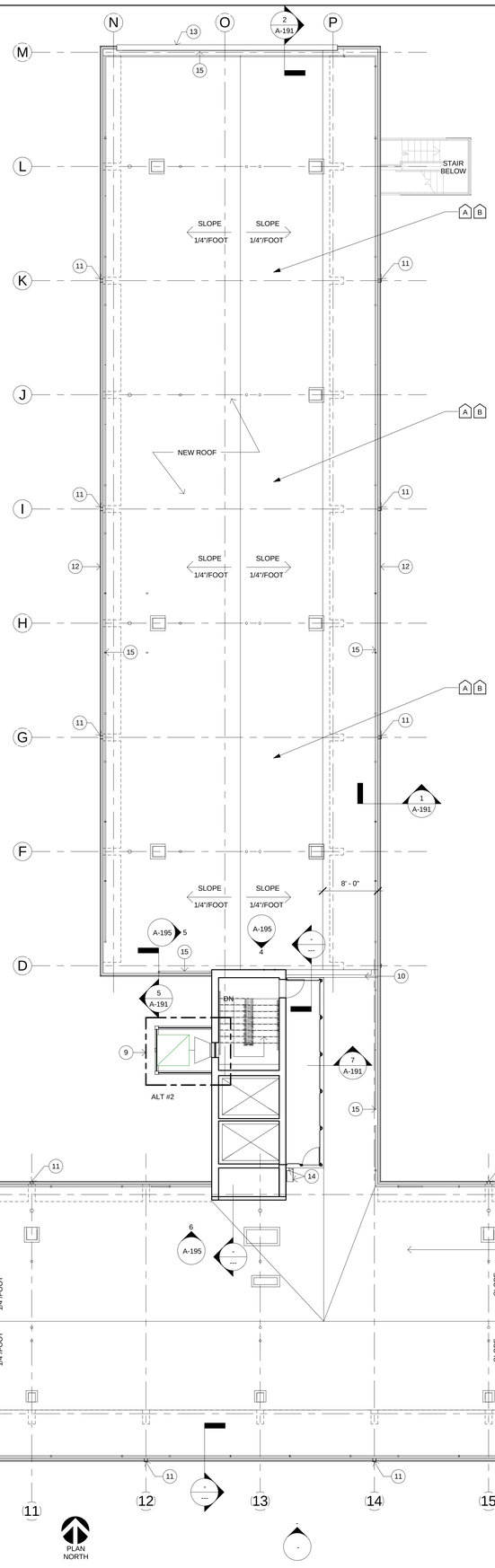
4 Cage and Ladder Elevation 2 - REF. Alternate 4
1/8" = 1'-0"



7 Equipment Pad Section - REF. Alternate 2
1/8" = 1'-0"



6 Chimney Cap Elevation
1/8" = 1'-0"



1 ROOF PLAN WITH ALTERNATES
1/8" = 1'-0"

PLAN NORTH

GENERAL NOTES

1. CONTRASTOR SHALL FIELD VERIFY EXISTING PENT HOUSE

BUILDING PERFORMANCE NOTES

A. **RIDIG POLYISOCYANURATE ROOF INSULATION CONSISTING OF 2" CONTINUOUS FLATBOARDS (R11.4) + 1/4" TAPERED BOARDS STARTING AT A MINUMUM OF 1/2" AND SLOPING TO 5-1/2" (AVERAGE THICKNESS 2-1/2" X R5.7 PER INCH = R14.25 TAPERED = R25.65)**

ROOF COVER BOARD
1/2" THICK (R VALUE = 0.5)

RIDIG POLYISOCYANURATE ROOF INSULATION
+
ROOF COVER BOARD = **R26.15**

B. **ROOF SOLAR REFLECTANCE + EMITTANCE MODIFIED BITUMEN MEMBRANE ROOFING**
COOL ROOF RATING COUNCIL CRRC-1 RATED
COLOR: WHITE
SRI: 89
EMITTANCE: 0.90
REFLECTIVITY, ASTM C 1549: 73% (0.73)

KEYED NOTES

1. NEW METAL CAP ON INCENERATOR
2. EXISTING CHIMNEY TO REMAIN
3. NEW GUARDRAIL REFERENCE
4. NEW HANDRAIL REFERENCE
5. NEW LADDER AND CAGE
6. PEFORATED METAL
7. PANELS
8. METAL TUBE FRAME
9. ALTERNATE #2 - DEDUCT TO REMOVE STAIR PRESSURIZATION
10. EXPANSION JOINT
11. DOWNSPOUT LOCATIONS AT GUTTER WITH CONTOL JOINTS. DOWNSPOUTS RUN ALONG ALL BUILDING FLOORS. REFERENCE EXTERIOR ELEVATIONS, SHEETS A-201 THRU A-203
12. STAINLESS STEEL GUTTERS
13. PARAPET
14. DOWNSPOUT WITH CONCRETE SPLASH BLOCK
15. NEW GUARDRAIL AROUND PERIMETER, REFERENCE EXTERIOR ELEVATIONS SHEETS A-200 THRU A-203. PANEL DIVISIONS TO FOLLOW FACADES' EXISTING HANDRAILS ON BALCONIES.

ALTERNATES

ALT #1 - DEDUCT TO ELIMINATE DOWNSPOUT REPLACEMENT

ALT #2 - DEDUCT TO ELIMINATE STAIR PRESSURIZATION SYSTEM & ENCLOSURE

ALT #3 - DEDUCT FOR ELIMINATION OF REMOVAL OF PENTHOUSE SCREEN AS INDICATED, REF. 4/A195

ALT #4 - DEDUCT TO PRESERVE EXISTING LADDER & CAGE

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VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT GABRIEL DURAND-HOLLIS 10881-1 STATE OF TEXAS

05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

ROOF DETAILS

SHEET NUMBER
A-195

EXTERIOR ELEVATION LEGEND

	EXT. EXPOSED CONCRETE
	EXT. FACE BRICK
X	WINDOW TYPE

ELEVATION GENERAL NOTES

1. ALL NEW WINDOWS ARE INDICATED WITH A NEW KEYNOTE. REFERENCE A600 FOR WINDOW DETAILS.
2. NEW SCOPE OF WORK INDICATED WITH KEYED NOTES
3. FOR STAIR DETAILS REFERENCE SHEETS A-900 THRU A-904
4. FOR STAIR PRESSURIZATION SYSTEM DETAILS REFERENCE MECHANICAL SHEETS M1.1-M1.3 AND M2.4
5. FOR LEAD-BASED PAINT REMOVAL REF. LEAD-BASED PAINT REMOVAL AND DISPOSAL SPECIFICATION OF MAY 18, 2018 BY TERRACON.
6. FOR ASBESTOS REPORT REF. LIMITED ASBESTOS SURVEY REPORT OF APRIL 17, 2018 BY TERRACON.

KEYED NOTES

1 NEW METAL GUARDRAIL

2. NEW METAL HANDRAIL

3. STAIR PRESSURIZATION DUCT, REFERENCE MEP DRAWINGS FOR DETAILS

4. LOADING DOCK AREA NEW RAILINGS, REFERENCE SHEETS A-900 & A-904

5. NEW ENCLOSURE FOR VERTICAL DUCT SYSTEM: 6X6 CHANNEL FRAME WITH PERFORATED PANELS AS SCHEDULED

6. NEW LADDER AND CAGE

ALTERNATES

ALT #1 - DEDUCT TO ELIMINATE DOWNSPOUT REPLACEMENT

ALT #2 - DEDUCT TO ELIMINATE STAIR PRESSURIZATION SYSTEM & ENCLOSURE

ALT #3 - DEDUCT FOR ELIMINATION OF REMOVAL OF PENTHOUSE SCREEN AS INDICATED, REF. 4/A195

ALT #4 - DEDUCT TO PRESERVE EXISTING LADDER & CAGE

1 North Elevation
1/8" = 1'-0"

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818 SOUTH FLORES STREET
SAN ANTONIO, TX 78204
T: 210.477.6262

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION

LOCATION: 411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS

ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT — GABRIEL DURAND-HOLLIS — 19981 — STATE OF TEXAS

05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 19-981

EXTERIOR ELEVATION

SHEET NUMBER
A-200

5/25/2018 1:29:31 PM C:\Users\kc.perez\Desktop\SAHA - Victoria Plaza - PERMIT SET - 05-04-18\Revit\my.rvt

EXTERIOR ELEVATION LEGEND

	EXT. EXPOSED CONCRETE
	EXT. FACE BRICK
X	WINDOW TYPE

KEYED NOTES

1. NEW METAL GUARDRAIL
2. NEW METAL HANDRAIL
3. STAIR PRESSURIZATION DUCT AND RELATED ENCLOSURE, REFERENCE MEP DRAWINGS FOR DETAILS
4. PROVIDE PEFORATED METAL PANELS AT STAIR PRESSURIZATION DUCT, ENCLOSURE AS SPECIFIED
5. STL. GUTTERS AND DOWNSPOUTS AS SPECIFIED PTD. TYP. REF. DEDUCTIVE ALTERNATE # 1
6. NEW METAL DRIP FLASHING @ OLD GUTTER LOCATION ON FLOORS 2-9, REF 12/A-191
7. RESTORE EXISTING SHADE STRUCTURES. REF. A-104
8. EXISTING TILE MOSAICS TO REMAIN.
9. NEW ENCLOSURE FOR VERTICAL DUCT SYSTEM: 6X6 CHANELS FRAME WITH PERFORATED PANELS AS SCHEDULED
10. EXISTING CONCRETE ENTRY CANOPY TO REMAIN

ELEVATION GENERAL NOTES

1. ALL NEW WINDOWS ARE INDICATED WITH A NEW KEYNOTE. REFERENCE A600 FOR WINDOW DETAILS.
2. NEW SCOPE OF WORK INDICATED WITH KEYED NOTES
3. FOR STAIR DETAILS REFERENCE SHEETS A-900 THRU A-904
4. FOR STAIR PRESSURIZATION SYSTEM DETAILS REFERENCE MECHANICAL SHEETS M1.1-M1.3 AND M2.4
5. FOR LEAD-BASED PAINT REMOVAL REF. LEAD-BASED PAINT REMOVAL AND DISPOSAL SPECIFICATION OF MAY 18, 2018 BY TERRACON.
6. FOR ASBESTOS REPORT REF. LIMITED ASBESTOS SURVEY REPORT OF APRIL 17, 2018 BY TERRACON.

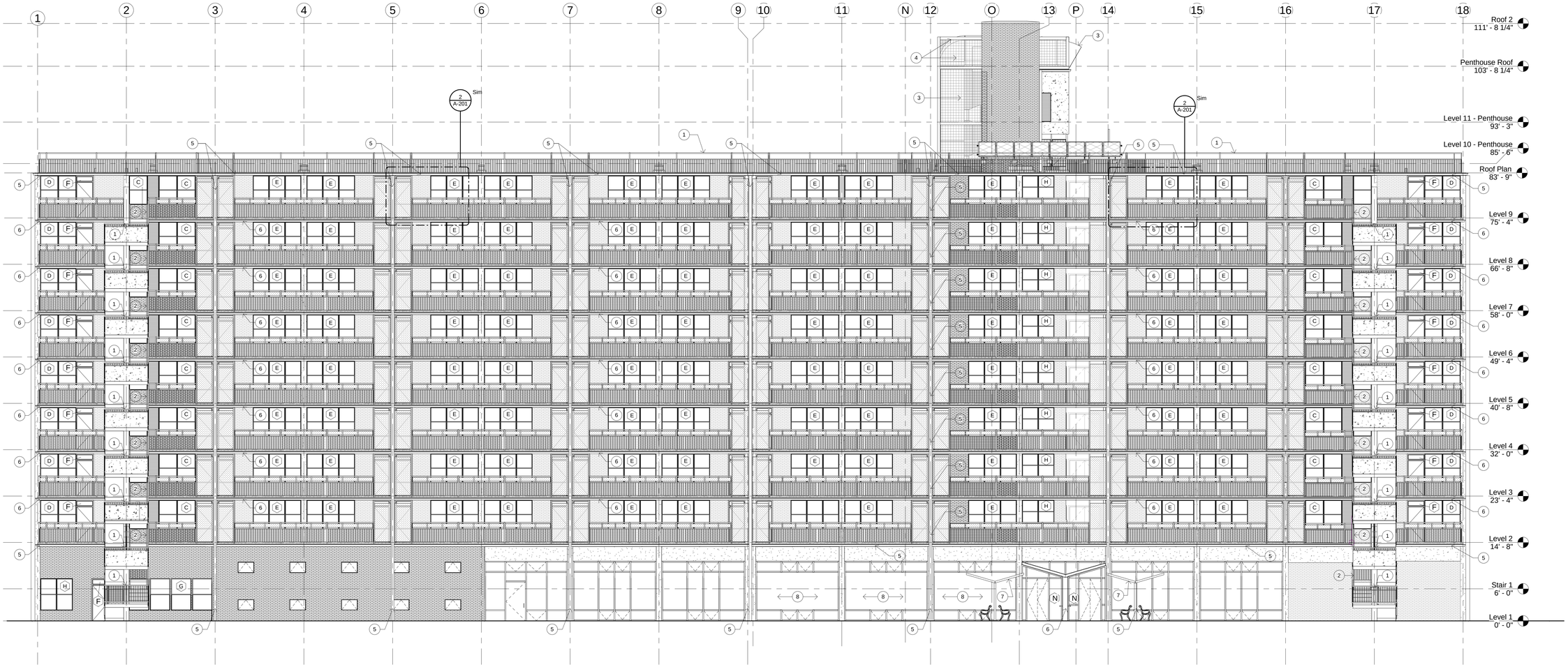
ALTERNATES

ALT #1 - DEDUCT TO ELIMINATE DOWNSPOUT REPLACEMENT

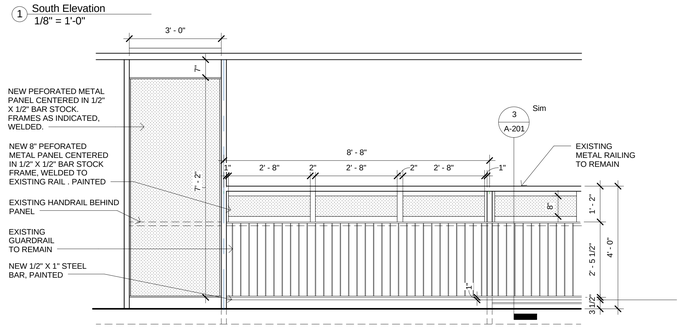
ALT #2 - DEDUCT TO ELIMINATE STAIR PRESSURIZATION SYSTEM & ENCLOSURE

ALT #3 - DEDUCT FOR ELIMINATION OF REMOVAL OF PENTHOUSE SCREEN AS INDICATED, REF. 4/A195

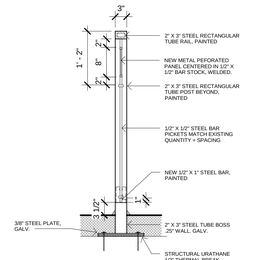
ALT #4 - DEDUCT TO PRESERVE EXISTING LADDER & CAGE



1 South Elevation
1/8" = 1'-0"



2 TYPICAL GUARDRAIL ELEVATION AT BALCONY
1/2" = 1'-0"



3 TYPICAL GUARDRAIL SECTION PANEL
3/4" = 1'-0"

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DURAND–HOLLIS RUPE ARCHITECTS, INC.
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SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT — GABRIEL DURAND-HOLLIS — 20811 — STATE OF TEXAS

05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

EXTERIOR ELEVATION

SHEET NUMBER
A-201

EXTERIOR ELEVATION LEGEND

	EXT. EXPOSED CONCRETE
	EXT. FACE BRICK
X	WINDOW TYPE

ELEVATION GENERAL NOTES

1. ALL NEW WINDOWS ARE INDICATED WITH A NEW KEYNOTE. REFERENCE A600 FOR WINDOW DETAILS.
2. NEW SCOPE OF WORK INDICATED WITH KEYED NOTES
3. FOR STAIR DETAILS REFERENCE SHEETS A-900 THRU A-904
4. FOR STAIR PRESSURIZATION SYSTEM DETAILS REFERENCE MECHANICAL SHEETS M1.1-M1.3 AND M2.4
5. FOR LEAD-BASED PAINT REMOVAL REF. LEAD-BASED PAINT REMOVAL AND DISPOSAL SPECIFICATION OF MAY 18, 2018 BY TERRACON.
6. FOR ASBESTOS REPORT REF. LIMITED ASBESTOS SURVEY REPORT OF APRIL 17, 2018 BY TERRACON.

ALTERNATES

ALT #1 - DEDUCT TO ELIMINATE DOWNSPOUT REPLACEMENT

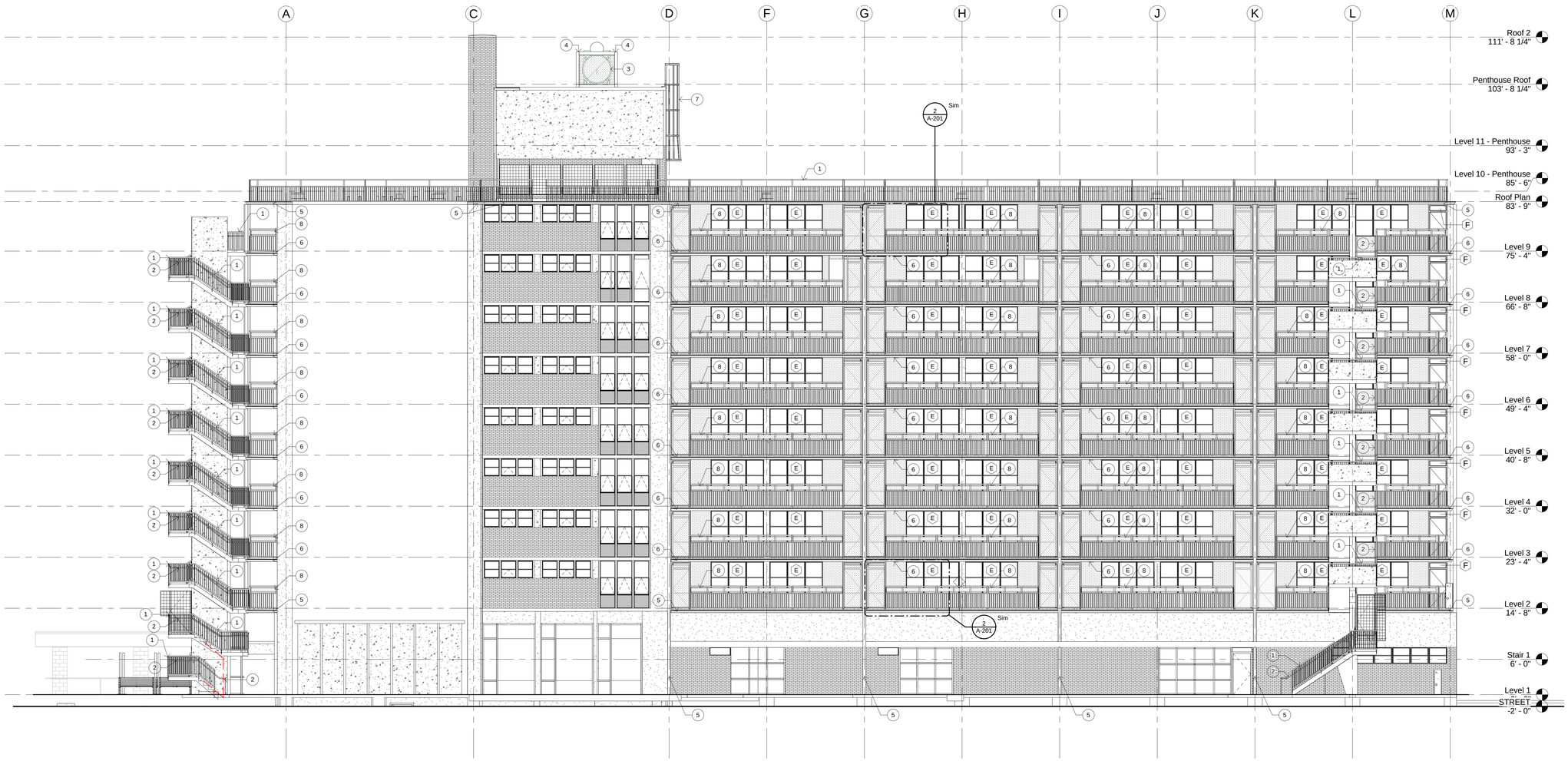
ALT #2 - DEDUCT TO ELIMINATE STAIR PRESSURIZATION SYSTEM & ENCLOSURE

ALT #3 - DEDUCT FOR ELIMINATION OF REMOVAL OF PENTHOUSE SCREEN AS INDICATED, REF. 4/A195

ALT #4 - DEDUCT TO PRESERVE EXISTING LADDER & CAGE

KEYED NOTES

1. NEW METAL GUARDRAIL
2. NEW METAL HANDRAIL
3. STAIR PRESSURIZATION DUCT AND RELATED ENCLOSURE, REFERENCE MEP DRAWINGS FOR DETAILS
4. NEW ENCLOSURE FOR VERTICAL DUCT SYSTEM: 6X6 CHANELS FRAME WITH PERFORATED PANELS AS SPECIFIED
5. STL. GUTTER AND DOWNSPOUT AS SPECIFIED PTD. TYP. REF. DEDUCTIVE ALTERNATE #1
6. NEW METAL DRIP FLASHING @ OLD GUTTER LOCATION ON FLOORS 2-9 REF. 12/A-191
7. NEW LADDER AND CAGE
8. NEW PERFORATED METAL PANEL CENTERED IN 1/2" X 1/2" BAR STOCK FRAMES, WELDED TO EXISTING RAILING.



1 East Elevation
1/8" = 1'-0"

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SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION

LOCATION: 411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT — GABRIEL DURAND-HOLLIS — 19491-1 — STATE OF TEXAS

05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 19-861

EXTERIOR ELEVATION

SHEET NUMBER
A-202

ALTERNATES

ALT #1 - DEDUCT TO ELIMINATE DOWNSPOUT REPLACEMENT

ALT #2 - DEDUCT TO ELIMINATE STAIR PRESSURIZATION SYSTEM & ENCLOSURE

ALT #3 - DEDUCT FOR ELIMINATION OF REMOVAL OF PENTHOUSE SCREEN AS INDICATED, REF. 4/A195

ALT #4 - DEDUCT TO PRESERVE EXISTING LADDER & CAGE

ELEVATION GENERAL NOTES

1. ALL NEW WINDOWS ARE INDICATED WITH A NEW KEYNOTE. REFERENCE A600 FOR WINDOW DETAILS.
2. NEW SCOPE OF WORK INDICATED WITH KEYED NOTES
3. FOR STAIR DETAILS REFERENCE SHEETS A-900 THRU A-904
4. FOR STAIR PRESSURIZATION SYSTEM DETAILS REFERENCE MECHANICAL SHEETS M1.1-M1.3 AND M2.4
5. FOR LEAD-BASED PAINT REMOVAL REF. LEAD-BASED PAINT REMOVAL AND DISPOSAL SPECIFICATION OF MAY 18, 2018 BY TERRACON.
6. FOR ASBESTOS REPORT REF. LIMITED ASBESTOS SURVEY REPORT OF APRIL 17, 2018 BY TERRACON.

KEYED NOTES

1 NEW METAL GUARDRAIL

2. NEW METAL HANDRAIL

3. STAIR PRESSURIZATION DUCT, REFERENCE MEP DRAWINGS FOR DETAILS

4. LOADING DOCK AREA NEW RAILING, REFERENCE SHEETS A-900 & A904

5. STL GUTTER AND DOWNSPOUT AS SPECIFIED PTD, TYP. REF. DEDUCTIVE ALTERNATE #1

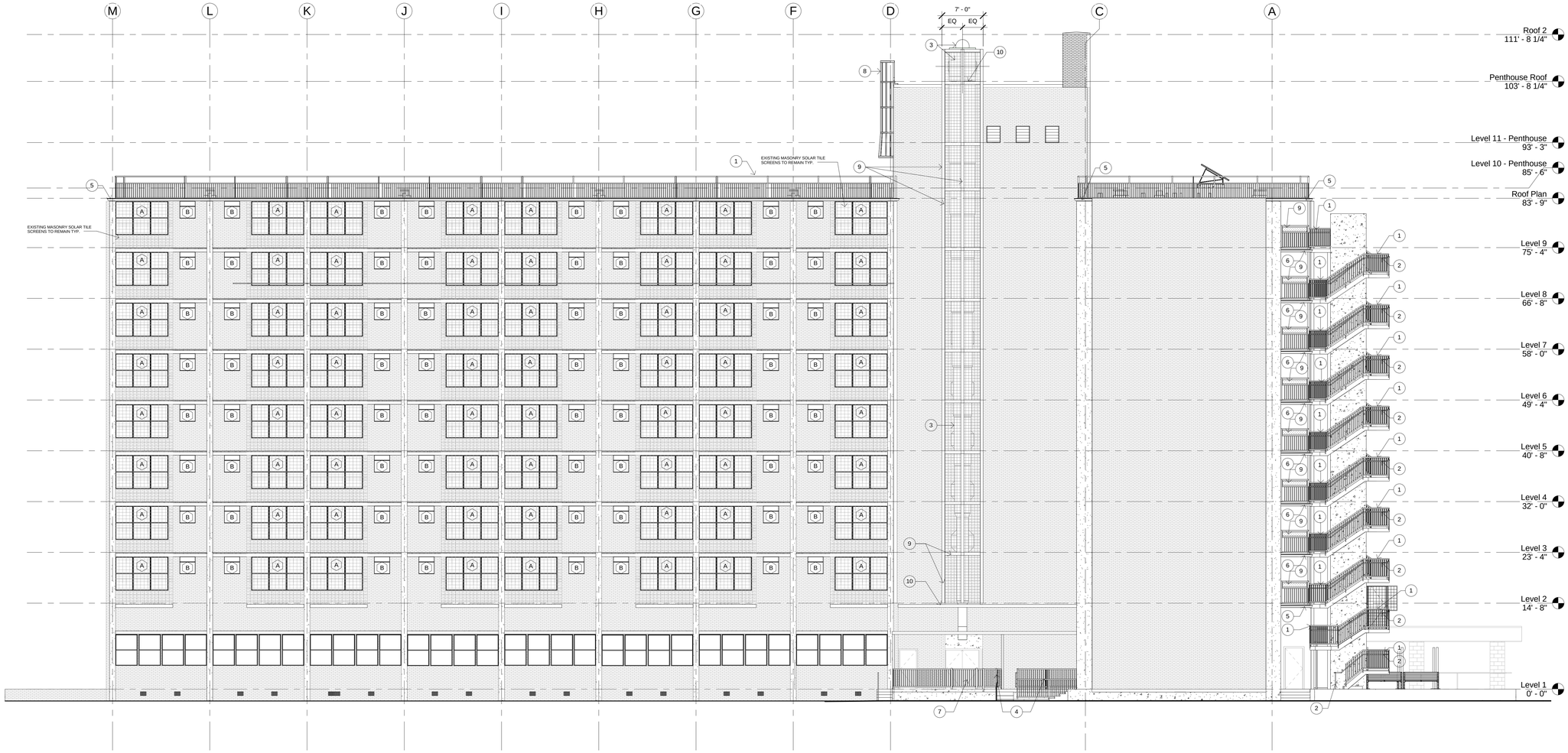
6. NEW METAL DRIP FLASHING @ OLD GUTTER LOCATION ON FLOORS 2-9 REF. 12/A-191

7. NEW 4FT GATE FOR DOCK. FOR DETAILS REFERENCE 8/A-904

8. NEW LADDER AND CAGE

9. NEW ENCLOSURE FOR VERTICAL DUCT SYSTEM: 6X6 CHANELS FRAME WITH PERFORATED PANELS AS SCHEDULED

10. STAIR PRESSURIZATION DUCT TO SIT ON TOP OF EXISTING ROOF



1 West Elevation
1/8" = 1'-0"

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VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT — DANIEL DURAND-HOLLIS — 10881-1 — STATE OF TEXAS

05/25/18

PERMIT SET

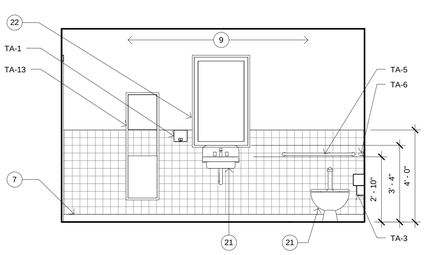
PROJECT ARCHITECT
DANIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

EXTERIOR ELEVATION

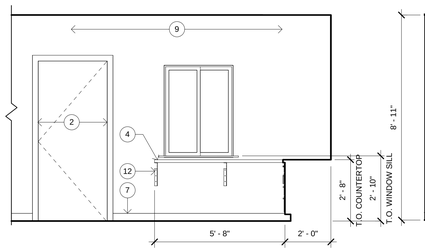
SHEET NUMBER
A-203

KEYED NOTES

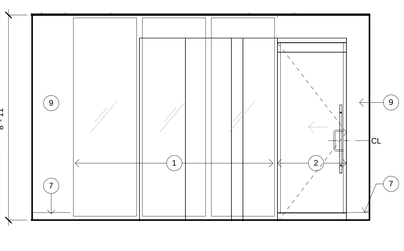
1. TEMPERED GLASS PARTITIONS IN ALUMINUM FRAME AS SCHEDULED
2. NEW DOOR AS SCHEDULED
3. NEW BUILT-IN DESK / MILLWORK
4. SOLID SURFACE COUNTER AS SCHEDULED
5. HI-LO DRINKING FOUNTAIN AS SCHEDULED
6. NEW INTERIOR SLIDING GLASS WINDOW WITH COUNTER, REFERENCE INTERIOR ELEVATIONS
7. 4" RUBBER BASE
8. 4" BACKSPLASH WRAPS AROUND EXISTING COLUMN
9. NEW WALL PAINT AS SCHEDULED
10. EXISTING CONCRETE COLUMN
11. DRENCH SHOWER WITH EYE STATION, REFERENCE PLUMBING DRAWINGS
12. SUPPORT BRACKETS FOR SHELVES, REFERENCE SPECIFICATIONS
13. NEW HAND SINK, REFERENCE MEP
14. EXISTING KITCHEN EQUIPMENT TO REMAIN
15. EXISTING MILLWORK AND COUNTERTOP TO REMAIN. PROTECT DURING CONSTRUCTION.
16. RELOCATION OF ELECTRICAL PANEL, REF. MEP DRAWINGS FOR DETAILS.
17. PROJECTOR SCREEN AS SPECIFIED
18. NEW, PLYWOOD SHELVES, REF. SPECIFICATIONS
19. NEW LOWER CABINETS, REF. A-701
20. NEW UPPER CABINETS, REF. A-701
21. NEW PLUMBING FIXTURES, REF. MEP
22. MIRROR
23. APRON AS SCHEDULED



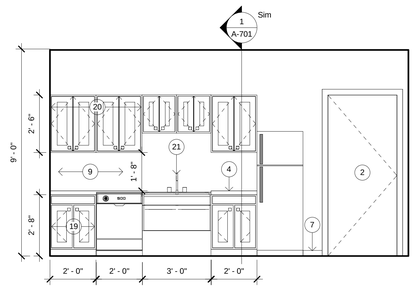
1 Elevation - Rest Room
3/8" = 1'-0"



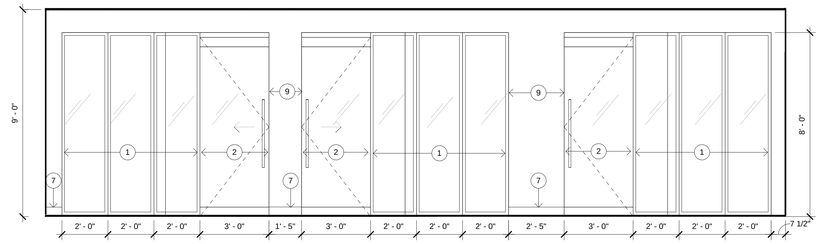
2 Elevation #2 - Interview Glass Partition
3/8" = 1'-0"



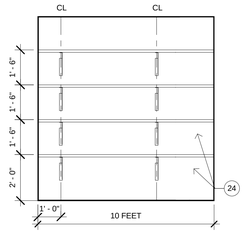
3 Elevation #3 - Manager Glass Partition
3/8" = 1'-0"



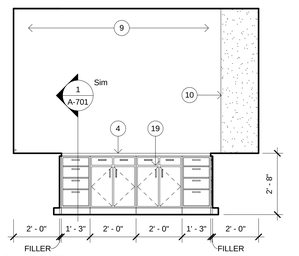
4 Elevation - Breakroom
3/8" = 1'-0"



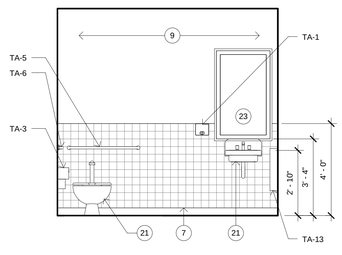
5 Elevation #4 - Offices' Glass Partitions
3/8" = 1'-0"



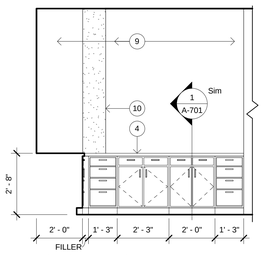
6 Elevation - Storage Shelving
3/8" = 1'-0"



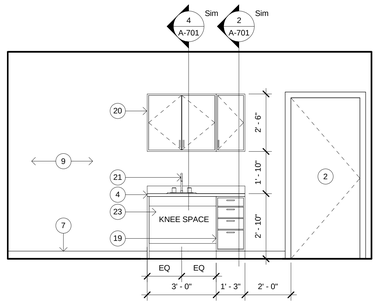
7 Elevation - Reception
3/8" = 1'-0"



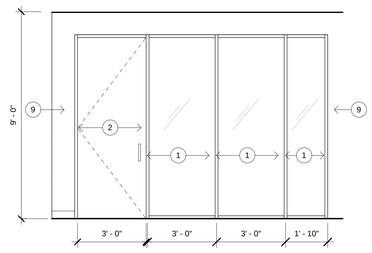
8 Elevation - Rest Room
3/8" = 1'-0"



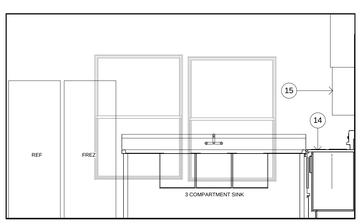
9 Elevation - Reception
3/8" = 1'-0"



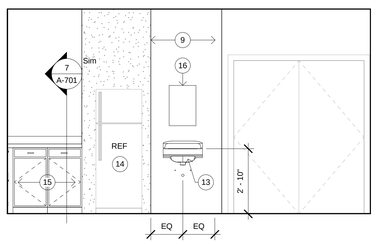
10 Elevation - Clinic
3/8" = 1'-0"



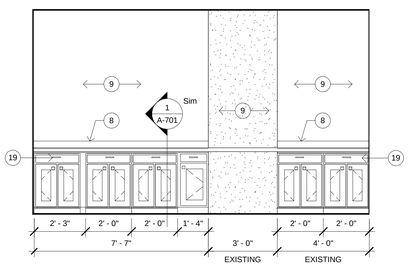
21 Elevation #1 - West Wing
3/8" = 1'-0"



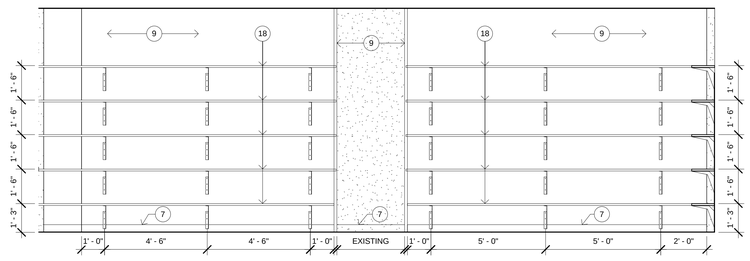
20 Elevation #2 - Kitchen Level 1
3/8" = 1'-0"



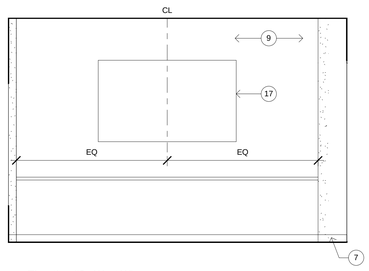
19 Elevation #1 - Kitchen Level 1
3/8" = 1'-0"



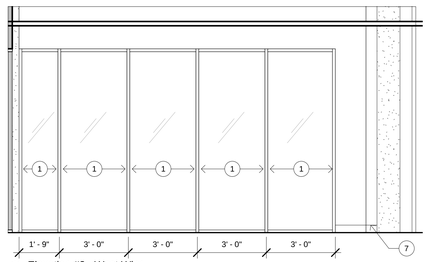
17 Elevation #17 - Manager Office Built-in
3/8" = 1'-0"



24 Elevation #4 - West Wing
3/8" = 1'-0"



23 Elevation #3 - West Wing
3/8" = 1'-0"



22 Elevation #2 - West Wing
3/8" = 1'-0"

TOILET ACCESSORY LEGEND

BOBRICK FIXTURES LISTED AS BASIS OF DESIGN

TA-1	WALL MOUNTED SOAP DISPENSER - BOBRICK B-2112
TA-2	RECESSED MEDICINE CABINET B398
TA-3	TOILET PAPER DISPENSER - BOBRICK B-543
TA-4	TOWEL BAR - BOBRICK B-674x24"
TA-5	36" STAINLESS STEEL GRAB BAR MOUNTED 33"-36" A.F.F B-6806X36"
TA-6	42" STAINLESS STEEL GRAB BAR MOUNTED 33" 36" A.F.F B-6806X42"
TA-7	COAT HOOK MOUNTED 48" A.F.F. (SEE PLAN FOR LOCATION) B-670
TA-8	SOLID PHENOLIC FOLD-DOWN SHOWER SEAT - BOBRICK B-5191
TA-9	24" L-SHAPED STAINLESS STEEL GRAB BARS @ SHOWER MOUNTED 33"-36" A.F.F
TA-10	SHOWER CURTAIN ROD - BOBRICK B207
TA-11	VINYL SHOWER CURTAIN - 204-2
TA-12	30" STAINLESS STEEL GRAB BAR MOUNTED 33"-36" A.F.F B-5806X30"
TA-13	PAPER TOWEL DISPENSER - BOBRICK B3942

DURAND–HOLLIS RUPE ARCHITECTS, INC.
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411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT GABRIEL DURAND-HOLLIS STATE OF TEXAS
JOB#1-1
05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10-881

INTERIOR ELEVATIONS

SHEET NUMBER
A-500

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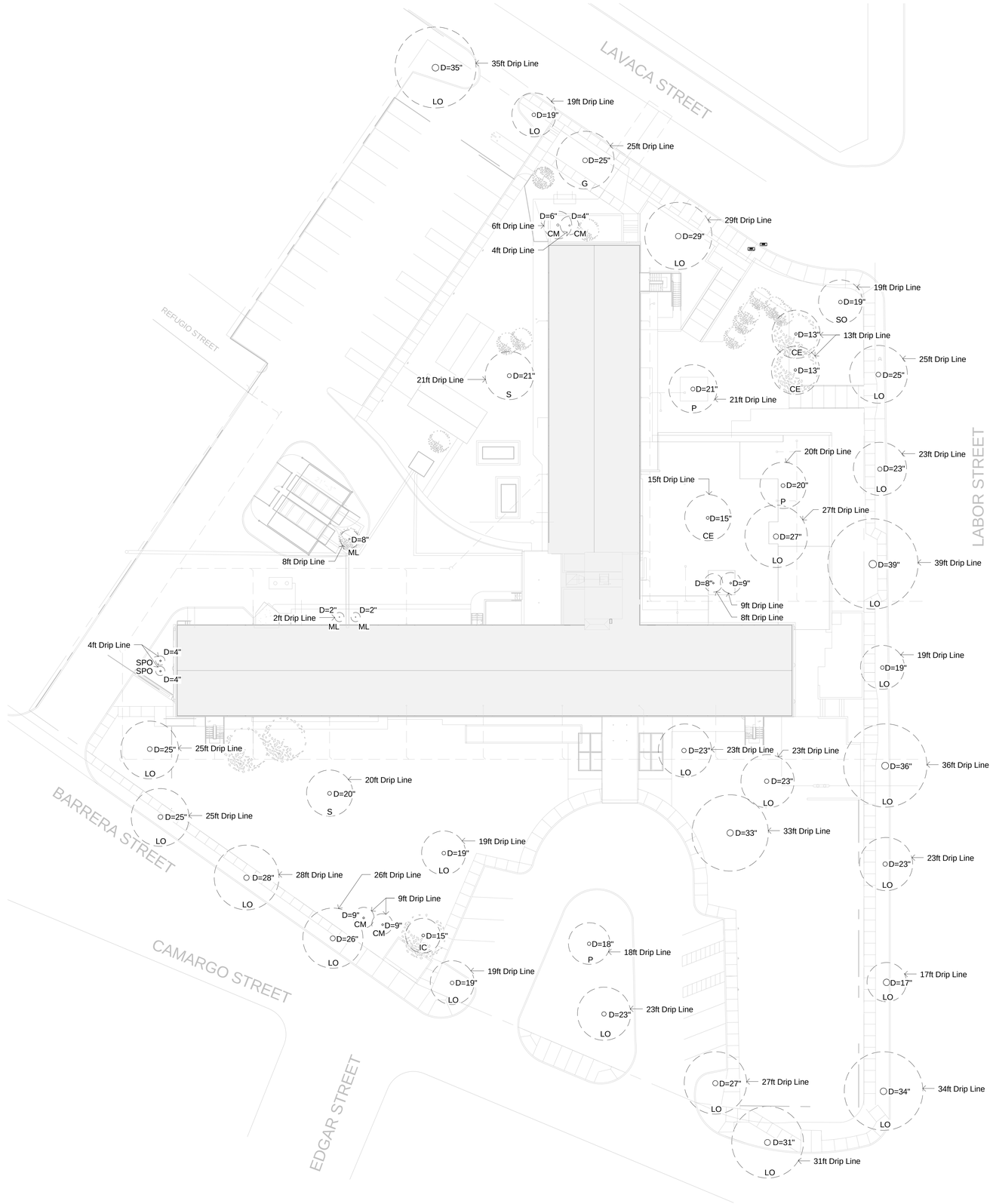

1 Tree Survey
1" = 20'-0"

PLAN NORTH

SITE WORK GENERAL NOTES

1. CONTRACTOR NOTE: ALL SITE WORK IS PROHIBITED WITHIN EXISTING TREE DRIP LINE AS INDICATED ON DRAWING.

TREE TYPES LEGEND	
CM	CREPE MYRTLE
CE	CHINESE ELM
G	GINKGO
IC	ITALIAN CYPRESS
LO	LIVE OAK
ML	MOUNTAIN LAUREL
P	PINE
SO	SPANISH OAK
SPO	SPANISH OLIVE
S	SYCAMORE

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VICTORIA PLAZA MODERNIZATION

LOCATION: 411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT GABRIEL DURAND-HOLLIS 10881 STATE OF TEXAS

05/25/18

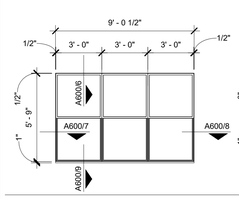
PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

TREE SURVEY

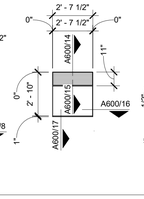
SHEET NUMBER
A-503

5/25/2018 1:31:15 PM C:\Users\g.perez\Desktop\SAHA - Victoria Plaza - PERMIT SET_05-04-18\Resume\y.rvt



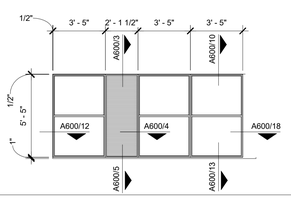
A

TRIPLE SINGLE HUNG,
PGT ENERGY VIEW WINDOWS,
SERIES 5400 VINYL FRAME,
HIGH PERFORMANCE LOW E GLAZING,
CLEAR GLAZED, SCREENED
INSIDE COLOR BEIGE,
OUTSIDE COLOR BEIGE



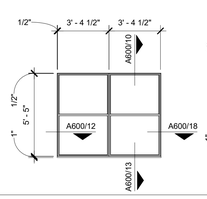
B

SINGLE, FIXED W/ UPPER
INSULATED PANEL, PGT
ENERGY VIEW WINDOWS,
SERIES 5400 VINYL FRAME,
HIGH PERFORMANCE LOW E GLAZING,
OBSCURE GLAZED,
INSIDE COLOR BEIGE,
OUTSIDE COLOR BEIGE



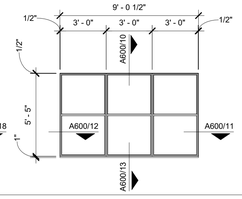
C

QUAD, SINGLE HUNG W/
1 INSULATED PANEL, PGT
ENERGY VIEW WINDOWS,
SERIES 5400 VINYL FRAME,
HIGH PERFORMANCE LOW E GLAZING,
CLEAR GLAZED, SCREENED
INSIDE COLOR BEIGE,
OUTSIDE COLOR BEIGE



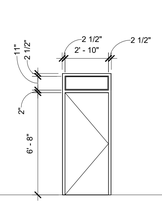
D

DOUBLE, SINGLE HUNG W/
1 FIXED PANEL, PGT
ENERGY VIEW WINDOWS,
SERIES 5400 VINYL FRAME,
HIGH PERFORMANCE LOW E GLAZING,
CLEAR GLAZED, SCREENED
INSIDE COLOR BEIGE,
OUTSIDE COLOR BEIGE



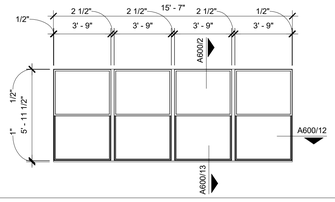
E

TRIPLE SINGLE HUNG,
PGT ENERGY VIEW WINDOWS,
SERIES 5400 VINYL FRAME,
HIGH PERFORMANCE LOW E GLAZING,
CLEAR GLAZED, SCREENED
INSIDE COLOR BEIGE,
OUTSIDE COLOR BEIGE



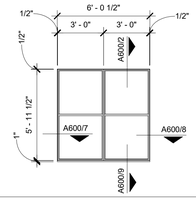
F

SINGLE, FIXED WINDOW ABOVE
DOOR,
WOOD FRAME,
HIGH PERFORMANCE LOW E GLAZING,
CLEAR GLAZED, PAINTED FRAME



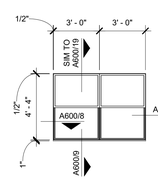
G

QUAD SINGLE HUNG,
PGT ENERGY VIEW WINDOWS,
SERIES 5400 VINYL FRAME,
HIGH PERFORMANCE LOW E GLAZING,
CLEAR GLAZED, SCREENED
INSIDE COLOR BEIGE,
OUTSIDE COLOR BEIGE



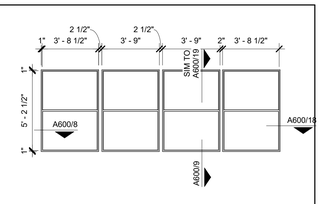
H

DOUBLE SINGLE HUNG,
PGT ENERGY VIEW WINDOWS,
SERIES 5400 VINYL FRAME,
HIGH PERFORMANCE LOW E GLAZING,
CLEAR GLAZED, SCREENED
INSIDE COLOR BEIGE,
OUTSIDE COLOR BEIGE



J

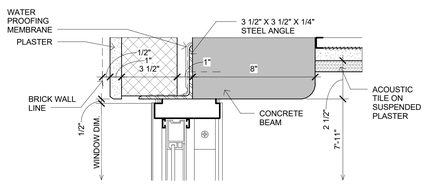
DOUBLE SINGLE HUNG,
PGT ENERGY VIEW WINDOWS,
SERIES 5400 VINYL FRAME,
HIGH PERFORMANCE LOW E GLAZING,
CLEAR GLAZED, SCREENED
INSIDE COLOR BEIGE,
OUTSIDE COLOR BEIGE



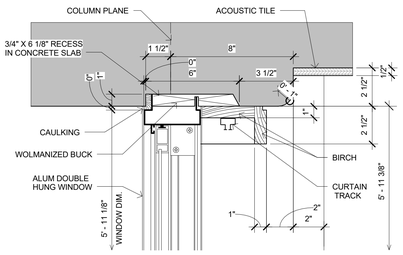
K

QUAD SINGLE HUNG,
PGT ENERGY VIEW WINDOWS,
SERIES 5400 VINYL FRAME,
HIGH PERFORMANCE LOW E GLAZING,
CLEAR GLAZED, SCREENED
INSIDE COLOR BEIGE,
OUTSIDE COLOR BEIGE

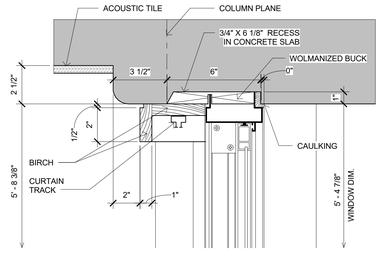
1 Window Replacement Types
1/4" = 1'-0"



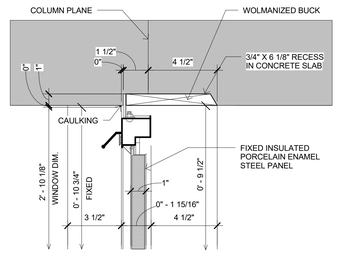
2 Window Head Detail
3" = 1'-0"



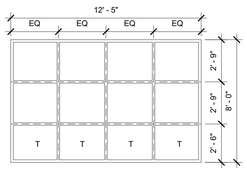
6 Window Head Detail 2
3" = 1'-0"



10 Window Head Detail 3
3" = 1'-0"

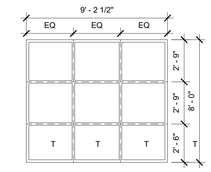


14 Window Head Detail 4
3" = 1'-0"



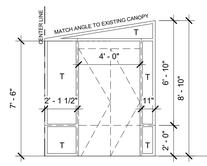
L

ALUMINUM STOREFRONT
HIGH PERFORMANCE LOW E GLAZING,
CLEAR GLAZED,
INSIDE COLOR BEIGE,
OUTSIDE COLOR BEIGE



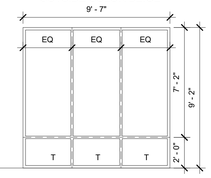
M

ALUMINUM STOREFRONT
HIGH PERFORMANCE LOW E GLAZING,
CLEAR GLAZED,
INSIDE COLOR BEIGE,
OUTSIDE COLOR BEIGE



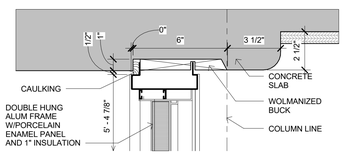
N

ALUMINUM STOREFRONT
HIGH PERFORMANCE LOW E GLAZING,
CLEAR GLAZED,
INSIDE COLOR BEIGE,
OUTSIDE COLOR BEIGE

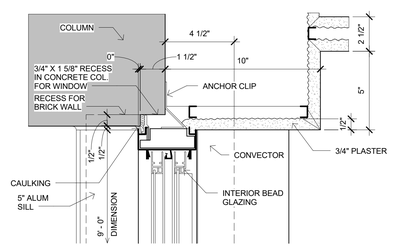


P

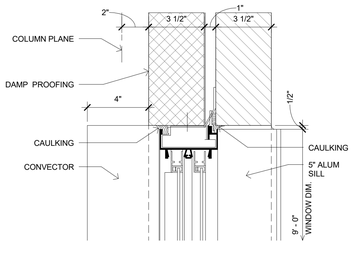
ALUMINUM STOREFRONT
HIGH PERFORMANCE LOW E GLAZING,
CLEAR GLAZED,
INSIDE COLOR BEIGE,
OUTSIDE COLOR BEIGE



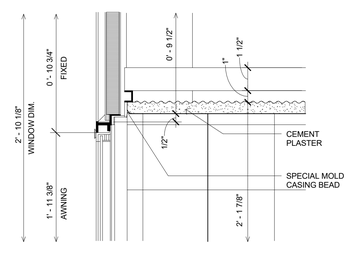
3 Window Head Detail at Restroom
3" = 1'-0"



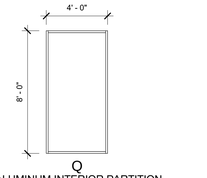
7 Window Jamb Detail
3" = 1'-0"



11 Window Jamb Detail 3
3" = 1'-0"

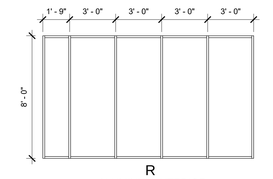


15 Window Intermediate Rail Detail
3" = 1'-0"



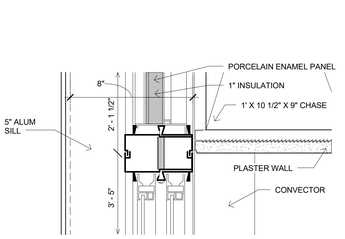
Q

ALUMINUM INTERIOR PARTITION
WITH TEMPERED GLASS,
ANODIZED

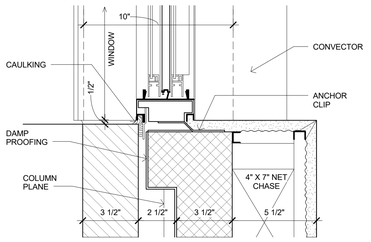


R

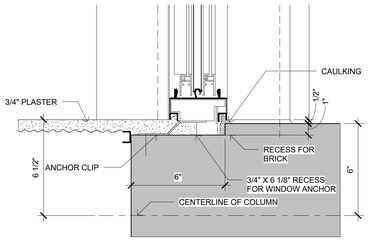
ALUMINUM INTERIOR
PARTITION WITH TEMPERED
GLASS, ANODIZED



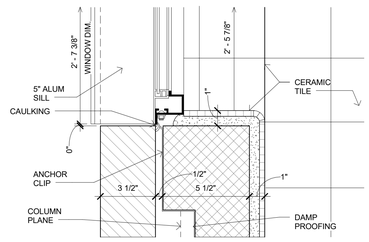
4 Window Mullion Detail
3" = 1'-0"



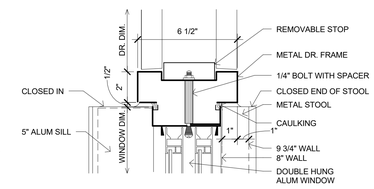
8 Window Jamb Detail 2
3" = 1'-0"



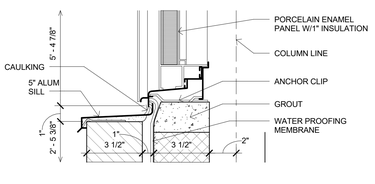
12 Window Jamb Detail 4
3" = 1'-0"



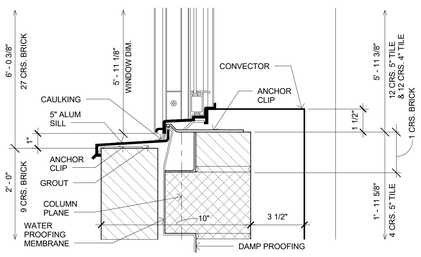
16 Window Jamb Detail 5
3" = 1'-0"



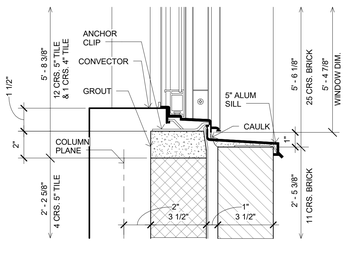
18 Window/Door Mullion Detail
3" = 1'-0"



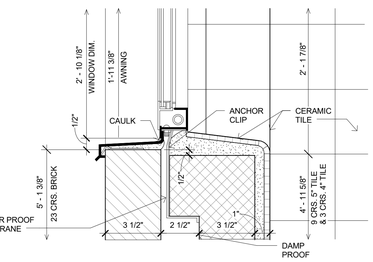
5 Window Sill Detail
3" = 1'-0"



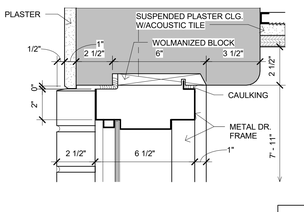
9 Window Sill Detail 2
3" = 1'-0"



13 Window Sill Detail 3
3" = 1'-0"



17 Window Sill Detail 4
3" = 1'-0"



19 Window Head Detail 5
3" = 1'-0"

DURAND–HOLLIS RUPE ARCHITECTS, INC.
14603 HUEBNER ROAD
BUILDING 18
SAN ANTONIO, TEXAS 78230
TEL. 210 308–0080
FAX. 210 697–3309
eMAIL OFFICE@DHRARCHITECTS.COM

OWNER:

SAHA SAN ANTONIO HOUSING AUTHORITY
Opportunity Lives Here

SAN ANTONIO HOUSING AUTHORITY
818 SOUTH FLORES STREET
SAN ANTONIO, TX 78204
T: 210.477.6262

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT
GABRIEL DURAND-HOLLIS
10681
STATE OF TEXAS
05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-1681

WINDOW TYPES & DETAILS

SHEET NUMBER
A-600

GENERAL NOTES

1. CONTRACTOR SHALL PROVIDE 1" OPERABLE BLINDS AT ALL WINDOW OPENINGS EXCEPT WINDOW TYPES "P" AND "N".

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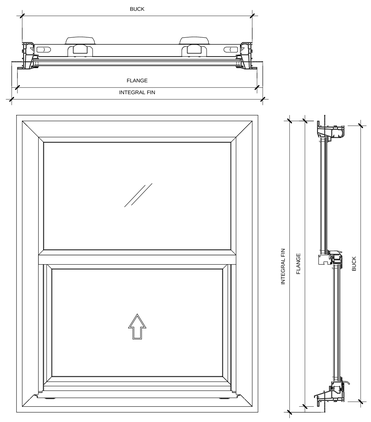


1 Window Detail AutoCAD
1 1/2" = 1'-0"

Window Schedule

Type Mark	Level	Height	Sill Height	Head Height	Width	Manufacturer	Count	Comments
27	Level 1	2' - 0"			3' - 0"		10	
28		2' - 6"			2' - 6"		4	
29	BASEMENT	3' - 4"	2' - 0"	5' - 4"	6' - 4"		1	
35	Level 1		2' - 10"	2' - 10"			1	
36	Level 1		2' - 10"	2' - 10"			1	
37	Level 1		2' - 10"	2' - 10"			1	
41	Level 1	3' - 0"	4' - 0"	7' - 0"	3' - 0"		1	
42	Level 1	6' - 0"	1' - 0"	7' - 0"	5' - 0"		1	
44	Roof Plan	5' - 1 1/4"	1' - 2"	6' - 3 1/4"	5' - 1 3/8"		5	
45	Roof Plan	5' - 1 1/4"	1' - 2"	6' - 3 1/4"	4' - 11"		1	
46	Roof Plan	5' - 1 1/4"	1' - 2"	6' - 3 1/4"	2' - 2"		1	
47	Level 11 - Penthouse	2' - 10"	-0' - 0 1/4"	2' - 9 3/4"	2' - 4"		3	
68		5' - 4"			3' - 9"		61	
69	Level 1	2' - 9"	5' - 3"	8' - 0"	3' - 0"		6	
70	Level 1	1' - 4"	6' - 8"	8' - 0"	3' - 6"		3	
71	Level 1	6' - 0"	2' - 0"	8' - 0"	3' - 0"		10	
75		7' - 10"			2' - 2"		9	
84		2' - 3 1/4"			2' - 7"		24	
112		5' - 4 7/8"			2' - 1 1/2"		18	
A					3' - 0"		560	
B		2' - 0 1/4"			2' - 7 5/8"		178	
C		5' - 4 7/8"			3' - 5"		51	
D		5' - 4 7/8"			3' - 4 1/4"		34	
E		5' - 4 7/8"			3' - 0"		483	
G		5' - 11 3/8"			3' - 8 3/4"		8	
H				7' - 11"	3' - 0"		34	
J		4' - 3 3/4"			3' - 0"		4	
K		2' - 10 3/4"			2' - 7"		48	
L		5' - 9 1/2"			2' - 7"		24	
P	Level 1	8' - 0"	0' - 0"	8' - 0"	4' - 3"	Kawneer	1	
Q	BASEMENT	3' - 0"	4' - 9 5/8"	7' - 9 5/8"	3' - 4 1/2"		1	
Y	Level 1	4' - 0"	2' - 9 3/4"	6' - 9 3/4"	3' - 0"		1	

DURAND–HOLLIS RUPE ARCHITECTS, INC.
14603 HUEBNER ROAD
BUILDING 18
SAN ANTONIO, TEXAS
78230
TEL. 210 308–0080
FAX. 210 697–3309
eMAIL OFFICE@DHRARCHITECTS.COM

OWNER:
SAN ANTONIO HOUSING AUTHORITY
818 SOUTH FLORES STREET
SAN ANTONIO, TX 78204
T: 210.477.6262

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT
GABRIEL DURAND-HOLLIS
10881
STATE OF TEXAS

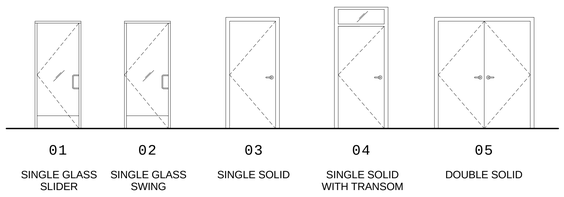
05/25/18

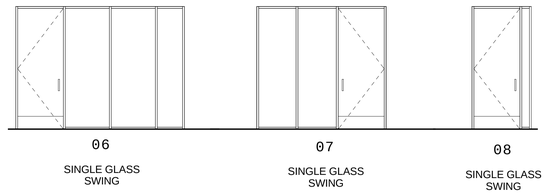
PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

WINDOW TYPES & DETAILS

SHEET NUMBER
A-600.1





1 Frame Types
1/4" = 1'-0"

Door Schedule

Mark	Level	Description	Height	Width	Thickness	Manufacturer	Finish	Frame Type	Frame Material	Count	Hardware Key #	Comments
100.B	Level 1	SOLID CORE SINGLE DOOR	7' - 0"	3' - 0"				03		6		
100.C	Level 1	SLIDING, TEMPERED GLASS DOOR IN GLASS PARTITION	8' - 0"	3' - 0"		C.R. LAURENCE		01		1	AE	SLIDING, TEMPERED GLASS DOOR IN GLASS PARTITION, REFERENCE A-500 INTERIOR ELEVATIONS.
100.D	Level 1	SOLID CORE SINGLE DOOR	7' - 0"	3' - 0"				03		1		
100.E	Level 1	SOLID CORE SINGLE DOOR	7' - 0"	3' - 0"	0' - 1 3/4"			03		1	AD	STANDARD OFFICE DOOR.
100.F	Level 1	SOLID CORE SINGLE DOOR	7' - 0"	3' - 0"	0' - 1 3/4"			03		1	AD	STANDARD OFFICE DOOR.
100.G	Level 1	SOLID CORE SINGLE DOOR	7' - 0"	3' - 0"	0' - 1 3/4"			01		2	AA	DOUBLE DOOR FOR MECHANICAL ROOM WITH PRIVACY LOCK.
100.H1	Level 1	SWING GLASS DOOR IN GLASS PARTITION	7' - 10 1/2"	2' - 11 3/4"		C.R. LAURENCE		06		1	AH	SWING, TEMPERED GLASS DOOR IN GLASS PARITION.
100.H2	Level 1	SWING GLASS DOOR IN GLASS PARTITION	7' - 10 1/2"	3' - 0"		C.R. LAURENCE		07		1	AH	SWING, TEMPERED GLASS DOOR IN GLASS PARITION.
100.H3	Level 1	SWING GLASS DOOR IN GLASS PARTITION	7' - 10 1/2"	3' - 0"		C.R. LAURENCE		08		1	AH	SWING, TEMPERED GLASS DOOR IN GLASS PARITION.
113.	Level 1	SLIDING, TEMPERED GLASS DOOR	6' - 10 5/8"	3' - 0"		C.R. LAURENCE		01		1	AF	SLIDING GLASS DOOR IN CONFERENCE ROOM.
117.	Level 2 thru 9	SLIDING, TEMPERED GLASS DOOR IN GLASS PARTITION	7' - 9 1/2"	3' - 0"		C.R. LAURENCE		01		1	AE	SLIDING, TEMPERED GLASS DOOR IN GLASS PARTITION, REFERENCE A-500 INTERIOR ELEVATIONS.
121.I	Level 2 thru 9	SOLID CORE DOOR	7' - 0"	3' - 0"	0' - 1 3/4"			03		1	AJ	UNIT BATHROOM DOOR WITH PRIVACY LOCK.
122.	Level 2 thru 9	SOLID CORE SINGLE DOOR	7' - 0"	3' - 0"	0' - 1 3/4"			03		1	AD	STANDARD OFFICE DOOR.
129.	Level 1	SLIDING, TEMPERED GLASS DOOR IN GLASS PARTITION	7' - 9 1/2"	3' - 0"		C.R. LAURENCE		01		1	AE	SLIDING, TEMPERED GLASS DOOR IN GLASS PARTITION, REFERENCE A-500 INTERIOR ELEVATIONS.
130.	Level 2 thru 9	SLIDING, TEMPERED GLASS DOOR IN GLASS PARTITION	7' - 9 1/2"	3' - 0"		C.R. LAURENCE		01		1	AE	SLIDING, TEMPERED GLASS DOOR IN GLASS PARTITION, REFERENCE A-500 INTERIOR ELEVATIONS.
175.	Level 1	SOLID CORE SINGLE DOOR	7' - 0"	3' - 0"				03		1		
200.A	Level 2 thru 9	SOLID CORE DOOR IN NEW FRAME	6' - 8"	3' - 0"	0' - 1 3/4"			04		32	AK	DOOR AND FRAME FOR END UNITS X01, X02, X14 & X15, REPEAT DOOR ON LEVELS 2 THRU 9.CORRIDNIATE ON FIELD
200.B	Level 2 thru 9	SOLID CORE DOOR PANEL IN EXSITING FRAME	6' - 8"	2' - 10"	0' - 1 3/8"			NONE	EXISTING TO REMAIN	152	AL	DOOR PANEL FOR UNITS AS NOTED, REPEAT PANEL REPLACEMENT ON LEVELS 2 THRU 9. TRANSOM TO BE REPLACED. DOOR FRAME TO REMAIN - SAND AND REPAINT FRAME.
200.C	Level 2 thru 9	SOLID CORE DOUBLE DOOR	7' - 0"	4' - 0"	0' - 1 3/4"			05		8	AB	DOUBLE DOOR FOR ELECTRICAL ROOM REPEATS ON LEVELS 2 THRU 9.

Hardware Sets

SET #AA - 2 total - Mechanical Rooms

Doors: 100G

6	Hinges	5BB1 4 1/2 x 4 1/2 NRP	652	IV
2	Flush Bolt	FB458	US26D	IV
1	Dust Proof Strike	DP2	US26D	IV
1	Lockset	8581PD D	626	FL
1	Coordinator	3780	S1	AB
2	Door Closer	SC61A RW/PA	689	FL
2	Wall Bumper	WS406CCV	US32D	IV
1	Astragal	1392 SP 84"		NA
2	Door Silencer	SR64	GRY	IV

SET #AB - 8 total - Electrical Rooms

Doors: 200C

6	Hinges	5BB1 4 1/2 x 4 1/2 NRP	652	IV
2	Flush Bolt	FB458	US26D	IV
1	Dust Proof Strike	DP2	US26D	IV
1	Lockset	8581PD D	626	FL
1	Coordinator	3780	S1	AB
2	Door Closer	SC61A RW/PA	689	FL
2	Wall Bumper	WS406CCV	US32D	IV
1	Astragal	1392 SP 84"		NA
2	Door Silencer	SR64	GRY	IV

SET #AC - 1 total - Suite Entrance

Doors: 100A

3	Hinges	5BB1 4 1/2 x 4 1/2 NRP	652	IV
1	Lockset	B511PD D	626	FL
1	Door Closer	SC61A RW/PA	689	FL
1	Wall Bumper	WS406CCV	US32D	IV
3	Door Silencer	SR64	GRY	IV

SET #AD - 9 total - Standard Office

Doors: 100B

3	Hinges	5BB1 4 1/2 x 4 1/2 NRP	652	IV
1	Lockset	B511PD D	626	FL
1	Wall Bumper	WS406CCV	US32D	IV
3	Door Silencer	SR64	GRY	IV

SET #AE - 5 total - Offices - CR Laurence

Doors: 100C

1	Mortise Cylinder	986	626	FL
1	Door Pull	RM3100 24" OA	US32D	RO

NOTE: BALANCE OF HARDWARE BY DOOR SUPPLIER

SET #AF - 1 total - Conference Room - CR Laurence

Doors: 100D

1	Mortise Cylinder	986	626	FL
1	Door Pull	RM3100 24" OA.	US32D	RO

NOTE: BALANCE OF HARDWARE BY DOOR SUPPLIER

SET #AG - 2 total - Restrooms - Privacy

Doors: 100E

3	Hinges	5BB1 4 1/2 x 4 1/2	652	IV
1	Privacy Set	B3015 D	626	FL
1	Wall Bumper	WS406CCV	US32D	IV
1	Gasketing	2525 B-17 17'		NA

SET #AH - 3 total - Offices - CR Laurence

Doors: 100H

2	Mortise Cylinder	986	626	FL
2	Door Pull	RM3100 24" OA.	US32D	RO

SET #AJ - 1 total - Unit Bath - Privacy

Doors: 121.I

3	Hinges	5BB1 4 1/2 x 4 1/2	652	IV
1	Privacy Set	B3015 D	US32D	FL
1	Wall Bumper	WS406CCV	626	IV
1	Gasketing	2525 B-17 17'		NA

SET #AK - 32 total - Entrance Doors to End Units

Doors: 200A

3	Hinges	5BB1 4 1/2 x 4 1/2 NRP	652	IV
1	Deadlock	D261	626	FL
1	Lockset	H101P6 D	630	FL
1	Door Closer	SC61A RW/PA	689	FL
1	Wall Bumper	WS406CCV	US32D	IV
1	Gasketing	2525 B-17 17'		NA

SET #AL - 152 TOTAL ENTRANCE DOORS

Doors: 200B

3	Hinges	5BB1 4 1/2 x 4 1/2 NRP	652	IV
1	Deadlock	D261	626	FL
1	Lockset	H101P6 D	630	FL
1	Door Closer	SC61A RW/PA	689	FL
1	Wall Bumper	WS406CCV	US32D	IV
1	Gasketing	2525 B-17 17'		NA

HARDWARE GENERAL NOTES

1. VERIFY KEYING REQUIRMENETS AND PROVIDE LOCKS KEYED TO THE EXISTING SYSTEM OR AS REQUIRED BY SAN ANTONIO HOUSING AUTHORITY.
2. PROVIDE A MINIMUM TWO (2) YEARS WARRANTY ON ALL HARDWARE PROUCTS PROVIDED.

HARDWARE LEGEND

Manufacturer List

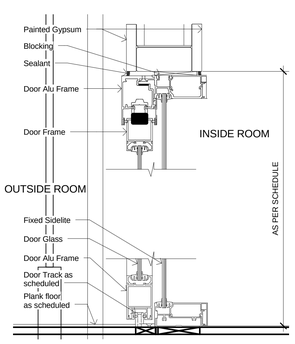
Code	Name
AB	ABH Manufacturing Inc.
FL	Falcon Lock
IV	Ives
NA	National Guard
RO	Rockwood

Option List

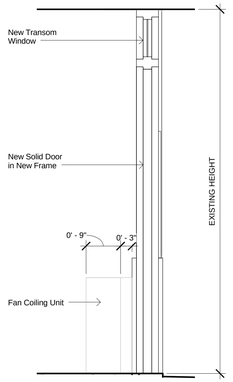
Code	Description
NRP	NRP (Steel Hinge - 4 1/2 x 4 1/2 only)

Finish List

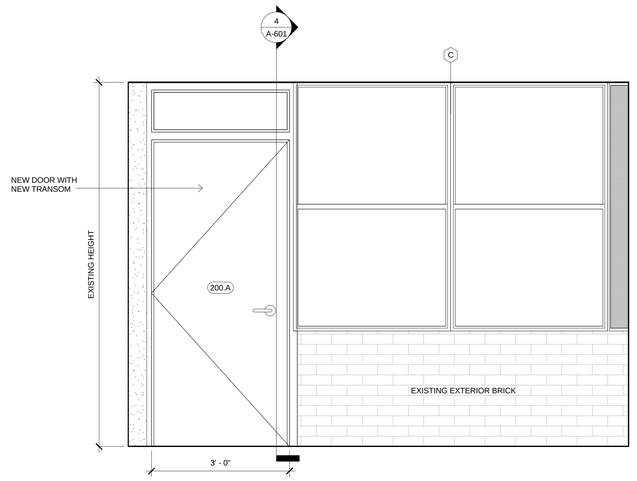
Code	Description
S1	Sprayed Aluminum Finish
626	Satin Chromium Plated
630	Satin Stainless Steel
652	Satin Chromium Plated
689	Aluminum Painted
GRY	Grey
US26D	Chromium Plated, Dull
US32D	Stainless Steel, Dull



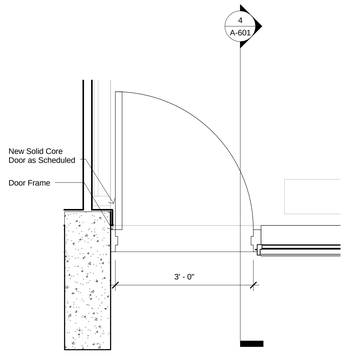
5 Typ. Sliding Door Detail
3" = 1'-0"



4 Typical Section Thru Door 200.A
3/4" = 1'-0"



3 Unit Front Entrance Elevation
3/4" = 1'-0"



2 New Door Detail - Plan View
3/4" = 1'-0"

DURAND–HOLLIS RUPE ARCHITECTS, INC.
14603 HUEBNER ROAD
BUILDING 18
SAN ANTONIO, TEXAS 78230
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FAX. 210 697–3309
eMAIL OFFICE@DHRARCHITECTS.COM

OWNER:

SAN ANTONIO HOUSING AUTHORITY
818 SOUTH FLORES STREET
SAN ANTONIO, TX 78204
T: 210.477.6262

LOCATION:

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS

ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT — GABRIEL DURAND-HOLLIS — 19491-1 — STATE OF TEXAS

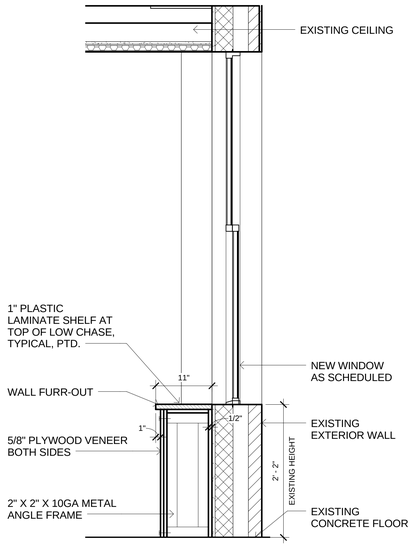
05/25/18

PERMIT SET

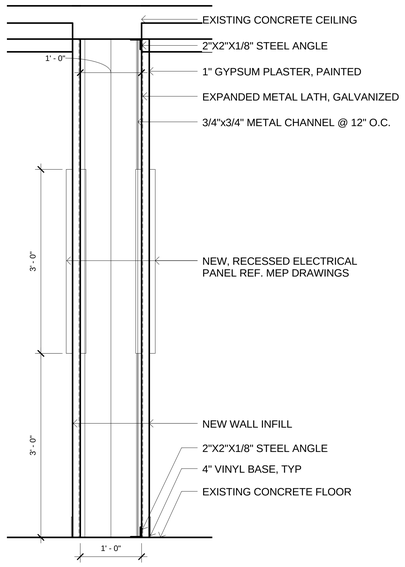
PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10-967

DOOR TYPES & HARDWARE

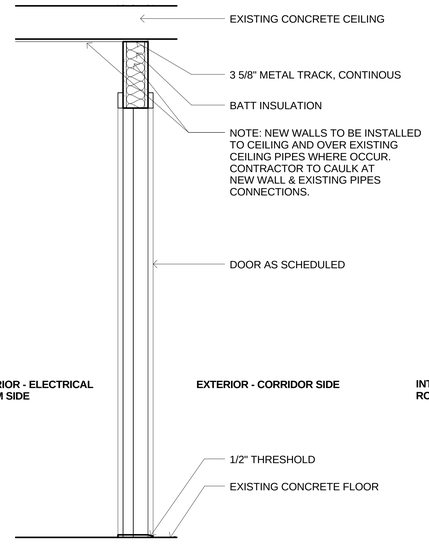
SHEET NUMBER
A-601



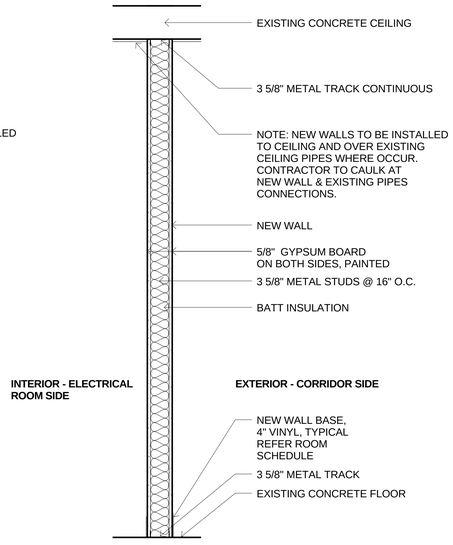
4 Section thru Pipe Conceal Furr-Out
1" = 1'-0"



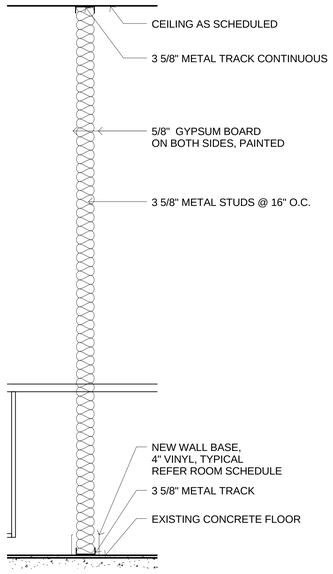
3 Section thru Wall @ Residential Units
1" = 1'-0"



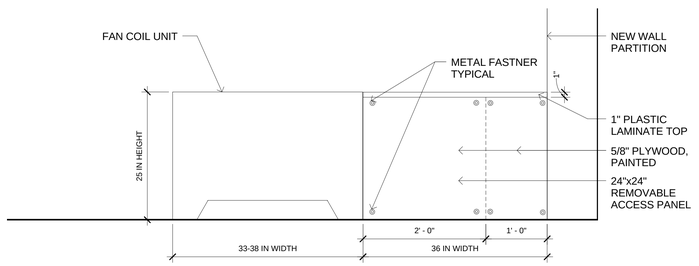
2 Section thru Door
1" = 1'-0"



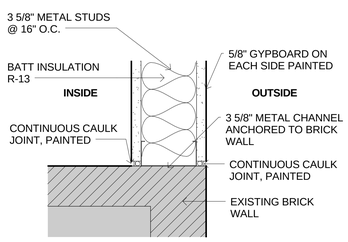
1 Interior Partition - Electrical Room
1" = 1'-0"



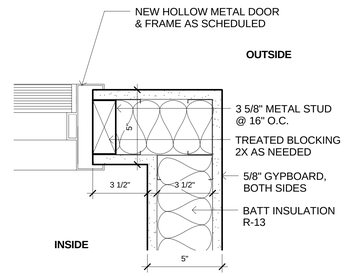
9 Interior Partition - Insulated - B
1" = 1'-0"



5 Typical Pipe Conceal Elevation
1" = 1'-0"



7 Enlarged Wall Connection Detail - Plan View
3" = 1'-0"



6 Enlarged Door Detail - Plan View
3" = 1'-0"

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SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION

LOCATION: 411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS

ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT GABRIEL DURAND-HOLLIS 10881-1 STATE OF TEXAS

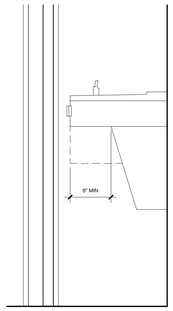
05/25/18

PERMIT SET

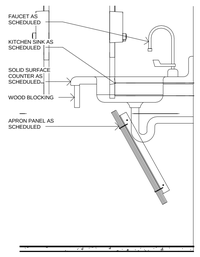
PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10-881

DETAILS

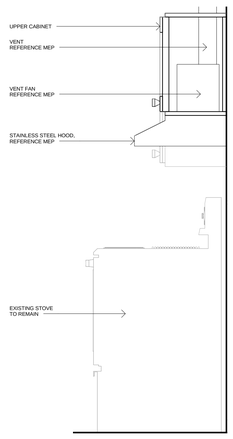
SHEET NUMBER
A-700



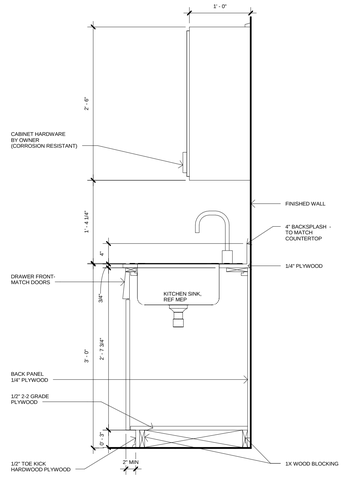
5 Section thru Driking Fountain
1" = 1'-0"



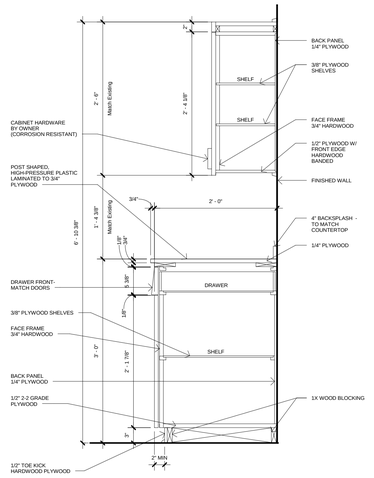
4 Section thru Accessible Breakroom Sink
1" = 1'-0"



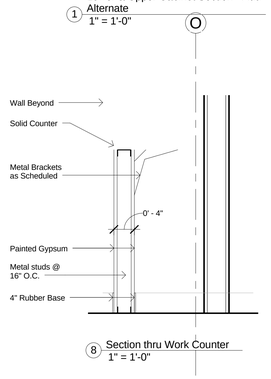
7 Section thru Vent Hood
1" = 1'-0"



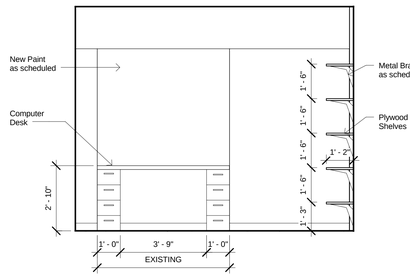
2 Sink Section - Add Alternate
1" = 1'-0"



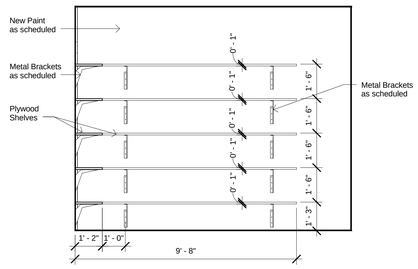
1 Lower & Upper Cabinet Section - Add Alternate
1" = 1'-0"



8 Section thru Work Counter
1" = 1'-0"



6 Elevation #6 - West Wing
3/8" = 1'-0"



3 Elevation #5 - West Wing
3/8" = 1'-0"

CABINET CONSTRUCTION FOR HUD SEVERE USE

HUD KITCHEN CABINETSUSE SOLID HARDWOOD MATERIAL AND MEET "SEVERE USE" SPECIFICATIONS.

CABINETS TO BE TESTED & CERTIFIED BY THE KITCHEN CABINET MANUFACTURERS ASSOCIATION.

MANUFACTURERS ASSOCIATION (KCMA) DEVELOP NATIONAL PERFORMANCE STANDARD, ANSI/KCMA A161.1 & NATIONALLY RECOGNIZED TESTING & CERTIFICATION PROGRAM UTILIZING INDEPENDENT LABORATORIES.

CABINET CONSTRUCTION MEETS THE HUD-SEVERE USE CRITERIA & REFERENCES ANSI/HPMA HP 1983.

CABINET CONSTRUCTION CRITERIA

FACE FRAMES - 3/4" KILN DRIED HARDWOOD WITHOUT KNOTS & CHOSEN FOR TIGHT UNIFORM COLOR, MAKING IT FIT FOR A NATURAL FINISH.

THE FRAMES ARE TO BE GLUED, SCREWED, FILLED AND SANDED FOR LONG-TERM STRENGTH & RIGIDITY. THE STILES MUST BE 2 INCHES WIDE & MULLS 2 INCHES MIN. RAILS 2 INCHES WIDE.

END PANELS - THE EXPOSED ENDS OF THE CABINETS TO BE MADE OF 2- 2 GRADE, 1/2 IN THICK 5-PLY HARDWOOD PLYWOOD. THE CABINET ENDS THAT ARE NOT EXPOSED - 1/2 IN SOFTWOOD PLYWOOD.

BACK PANELS - 1/4" PLYWOOD IS GLUED OR NAILED OR STAPLED STRONGLY & SECURELY TO CABINET CLEATS, ENDS AND SHELVES.

WALL CABINET BOTTOMS - 1/2 IN PLYWOOD WITH A FRONT EDGE HARDWOOD BANDED.
BASE BOTTOMS - 1/2 IN PLYWOOD 2-2 GRADE PLYWOOD. THE BOTTOM SHALL BE HELD UP BY 3/4 IN THICK TOUGH LUMBER BRACES THAT ARE PRESSURE TREATED.

DRAWERS - THE FRONT PROFILE OF THE DRAWERS SHOULD MATCH THE DOOR'S PROFILE. THE SIDE & BACK PORTIONS TO BE CONSTRUCTED OF MIN. 11/16 IN SOLID LUMBER WITH 4 SIDED DRAWER BOX THAT IS MADE WITH LOCKING JOINTS.
FRONT OF DRAWERS - SCREWED & GLUED TO THE DRAWER BOX & THE BOTTOM MUST BE DADOED INTO THE 4 SIDES.
BOTTOM OF DRAWERS - 1/4" PLYWOOD MIN. ALL PARTS TO BE GLUED & STAPLED OR NAILED TOGETHER. THE DRAWERS TO BE MOUNTED ON A PAIR OF METAL SIDE RAILS THAT ARE BALL-BEARING & WITH 75 LB. CAPASITY.

HARDWARE - MUST BE CORROSION RESISTANT. ALL HINGES TO BE FULL-WRAP, PARTIALLY-CONCEALED.

FINISH - THE EXPOSED SURFACES & INTERIOR SHOULD BE FACTORY FINISHED.

COUNTERTOPS - POST SHAPED, HIGH-PRESSURE PLASTIC LAMINATED TO 3/4" PLYWOOD. THE ENDS & COUNTERTOP'S BOTTOM FRONT EDGE MUST HAVE A FIRM WOOD MOULD. THE EDGE OF THE COUNTERTOP MUST BE NO-DRIP.

REQUIREMENTS FOR EARNING THE KCMA CERTIFICATION SEAL

ALL CABINETS MUST BE FULLY ENCLOSED WITH BACKS, BOTTOMS, SIDES, & TOPS ON WALL CABINETS; & BACKS, BOTTOMS & SIDES ON BASE CABINETS, WITH CERTAIN SPECIFIED EXCEPTIONS ON KITCHEN SINK FRONTS, SINK BASES, OVEN CABINETS & REFRIGERATOR CABINETS. ALL CABINETS DESIGNED TO REST ON THE FLOOR MUST BE PROVIDED WITH A TOE SPACE AT LEAST 2 IN DEEP & 3 IN HIGH.

ALL UTILITY CABINETS MUST MEET THE SAME CONSTRUCTION REQUIREMENTS AS WALL CABINETS.

DOORS MUST BE PROPERLY ALIGNED, HAVE MEANS OF CLOSURE, AND CLOSE WITHOUT EXCESSIVE BINDING OR LOOSENESS.

ALL MATERIALS MUST ENSURE RIGIDITY IN COMPLIANCE WITH PERFORMANCE STANDARDS.

FACE FRAMES, WHEN USED, MUST PROVIDE RIGID CONSTRUCTION.

FOR FRAMELESS CABINETS, THE ENDS, TOPS/BOTTOMS, AND BACK SHALL BE OF THICKNESS NECESSARY TO PROVIDE RIGID CONSTRUCTION.

CORNER OR LINEAR BRACING MUST BE PROVIDED AT POINTS WHERE NECESSARY TO ENSURE RIGIDITY AND PROPER JOINING OF VARIOUS COMPONENTS.

ALL WOOD PARTS MUST BE DRIED TO A MOISTURE CONTENT OF 10% OR LESS AT THE TIME OF FABRICATION.

ALL INTERIOR EXPOSED SURFACES SHALL BE FREE OF SAW MARKS AND POOR WORKMANSHIP, AND SHALL BE COVERED WITH A LAMINATE MATERIAL OR HAVE A MIN OF 1 COAT OF CLEAR OR PIGMENTED FINISH.

EXPOSED CABINET HARDWARE MUST COMPLY WITH BUILDERS HARDWARE MANUFACTURING ASSOCIATION FINISHING STANDARDS.

ALL EXTERIOR EXPOSED SURFACES & EDGES EXCEPT THE EDGES OF END PANELS & THE EDGES OF BACK PANELS, SHALL BE FREE OF SAW MARKS & OTHER IMPERFECTIONS & SHALL BE FILLED & SANDED, EDGE-BANDED, OR OTHERWISE FINISHED TO ENSURE COMPLIANCE WITH THE PERFORMANCE STANDARDS.

ALL EXTERIOR EXPOSED PARTS OF CABINETS MUST HAVE NAILS & STAPLES SET & HOLES FILLED.

ALL EXPOSED CONSTRUCTION JOINTS MUST BE FITTED IN A WORKMAN-LIKE MANNER CONSISTENT WITH SPECIFICATIONS.

FOR A LISTING OF CERTIFIED CABINET MANUFACTURERS COMPLYING WITH ANSI/KCMA A161.1, PLEASE REFER TO THE 2008 KCMA DIRECTORY OF CERTIFIED CABINET MANUFACTURERS AT WWW.KCMA.ORG.

DURAND–HOLLIS RUPE ARCHITECTS, INC.
14603 HUEBNER ROAD
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TEL. 210 308–0080
FAX. 210 697–3309
eMAIL OFFICE@DHRARCHITECTS.COM

OWNER:
SAN ANTONIO HOUSING AUTHORITY
818 SOUTH FLORES STREET
SAN ANTONIO, TX 78204
T: 210.477.6262

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

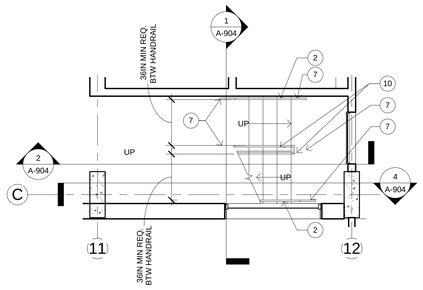
REGISTERED ARCHITECT — GABRIEL DURAND-HOLLIS — 19891 — STATE OF TEXAS
05/25/18

PERMIT SET

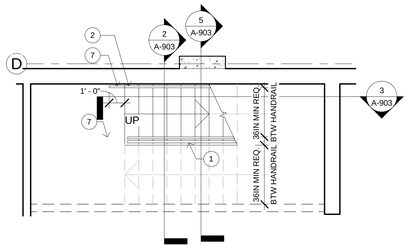
PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 19–881

MILLWORK & DETAILS

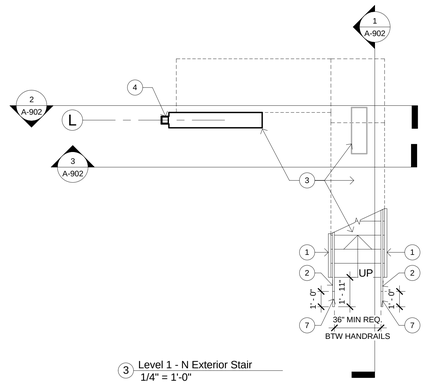
SHEET NUMBER
A-701



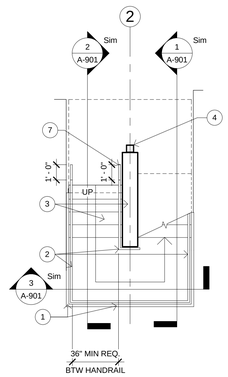
14 BASEMENT - Exterior Stair #2
1/4" = 1'-0"



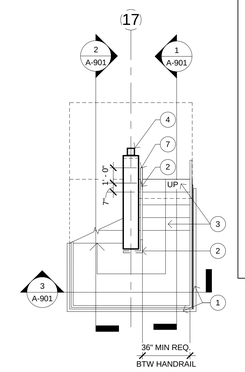
13 BASEMENT - Interior Stair #1
1/4" = 1'-0"



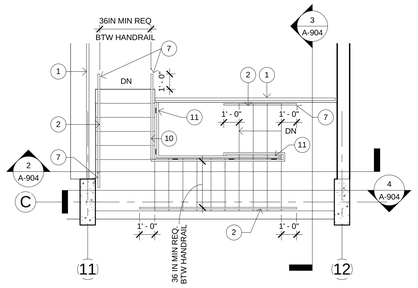
3 Level 1 - N Exterior Stair
1/4" = 1'-0"



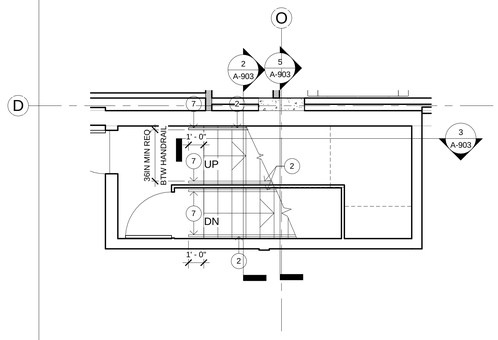
2 Level 1 - NW Exterior Stair
1/4" = 1'-0"



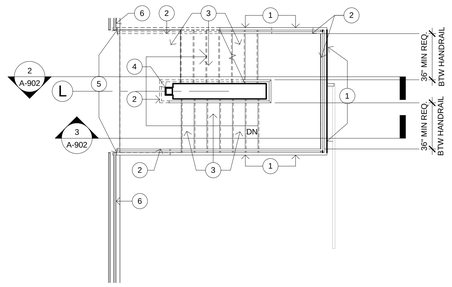
1 Level 1 - NE Exterior Stair
1/4" = 1'-0"



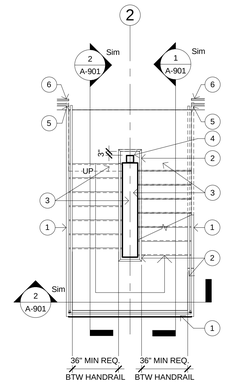
15 Level 1 - Exterior Stair #2
1/4" = 1'-0"



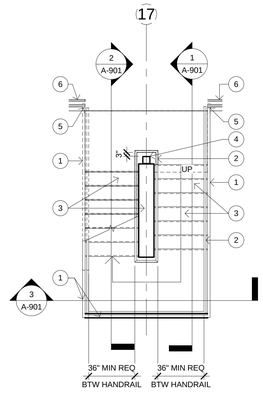
4 Level 1 - Interior Stair #1
1/4" = 1'-0"



7 Level 2 thru 9 - N Exterior Stair
1/4" = 1'-0"

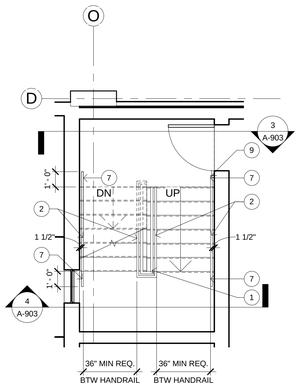


6 Level 2 thru 9 - NW Exterior Stair
1/4" = 1'-0"

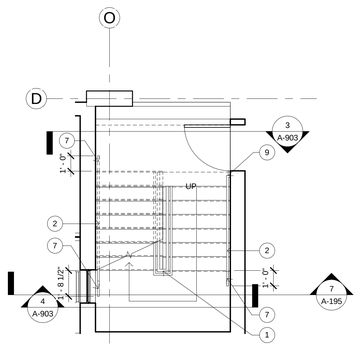


5 Level 2 thru 9 - NE Exterior Stair
1/4" = 1'-0"

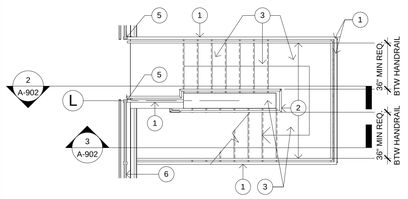
DUE TO EXISTING STAIR CLEARANCE LIMITATION, THE HANDRAILS NEED TO BE 1 1/4" IN DIAMETER TO MAINTAIN REQUIRED 36" CLEAR WIDTH BETWEEN NEW HANDRAILS.



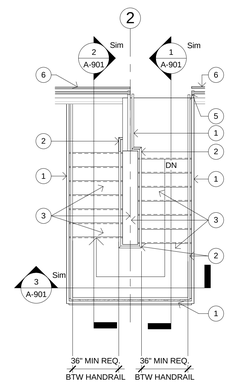
8 Level 2 thru 9 - Interior Stair #1
1/4" = 1'-0"



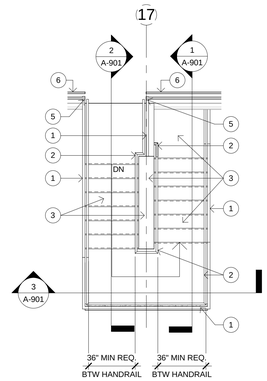
12 Level 10 - Interior Stair #1
1/4" = 1'-0"



11 Level 10 - N Exteror Stair
1/4" = 1'-0"



10 Level 10 - NW Exterior Stair
1/4" = 1'-0"



9 Level 10 - NE Exterior Stair
1/4" = 1'-0"

KEYED NOTES

1. NEW METAL GUARDRAIL, 42" H
2. NEW METAL HANDRAIL, 34" H
3. EXISTING CONCRETE COLUMN AND STAIR TO REMAIN
4. EXISTING DOWNSPOUT TO REMAIN
5. CONNECTION OF NEW GUARDRAIL TO EXISTING GUARDRAIL
6. EXISTING GUARDRAIL/HANDRAIL TO REMAIN
7. 12 IN HANDRAIL EXTENSIONS
8. NOT USED
9. HANDRAILS TERMINATES INTO WALL BY THE EXISTING DOOR FRAME
10. INSTALL HANDRAILS ONLY DUE TO STAIR CLEARANCE
11. PROVIDE "NARROW" 2" X 1 1/2" STEEL TUBE GUARD RAIL FRAME TO ACCOMODATE REQUIRED CLEARANCES

* UNLESS NOTED OTHERWISE, ALL HANDRAILS ARE 1 1/2" IN DIAMETER.

* CONCTRACTOR SHALL FIELD VERIFY EXISTING STAIR CONDITIONS & DIMENSIONS

DURAND–HOLLIS RUPE ARCHITECTS, INC.
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SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS

ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT — GABRIEL DURAND-HOLLIS — 19491 — STATE OF TEXAS

05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 19-681

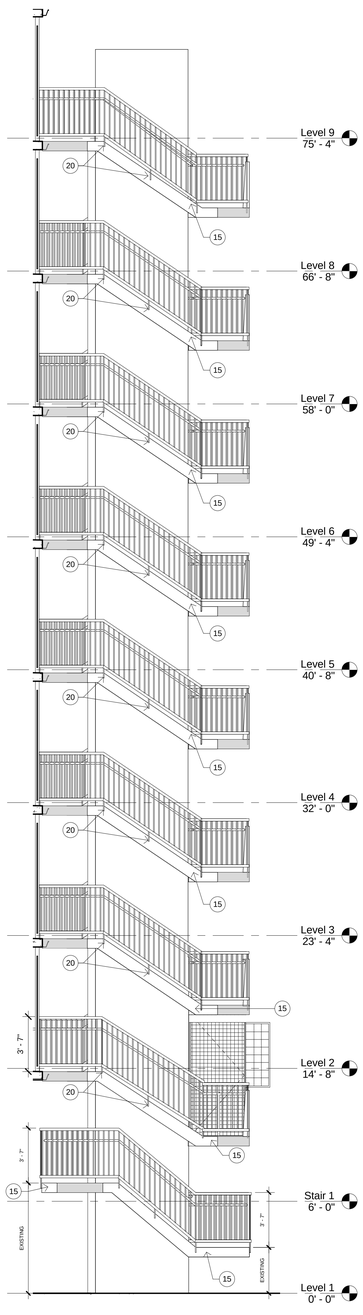
STAIR PLAN, SECTIONS, & DETAILS

SHEET NUMBER
A-900

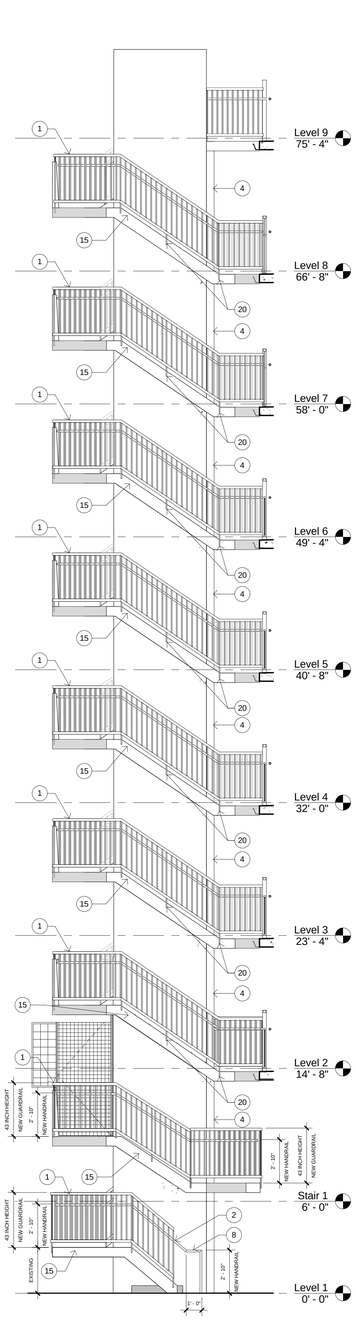
PLEASE NOTE: SHEET A-901 ILLUSTRATES NORTHEAST STAIR SECTIONS & ELEVATIONS DETAILS. THESE SAME DETAILS APPLY TO NORTHWEST STAIR AS WELL.

KEYED NOTES

1. NEW METAL GUARDRAIL, 42" H
2. NEW METAL HANDRAIL, 34" H
3. EXISTING METAL CAGE TO REMAIN
4. EXISTING METAL DOWNSPOUT TO REMAIN
5. EXISTING CONCRETE GUARD TO REMAIN
6. EXISTING GUARDRAIL TO REMAIN
7. EXISTING CORRIDOR HANDRAIL TO REMAIN
8. HANDRAIL EXTENTION 12"
9. HANDRAIL TO EXTEND AROUND EXISTING METAL GUTTER. REFERENCE FLOOR PLAN SHEET A-900
10. 1/2" THICK METAL PLATE BOLTED INTO EXISTING CONCRETE STAIR FOR NEW GUARDRAIL SUPPORT
11. NEW CHANNEL 4"X4.5" ON TOP OF EXISTING CONCRETE GUARD
12. NEW GUARDRAIL TO TIE INTO EXISTING GUARDRAIL
13. NEW RAILING POSTS EXTEND TO ATTACH TO EXISTING CONCRETE STAIR
14. NEW RAILING SUPPORTED BY CHANNEL
15. NEW RAILING ATTACHED TO THE 1/2" METAL PLATES BOLTED INTO EXISTING CONCRETE STAIR. REFERENCE STRUCTURAL FOR DETAILS
16. OPENING IN METAL CAGE FOR HANDRAIL
17. WALL HANDRAIL TO STOP AT CORNER DUE TO EXISTING DOOR
18. NEW HANDRAIL TO TIE TO EXISTING HANDRAIL
19. CONTINUOUS HANDRAIL
20. POSTS EXTEND BELOW AND TIE INTO METAL PLATE, REF. STRUCTURAL



10 Levels 1 thru 9 - West Elevation
1/4" = 1'-0"



9 Levels 1 thru 9 - East Elevation
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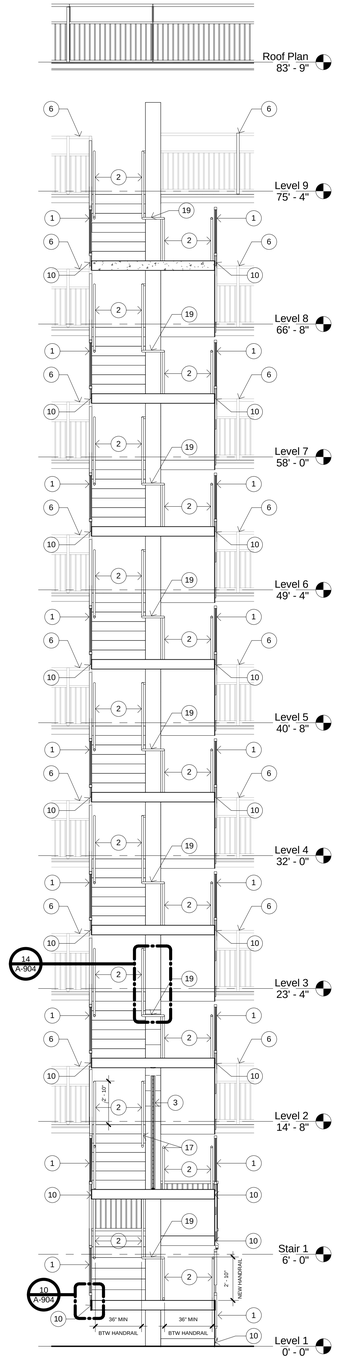
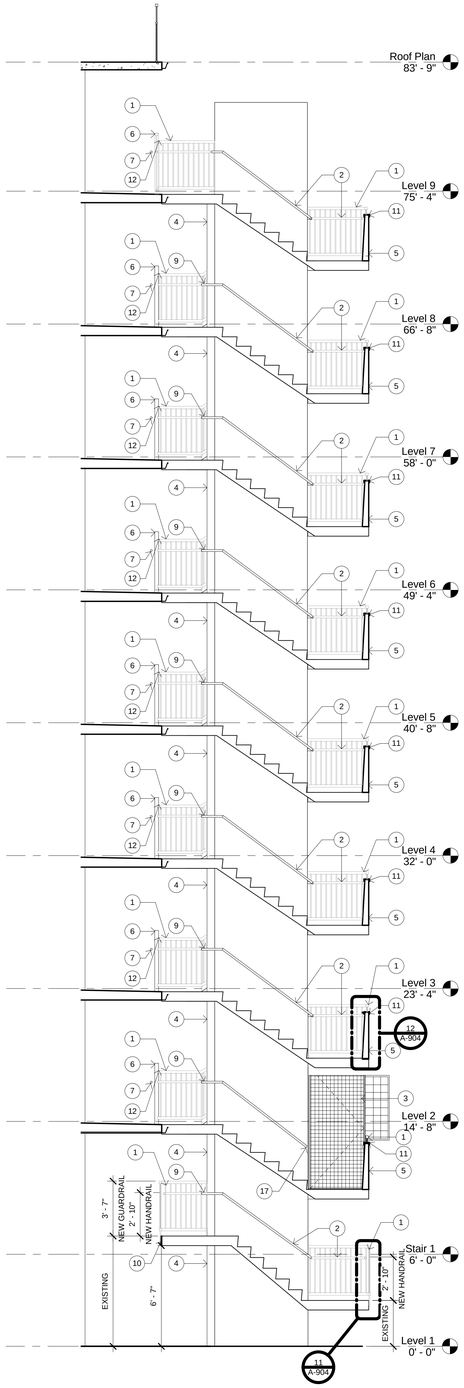
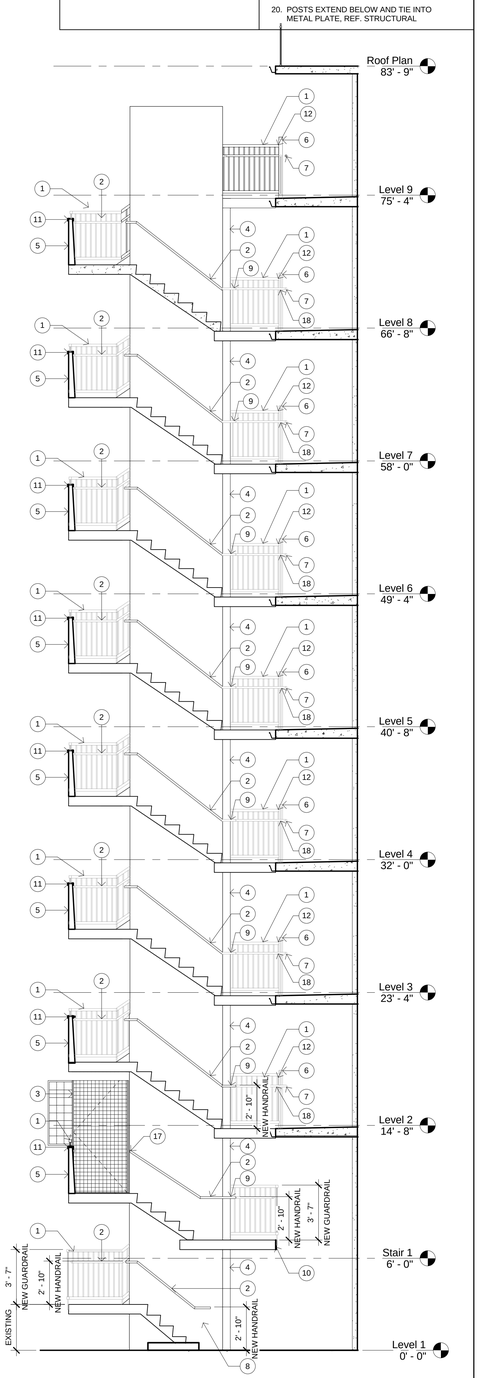


3 Levels 1 thru 9 - Section #3 - Thru NE Stair
1/4" = 1'-0"



2 Levels 1 thru 9 - Section #2 - Thru NE Stair
1/4" = 1'-0"



1 Levels 1 thru 9 - Section #1 - Thru NE Stair
1/4" = 1'-0"

DURAND–HOLLIS RUPE ARCHITECTS, INC.
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SAN ANTONIO, TEXAS
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SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT
GABRIEL DURAND-HOLLIS
20881-1
STATE OF TEXAS

05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

STAIR PLAN, SECTIONS, & DETAILS

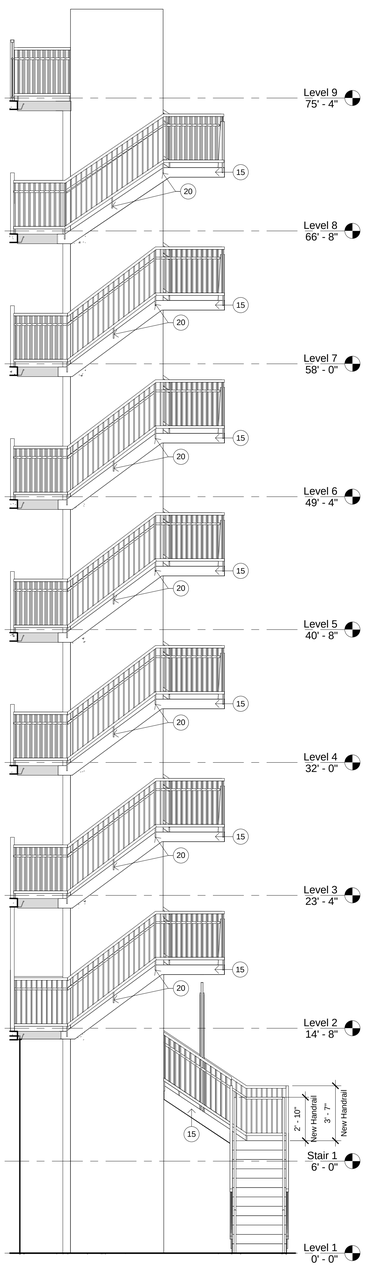
SHEET NUMBER

A-901

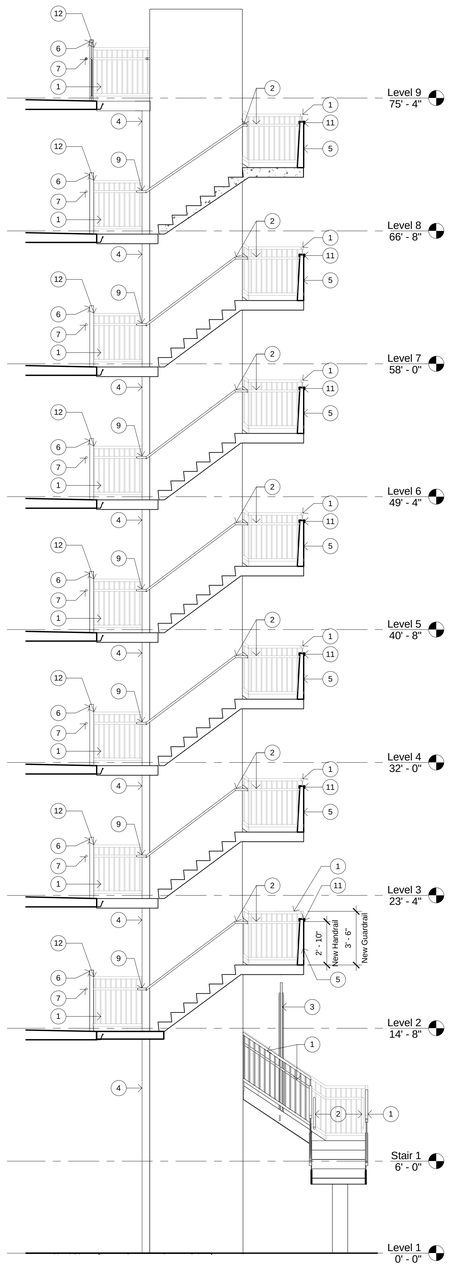
5/24/2018 | 12:30 PM C:\Users\jc.perez\Desktop\SAHA - Victoria Plaza - PERMIT SET_05-04-18\Geometry1.rvt

KEYED NOTES

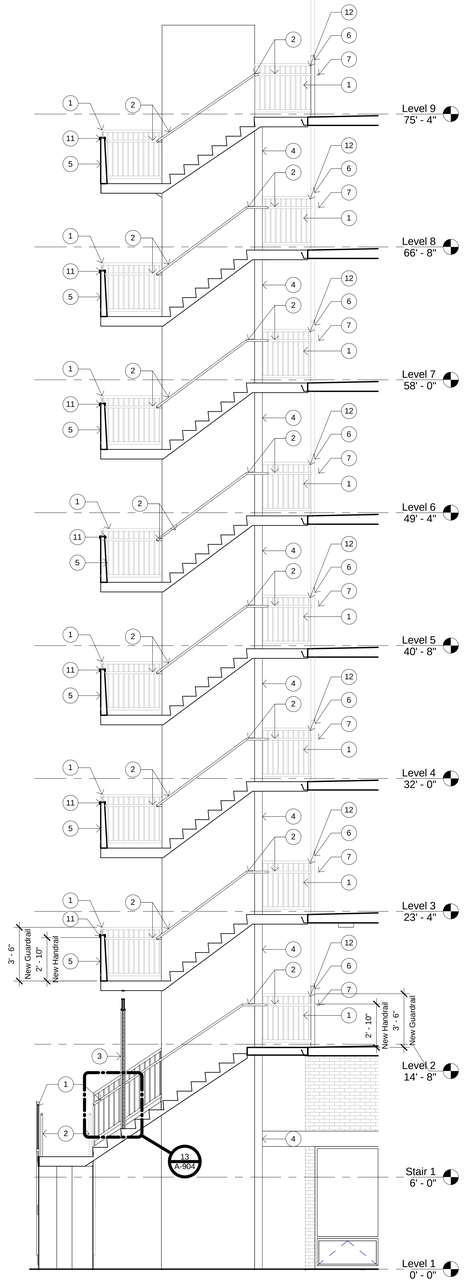
1. NEW METAL GUARDRAIL, 42" H
2. NEW METAL HANDRAIL, 34" H
3. EXISTING METAL CAGE TO REMAIN
4. EXISTING METAL DOWNSPOUT TO REMAIN
5. EXISTING CONCRETE GUARD TO REMAIN
6. EXISTING GUARDRAIL TO REMAIN
7. EXISTING COORRIDOR HANDRAIL TO REMAIN
8. HANDRAIL EXTENTION 12"
9. HANDRAIL TO EXTEND AROUND EXISTING METAL GUTTER. REFERENCE FLOOR PLAN SHEET A-900
10. 1/2" THICK METAL PLATE BOLTED INTO EXISTING CONCRETE STAIR FOR NEW GUARDRAIL SUPPORT
11. NEW CHANNEL 4"X4.5" ON TOP OF EXISTING CONCRETE GUARD
12. NEW GUARDRAIL TO TIE INTO EXISTING GUARDRAIL
13. NEW RAILING POSTS EXTEND TO ATTACH TO EXISTING CONCRETE STAIR
14. NEW RAILING SUPPORTED BY CHANNEL
15. NEW RAILING ATTACHED TO THE 1/2" METAL PLATES BOLTED INTO EXISTING CONCRETE STAIR. REFERENCE STRUCTURAL FOR DETAILS
16. OPENING IN METAL CAGE FOR HANDRAIL
17. WALL HANDRAIL TO STOP AT CORNER DUE TO EXISTING DOOR
18. NEW HANDRAIL TO TIE TO EXISTING HANDRAIL
19. CONTINUOUS WALL HANDRAIL
20. POSTS EXTEND BELOW AND TIE INTO METAL PLATE, REF. STRUCTURAL



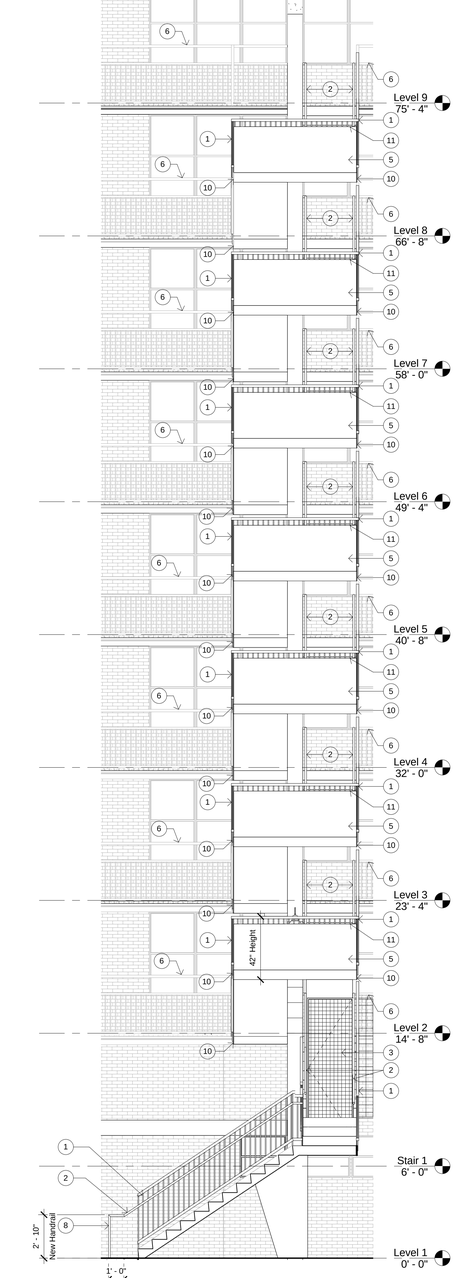
6 Levels 1 thru 9 - Elevation 2 - South
1/4" = 1'-0"



3 Levels 1 thru 9 - Section #3 - Thru North Stair
1/4" = 1'-0"



2 Levels 1 thru 9 - Section #2 - Thru North Stair
1/4" = 1'-0"



1 Levels 1 thru 9 - Section #1 - Thru North Stair
1/4" = 1'-0"

DURAND–HOLLIS RUPE ARCHITECTS, INC.
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818 SOUTH FLORES STREET
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SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION

LOCATION: 411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS

ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT — GABRIEL DURAND-HOLLIS — 20681 — STATE OF TEXAS

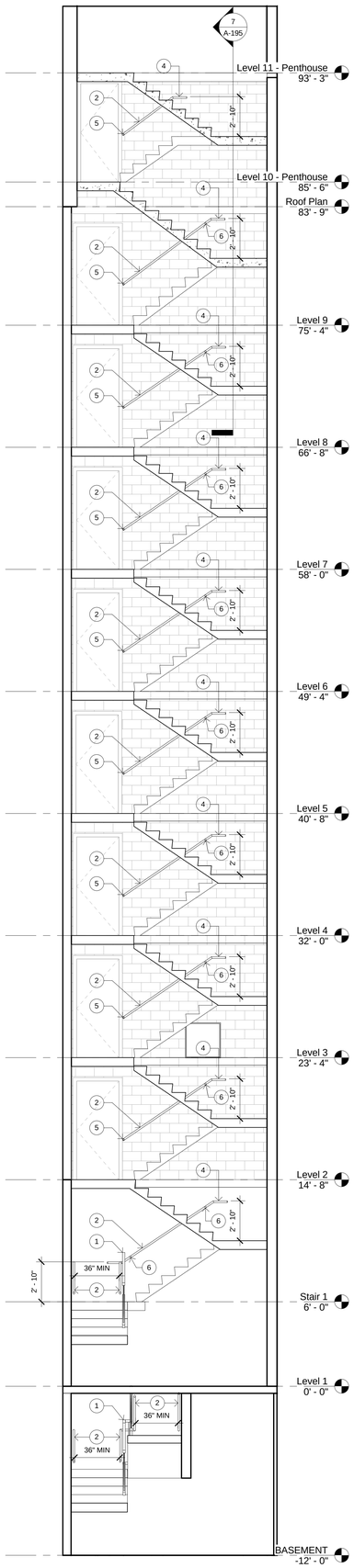
05/25/18

PERMIT SET

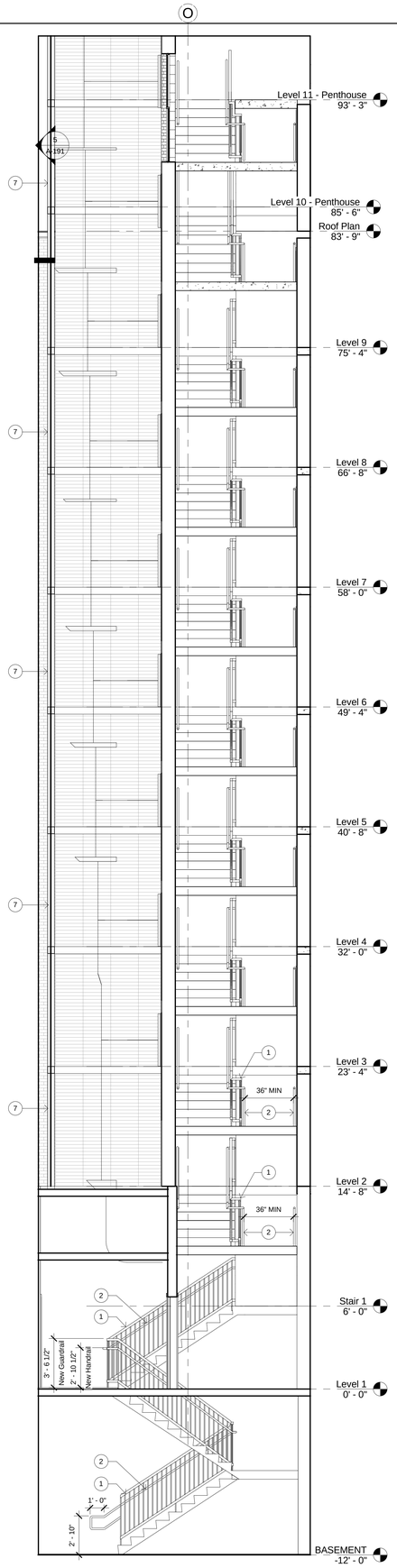
PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

STAIR PLAN, SECTIONS, & DETAILS

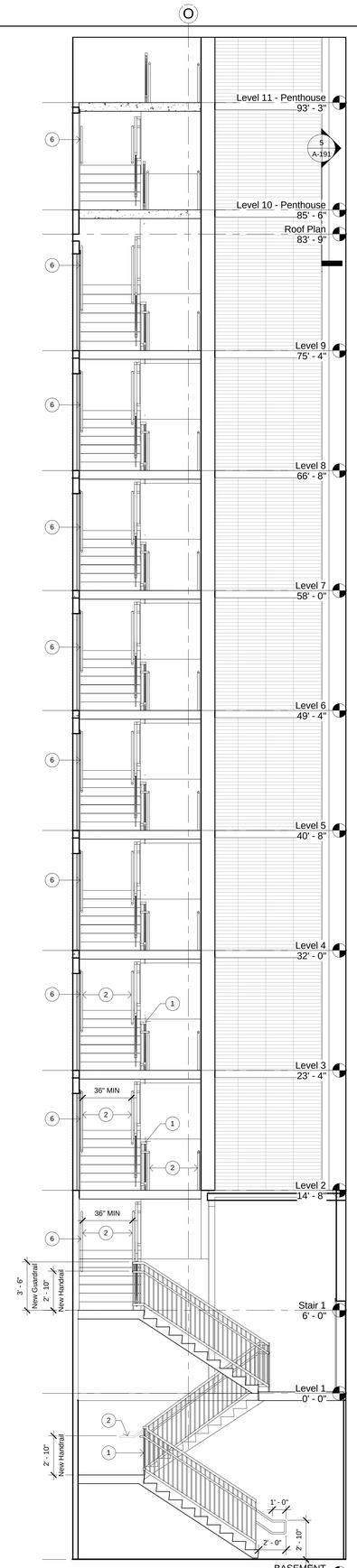
SHEET NUMBER
A-902



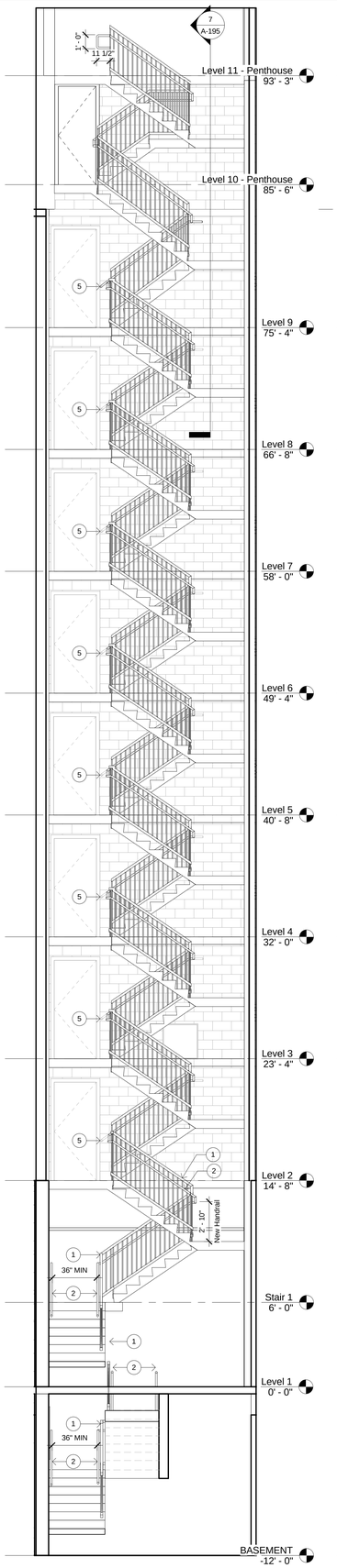
5 Section #5 - Interior Stair
1/4" = 1'-0"



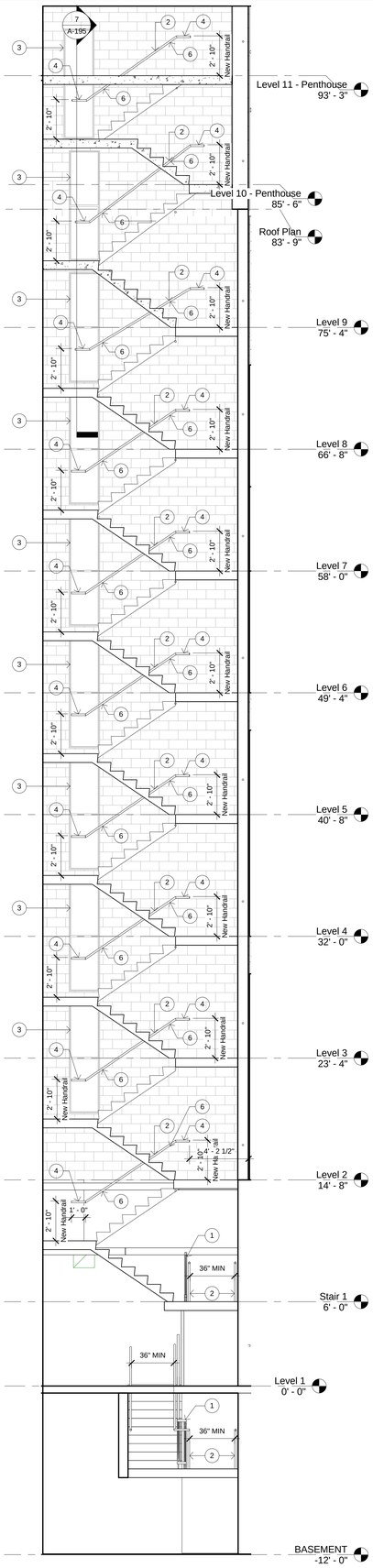
4 Section #4 - Interior Stair
1/4" = 1'-0"



3 Section #3 - Interor Stair
1/4" = 1'-0"



2 Section #2 - Interior Stair
1/4" = 1'-0"



1 Section #1 - Interior Stair
1/4" = 1'-0"

KEYED NOTES

1. NEW METAL GUARDRAIL, 42" H
2. NEW METAL HANDRAIL, 34" H
3. EXISTING FIXED WINDOW TO REMAIN
4. HANDRAIL EXTENSIONS 12"
5. HANDRAILS END AT DOOR FRAME
6. HANDRAIL CONNECTION TO EXISTING WALL. REFERENCE ADA SHEET A-020 FOR DIMENSIONS. BRACKET PROVIDED AS SCHEDULED - REFERENCE SPECIFICATIONS
7. STAIR PRESSURIZATION, REFERENCE MEP DRAWINGS FOR DETAILS

DHR ARCHITECTS
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OWNER:

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Opportunity Lives Here

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VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT
JAMES DURAND HOLLIS
18981
STATE OF TEXAS

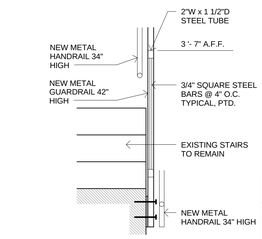
05/25/18

PERMIT SET

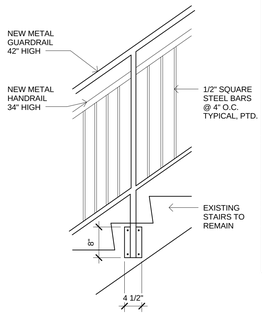
PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 18-981

STAIR PLAN, SECTIONS, & DETAILS

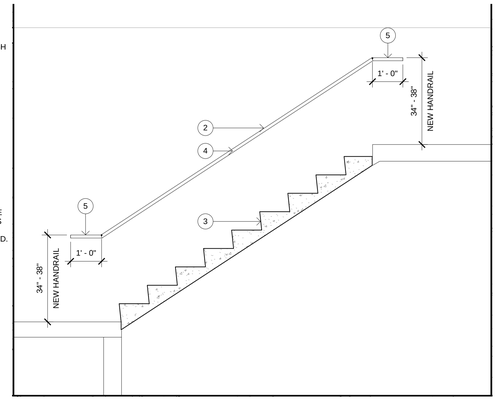
SHEET NUMBER
A-903



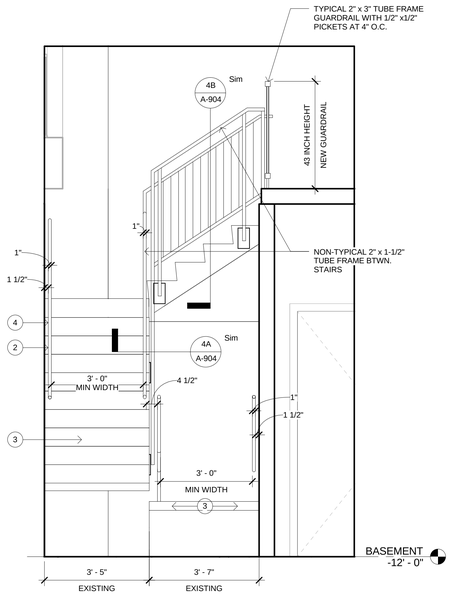
4A GUARDRAIL SECTION
3/4" = 1'-0"



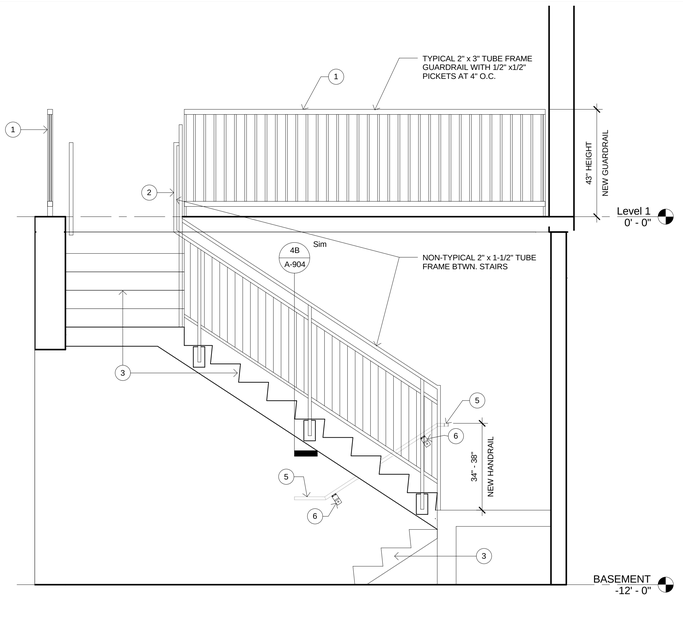
4B GUARDRAIL ELEVATION
3/4" = 1'-0"



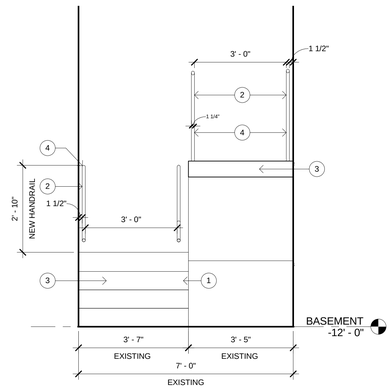
4 Section #4 - Interior Stair #2
1/2" = 1'-0"



3 Section #3 - Exterior Stair #2
1/2" = 1'-0"



2 Section #2 - Interior Stair #2
1/2" = 1'-0"



1 Section #1- Interior Stair #2
1/2" = 1'-0"

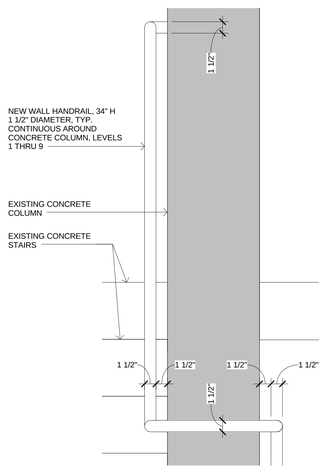
KEYED NOTES

1. NEW METAL GUARDRAIL
2. NEW METAL HANDRAIL, 34" H
3. EXISTING STAIR TO REMAIN
4. NEW HANDRAIL TO BE 1 1/4" IN DIAMETER
5. 12" HANDRAIL EXTENSIONS
6. HANDRAIL WALL BRACKET AS SCHEDULED, REFERENCE SPECIFICATIONS
7. HANDRAIL ATTACHMENT POINTS TO GUARDRAIL POSTS
8. NEW 4FT DOCK GATE WITH PICKETS AS SCHEDULED. CENTER GATE ON CORRIDOR WHICH LEADS INTO BUILDING
9. 3"X3" METAL POSTS

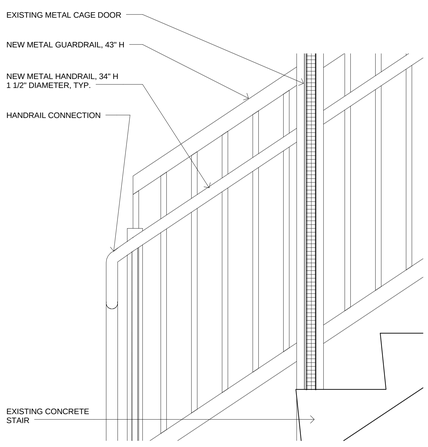
5 Stair at Dock
1/2" = 1'-0"

9 Guardrail at Dock #2
1/2" = 1'-0"

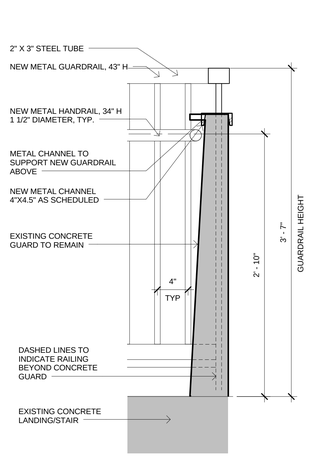
8 Guardrail at Dock #1
1/2" = 1'-0"



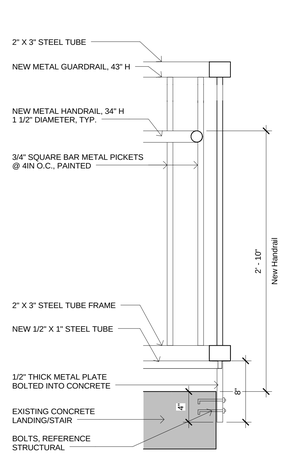
14 Levels 1 thru 9 - Wall Handrail
1 1/2" = 1'-0"



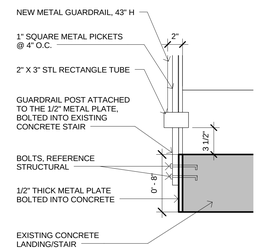
13 Section thru Metal Cage Door
1 1/2" = 1'-0"



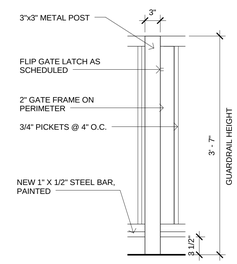
12 Enlarged Stair Section - Typical Levels 2-9
1 1/2" = 1'-0"



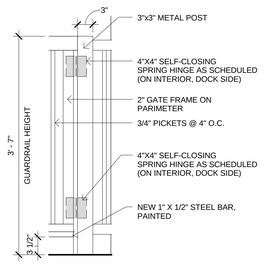
11 Enlarged Stair Section at Level 1
1 1/2" = 1'-0"



10 Enlarged Stair Section at Metal Plate
1 1/2" = 1'-0"



7 Guardrail at Dock #1 - Latch Detail
1" = 1'-0"



6 Guardrail at Dock #1 - Hinge Detail
1" = 1'-0"

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VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

REGISTERED ARCHITECT GABRIEL DURAND-HOLLIS 30681-1 STATE OF TEXAS

05/25/18

PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

STAIR PLAN, SECTIONS, & DETAILS

SHEET NUMBER
A-904

CONCRETE NOTES:

CN-1 CONCRETE SHALL BE LABORATORY DESIGNED TO DEVELOP MINIMUM 28-DAY COMPRESSIVE STRENGTHS AS GIVEN BELOW. REFER TO SPECIFICATIONS FOR AGGREGATES, CEMENT, ADMIXTURES, ETC.

DRILLED PIERS & PIER CAPS	3,000 PSI
GRADE BEAMS, SLABS-ON-GRADE	3,000 PSI
BEAMS AND FLAT SLAB FLOOR SYSTEM	4,000 PSI
BEAM, GIRDER, AND JOIST FLOOR SYSTEM	4,000 PSI
SLABS ON METAL FORMS	3,000 PSI
COMPOSITE SLABS ON METAL FORMS	4,000 PSI
COLUMNS AND WALLS	SEE SCHEDULE
PRECAST CONCRETE	5,500 PSI

NOTE: FLY ASH WILL BE PERMITTED UP TO 20% PORTLAND CEMENT REPLACEMENT, REFER TO SPECIFICATIONS.

CN-2 REINFORCING STEEL SHALL BE FROM NEW BILLET AND SHALL CONFORM TO THE FOLLOWING ASTM SPECIFICATIONS:

A615-GR 60	FOOTING SPIRALS
A185	WELDED WIRE FABRIC
A615-GR 60	BEAM STIRRUPS, COLUMN TIES
A615-GR 60	ALL OTHER REINFORCING
ASTM A108-60T	HEADED CONCRETE ANCHORS
ASTM A496	DEFORMED BAR ANCHORS

CN-3 DETAILING OF CONCRETE REINFORCEMENT BARS AND ACCESSORIES SHALL BE IN ACCORDANCE WITH LATEST ACI MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES (ACI 315). BAR SUPPORTS SHALL HAVE PLASTIC COATED LEGS OR BE HOT DIPPED GALVANIZED AFTER FABRICATION.

CN-4 PROVIDE BAR LAPS AND SPLICES PER REINFORCING BAR LAP SPLICE TABLE BELOW. SEE "CORNER DETAILS" FOR CONTINUOUS BARS AT CORNERS. SPIRALS SHALL BE LAPPED 1-1/2 TURNS. WELDED WIRE MESH SHALL BE LAPPED 8" MINIMUM AT SPLICE POINTS, OR 1-1/2 MESHES, WHICHEVER IS GREATEST.

CN-5 CONTRACTOR SHALL PROVIDE NECESSARY CONSTRUCTION JOINTS IN MONOLITHIC CONCRETE FORMING SO THAT NOT MORE THAN 400 CUBIC YARDS IS POURED IN ONE DAY. LOCATION OF CONSTRUCTION JOINTS MUST HAVE PRIOR APPROVAL OF STRUCTURAL ENGINEER OF RECORD AND SHALL GENERALLY BE LOCATED AT OR NEAR MID-POINTS OF SPANS OF SLAB, BEAMS AND WALLS. ALL CONTINUOUS REINFORCING SHALL BE CARRIED THROUGH THE JOINT. SEE DETAILS FOR CONTINUOUS KEY BETWEEN ADJACENT POURS.

CN-6 SEE ARCHITECTURAL, MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS FOR LOCATION AND SIZES OF ALL SLAB OPENINGS AND SLEEVES, INSERTS, ANCHORS AND BOLTS REQUIRED BY ABOVE.

CN-7 REFER TO ARCHITECTURAL DRAWINGS FOR ALL FLOOR FINISHES, DIMENSIONS AND LOCATIONS OF SLAB DROPS AND DEPRESSIONS.

CN-8 MECHANICAL AND ELECTRICAL CONDUITS IN SLABS SHALL RUN UNDER THE TOP LAYER OF SLAB REINFORCING OR WELDED WIRE FABRIC. PROVIDE A MINIMUM OF 1-1/2" CLEAR BETWEEN INDIVIDUAL CONDUITS, AND BETWEEN CONDUIT AND PARALLEL REINFORCING. DO NOT "BUNDLE" CONDUITS.

CN-9 "HEADED CONCRETE ANCHORS" (HCA) SHALL BE OF 50,000 PSI STEEL ROD WITH UPSET ENDS, AUTOMATICALLY ARC WELDED THROUGH CERAMIC FERRULES, "NELSON CONCRETE ANCHORS" OR EQUAL.

CN-10 REFER TO SPECIFICATIONS FOR TESTING REQUIREMENTS. ALL TESTING SHALL BE AT POINT OF DISCHARGE. IF PUMP IS USED, TESTING SHALL BE AT THE END OF THE HOSE.

STEEL FRAMING NOTES:

SF-1 WIDE FLANGE STRUCTURAL STEEL SHALL CONFORM TO ASTM A992, FY=50 KSI. STRUCTURAL PIPE SHALL CONFORM TO ASTM A53, GRADE B, FY=35. STRUCTURAL TUBING SHALL CONFORM TO ASTM A500, GRADE B, FY=46 KSI, ALL OTHERS SHALL CONFORM TO ASTM A36, FY=36 KSI. CONNECTIONS SHALL CONFORM TO REQUIREMENTS OF AISC.

SF-2 STEEL JOISTS AND BRIDGING SHALL CONFORM TO STEEL JOIST INSTITUTE SPECIFICATIONS. STEEL JOISTS HAVE BEEN DESIGNED FOR A NET UPLIFT LOAD OF 10 PSF. THE CONTRACTOR SHALL PROVIDE ALL JOIST BRIDGING REQUIRED FOR NET UPLIFT LOAD GIVEN.

SF-3 JOIST ERECTION PRECAUTION (OSHA REQUIREMENT) AT ALL COLUMNS NOT FRAMED BY BEAMS IN AT LEAST TWO DIRECTIONS: THE JOIST CLOSEST TO THE COLUMN ON BOTH SIDES OF THE BEAM SHALL BE BOLTED TO THE BEAM.

SF-4 ROOF DECK IS 1-1/2"-22 GAUGE TYPE B RIB DECK COMPLYING WITH STEEL DECK INSTITUTE; WITH MINIMUM I=.183 IN. 4/FT., SN=.192 IN. 3/FT. ATTACH TO SUPPORTING MEMBERS BY PLUG WELDING DIRECTLY THROUGH BOTTOM OF THE RIBS AT EVERY SUPPORT. WELD EACH SHEET AT BOTH SIDES AND AT OTHER RIBS SO THAT SPACING BETWEEN WELDS ACROSS THE WIDTH OF EACH SHEET DOES NOT EXCEED 18", IN ACCORDANCE WITH STEEL DECK INSTITUTE'S SPECIFICATIONS.

SF-5 FLOOR SLAB ON STEEL JOISTS SHALL BE 3" REGULAR WEIGHT CONCRETE SLAB (REINFORCED WITH 6x6 - W2.9xW2.9 WWF) ON GALVANIZED HEAVY DUTY 9/16" DEEP 28 GAUGE CORRUGATED STEEL DECK WITH MINIMUM I=.011 IN. 4/FT., S=.035 IN. 3/FT. (VULCRAFT TYPE 0.6C OR EQUAL). ATTACH STEEL DECK TO SUPPORTING MEMBERS BY PLUG WELDING AT EVERY SUPPORT IN ACCORDANCE WITH STEEL DECK INSTITUTE'S SPECIFICATIONS.

SF-6 WHERE METAL DECK IS SUPPORTED CONTINUOUSLY WELD DECK TO STEEL SUPPORT AT 12"o.c.

SF-7 WHERE FLOOR DECK CHANGES DIRECTIONS, PROVIDE DECK SUPPORT L 3 X 2-1/2 X 3/16 (L.L.H.) ACROSS ENDS OF SEATED JOISTS.

SF-8 TYPICAL STEEL JOIST SEAT ANCHORAGE: FIELD WELD EACH SEAT WITH TWO 1" LONG BY 1/8" WELDS FOR K-SERIES AND TWO 2" LONG BY 1/4" WELDS FOR LH-SERIES.

SF-9 STRUCTURAL FRAMING CONNECTIONS SHALL BE SEATED COLUMN CAPS, CLIP ANGLES OR WEB PLATES AS INDICATED ON DETAILS. USE A325 HIGH STRENGTH BOLTS OR WELDS SUFFICIENT TO DEVELOP REACTION CAPACITY ALLOWABLE UNIFORM LOAD/SPAN DIVIDED BY TWO AS SHOWN IN AISC MANUAL SECTION 2 (9th EDITION).

SF-10 DECK STOP ANGLES, FASCIA ANGLES, HANGERS, CLIPS AND OTHER STRUCTURAL AND MISCELLANEOUS MEMBERS SHALL BE CONNECTED OR JOINED USING 3/16" OR LARGER FILLET OR GROOVE WELDS AS REQUIRED FOR ADEQUATE CONNECTION.

SF-11 WHERE OPENINGS THROUGH ROOF ARE REQUIRED, FRAME AS DETAILED.

SF-12 WHERE BRACING ANGLES ARE SHOWN BETWEEN END OF JOIST BOTTOM CHORD AND SUPPORTING BEAM OR GIRDER, MAKE THESE CONNECTIONS AFTER ALL DEAD LOAD ON JOISTS IS IN PLACE. TEMPORARY BRACING SHALL REMAIN IN PLACE UNTIL FINAL CONNECTIONS ARE COMPLETED.

SF-13 JOIST BRACES (AT EACH COLUMN) OCCUR AT OR NEAR EVERY INTERIOR COLUMN AT THREE JOISTS THAT ARE CLOSEST TO THE COLUMN CENTERLINE; SEE PLAN AND DETAILS.

SF-14 PROVIDE ADEQUATE AND APPROPRIATE STRUCTURAL STEEL FRAMING APPROVED BY THE ENGINEER FOR THE SUPPORT AND MOUNTING OF MECHANICAL EQUIPMENT RESTING ON, OR SUSPENDED FROM, STEEL JOISTS. NO CONCENTRATED LOADS, HANGERS, ETC. SHALL BE ATTACHED TO THE TOP OR BOTTOM CHORD OF JOIST EXCEPT AT "PANEL POINTS" (THE JUNCTURES OF CHORDS AND DIAGONAL WEB MEMBERS). JOISTS SHALL BE MODIFIED OR STRENGTHENED TO CARRY SUCH LOADS.

SF-15 STEEL STAIRS TO BE DESIGNED AND DETAILED FOR LL=100 PSF BY STEEL FABRICATOR UNDER DIRECT SUPERVISION OF A LICENSED PROFESSIONAL ENGINEER (SPECIALITY ENGINEER). SHOP DRAWINGS TO BE SIGNED AND SEALED BY THE SPECIALITY ENGINEER.

SF-16 A NET UPLIFT LOAD OF 10 PSF IS TO BE USED FOR JOIST FABRICATION.

GENERAL NOTES:

GN-1 THIS STRUCTURE IS DESIGNED IN ACCORDANCE WITH THE INTERNATIONAL BUILDING CODE (2012) AS AMENDED AND ADOPTED BY THE GOVERNING AUTHORITY, AND APPLICABLE INDUSTRY STANDARDS (AISC, ACI, ETC.).

GN-2 THE DESIGN LOADS ARE:

SUPERIMPOSED DEAD LOADS

MECHANICAL DUCTS/CONDUITS, CEILING, ETC.	5 PSF
MECHANICAL EQUIPMENT	AS INDICATED ON PLANS

FLOOR LIVE LOAD

CORRIDOR	100 PSF
OFFICES	50 PSF
MOVEABLE PARTITIONS	20 PSF
MECHANICAL ROOMS	150 PSF
(NON REDUCIBLE)	

ASSEMBLY AREAS:

FIXED SEATS	60 PSF
LOBBIES	100 PSF
MOVEABLE SEATS	100 PSF
STAGES & PLATFORMS	125 PSF
CATWALKS	40 PSF

ROOF LIVE LOAD

FLAT ROOF	20 PSF
PITCHED ROOF	20 PSF

ROOF SNOW LOAD

GROUND SNOW Pg	5 PSF
SNOW EXPOSURE FACTOR Ce	1.0
SNOW LOAD IMPORTANCE FACTOR Is	1.1
THERMAL FACTOR Ct	1.0

WIND LOAD

BASIC WIND SPEED (ULTIMATE DESIGN)	115
WIND LOAD IMPORTANCE FACTOR Iw	1.15
BUILDING CATEGORY	III
WIND EXPOSURE	C
INTERNAL PRESSURE COEF.	±0.18
COMPONENTS AND CLADDING WIND PRESSURE	25 PSF

EARTHQUAKE LOADS

SEISMIC IMPORTANCE FACTOR Ie	1.00
SPECTRAL RESPONSE ACCELERATION Ss	14%
SPECTRAL RESPONSE ACCELERATION S	3%
SPECTRAL RESPONSE COEF. SDs	14%
SPECTRAL RESPONSE COEF. SD	5%
SEISMIC DESIGN CATEGORY	A
SEISMIC RESPONSE COEF Cs	01

RETAINING WALLS

GLOBAL STABILITY ANALYSIS FACTOR OF SAFETY	1.5
TYPE	CANTILEVER
EQUIVALENT FLUID PRESSURE	50 PCF
BACKFILL	DRAINED/ONSITE
FOOTING BEARING	1500 PSF
SURCHARGE	200 PSF

FLOOD LOAD

ELEVATION OF LOWEST FLOOR	REF. ARCH. DWGS.

GN-3 ALLOWABLE STRESS DESIGN LOAD COMBINATIONS (FOR ALL DESIGNS EXCEPT CONCRETE)

D
D+L
D+L+(Lr, OR S OR R)
D+(W OR 0.7E)+(Lr, OR S OR R)
0.6D+W
0.6D+0.7E

STRENGTH DESIGN LOAD COMBINATIONS (FOR CONCRETE DESIGN)

1.4D
1.2D+1.6L+0.5(Lr, OR S OR R)
1.2D+1.6(Lr, OR S OR R)+(L OR 0.8W)
1.2D+1.6W+L+0.5(Lr, OR S OR R)
1.2D+1.0E+L+S
0.9D+(1.0E OR 1.6W)

GN-4 PRIOR TO START OF CONSTRUCTION, THE CONTRACTOR AND FABRICATOR SHALL VERIFY ALL QUANTITIES, DIMENSIONS AND CONDITIONS AND NOTIFY ARCHITECT/STRUCTURAL ENGINEER OF RECORD OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK.

GN-5 UTILITIES PENETRATING BUILDING SHALL BE FLEXIBLE, USING SLEEVE JOINTS, BENDS, LOOPS, ETC. TO PERMIT MOVEMENTS DUE TO EXPANSIVE UNDERLYING SOILS.

GN-6 PROVIDE ADEQUATE AND APPROPRIATE STRUCTURAL STEEL FRAMING FOR THE SUPPORT AND MOUNTING OF MECHANICAL EQUIPMENT RESTING ON, OR SUSPENDED FROM, STEEL SUPERSTRUCTURE.

GN-7 THE STRUCTURAL DRAWINGS FOR THIS PROJECT ARE COPYRIGHTED AND SHALL NOT BE REPRODUCED FOR USE AS FABRICATOR'S ERECTION DRAWINGS. THE CONTRACTOR SHALL ALLOW ADEQUATE TIME AND EXPENSE FOR SUBCONTRACTORS TO PRODUCE THEIR OWN ORIGINAL ERECTION AND PLACEMENT DRAWINGS.

GN-8 THE STRUCTURE HAS BEEN DESIGNED TO RESIST DESIGN LOADS ONLY AS A COMPLETED STRUCTURE. ANY PROPOSED APPLICATION OF CONSTRUCTION LOADS OR OF ANY LOADS TO THE PARTIALLY COMPLETED STRUCTURE WHICH EXCEED THE DESIGN LOADS WILL REQUIRE REANALYSIS AND PROBABLE REDESIGN.

CONTRACTOR NOTE

THE STRUCTURAL SYSTEM FOR THIS PROJECT SHALL NOT BE CONSTRUCTED BY USING THE STRUCTURAL DRAWINGS ALONE. THESE DRAWINGS WERE DEVELOPED FROM DATA DERIVED PRIMARILY FROM THE ARCHITECTURAL DRAWINGS AND SECONDARILY FROM MEP, CIVIL AND OTHER DISCIPLINES' DOCUMENTS. IT IS INTENDED THAT CONSTRUCTION PROCEED BY UTILIZING ALL OF THE INFORMATION CONTAINED IN THE ENTIRE SET OF CONSTRUCTION DOCUMENTS TAKEN AS A WHOLE; FAILURE TO DO SO WILL RESULT IN ERRORS WHICH SHALL BE CORRECTED AT THE CONTRACTOR'S EXPENSE.

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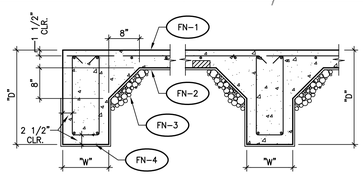
SAN ANTONIO, TEXAS 78232
PH. (210)979-7900 FX. (210)979-7800
TX FIRM REG. #3988

DATE: 01/10/18

STATE OF TEXAS
SHAWN J. FRANKE
82639
LICENSED
PROFESSIONAL ENGINEER



1 SECTION N.T.S.

2 SECTION N.T.S.

GRADE BEAM SCHEDULE

MARK	W x D	MAIN REINFORCING	TIES
B1	12 x 36	2-#8 x CONT. TOP & BOTTOM	#3 @ 24"o.c.

FOUNDATION NOTES:

FN-1 6" CONCRETE SLAB REINFORCED W/ #4 @ 12"o.c. EACH WAY IN TOP. SUPPORT AT 4'-0"o.c. EACH WAY WITH CONCRETE BLOCKS OR BRICKS. SUPPORT BOTTOM BEAM REINFORCEMENT AT 4'-0" INTERVALS.

FN-2 15 MIL. POLYOLEFIN VAPOR RETARDER UNLESS NOTES OTHERWISE IN SPECIFICATIONS. AT ALL JOINTS PROVIDE 6" LAPS W/ 4" TAPE.

FN-3 COMPACTED SELECT FILL (SEE UF-6 "UNDERFLOOR FILL NOTES").

FN-4 ALL BEAM SOFFITS SHALL BEAR 12" MINIMUM INTO NATURAL GRADE OR COMPACTED FILL. ON PERIMETER, INCREASE SCHEDULED BEAM DEPTH AS REQUIRED FOR SOFFIT TO BEAR 12" MINIMUM BELOW FINISH GRADE.

FN-5 GRADE BEAMS AND SLAB TURNDOWNS SHALL BE FORMED BY WALLS AND SOFFIT OF CAREFULLY SHAPED TRENCH. USE A SMOOTH-MOUTHED BUCKET. IF A TOOTHED BUCKET IS USED, EXCAVATION SHALL BE STOPPED 6" ABOVE FINAL GRADE AND THE REMAINING EXCAVATION ACCOMPLISHED WITH A SMOOTH MOUTHED BUCKET OR BY HAND LABOR TO REMOVE ALL LOOSE SOILS DISTURBED BY THE BUCKET TEETH. WOODFORM EXPOSED FACES TO A DEPTH OF 8" BELOW FINISHED GRADE.

FN-6 AT ALL BEAM CORNERS & T-INTERSECTIONS, PROVIDE 4-#7 X 6'-0" CORNER BARS (2-TOP AND 2-BOTTOM).

FN-7 TRENCHES SHALL BE VERIFIED FOR SIZE TO MAINTAIN CLEARANCES AROUND REINFORCEMENT PRIOR TO PLACING REINFORCEMENT.

FN-8 WHERE BEAM DEPTH EXCEEDS 36", ADD #4 @ 12"o.c. IN EACH FACE OF BEAM.

UNDERFLOOR FILL NOTES:

UF-1 BEFORE ANY CONSTRUCTION IS BEGUN, PERFORM ROUGH GRADING AND CUT SWALES SO THAT GROUNDS WILL DRAIN AWAY FROM THE BUILDING. MAINTAIN DRAINAGE DURING ALL PHASES OF CONSTRUCTION SO THAT STORM WATER WILL BE CONDUCTED AWAY FROM THE BUILDING. KEEP EXCAVATIONS PUMPED FREE OF STORM WATER AT ALL TIMES.

UF-2 PRECAUTIONS SHALL BE TAKEN TO PROTECT OPEN EXCAVATIONS FROM EXCESSIVE LOSS OR GAIN IN NATURAL MOISTURE LEVEL PRIOR TO PLACEMENT OF BASE MATERIAL. KEEP MOIST DURING DRY WEATHER AND KEEP STORM WATER PUMPED OUT, INCLUDING NIGHTS AND WEEKENDS, DURING RAINS.

UF-3 IN THE AREA OCCUPIED BY THE FOUNDATION, PLUS 2'-0", REMOVE 1'-6" INCLUDING ALL ORGANIC MATERIALS, ROOTS, ETC. FROM THE SITE. DO NOT USE FOR UNDERFLOOR FILL. PROVIDE A MINIMUM OF 1'-6" OF SELECT FILL AS PER UF-6.

UF-4 THE RESULTING SURFACE SHALL BE PROOF ROLLED WITH A SUFFICIENTLY HEAVY ROLLER (15 TONS) TO LOCATE AND DENSITY WEAK AND COMPRESSIBLE ZONES. A MINIMUM OF 6 PASSES OF THE ROLLER IS REQUIRED. ANY SOFT SPOTS SHALL BE REMOVED AND REPLACED WITH COMPACTED SELECT FILL.

UF-5 THE ROLLED SUBGRADE SHALL BE SCARIFIED JUST PRIOR TO FILL PLACEMENT TO A MINIMUM DEPTH OF 6" AND RECOMPACTED TO MINIMUM OF 95% OF THE MAXIMUM DENSITY DETERMINED BY ASTM D698 COMPACTION TEST, MAINTAINING MOISTURE CONTENT BETWEEN -1 AND +3 PERCENTAGE POINTS UNTIL COVERED.

UF-6 FOR A DISTANCE OF 3'-0" OUTSIDE OF THE BUILDING LINE, AND BEGINNING AT THE LOW END, BUILD UP TO THE ELEVATION OF THE BOTTOM OF THE SLAB WITH SELECT CRUSHED STONE FILL CONFORMING TO TxDOT SPECIFICATIONS, ITEM 247, TYPE "A" GRADE 2. A MINIMUM THICKNESS OF 1'-6" IS REQUIRED. NO DIRT FILL SHALL BE USED UNDER THE BUILDING FOUNDATION. SUBMIT WRITTEN CERTIFICATION OF COMPLIANCE WITH TxDOT, ITEM 247 SPECIFICATIONS BY TEST PERFORMED ON FIELD EXAMPLES.

UF-7 ALL FILL SHALL BE PLACED IN 8" LOOSE HORIZONTAL LIFTS AND COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DENSITY AS DETERMINED BY ASTM D698 COMPACTION TEST. EXCESS FILL AT BUILDING PERIMETER SHALL BE CUT AND GRADED TO COMPLY WITH FINISHED GRADE REQUIREMENTS, AND SHALL BE OVERLAID WITH A 1'-0" THICK LAYER OF IMPERVIOUS CLAY FOR A MINIMUM DISTANCE OF 5'-0" FROM BUILDING LINE.

UF-8 PERFORM ALL EARTH WORK DESCRIBED ABOVE BEFORE TRENCHING FOR GRADE BEAMS OR MECHANICAL LINES.

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LOCATION:
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REVISIONS

ISSUE	DESCRIPTION	DATE

PROJECT ARCHITECT
GEOFREY DURAND-HOLLIS, AIA
STATE OF TEXAS LICENSE NO. 15-14881

SHEET NUMBER
S100

LA PROJECT NO.: 60-044-00
LA FILE NO.: SVPS100

7. WOOD CONSTRUCTION		IBC 1704.6		
A. PREFABRICATED STRUCTURAL ELEMENTS & ASSEMBLIES	N/A	INSPECT STRUCTURAL LOAD BEARING MEMBERS AND ASSEMBLIES. VERIFY THAT THE FABRICATOR MAINTAINS DETAILED FABRICATION AND QUALITY CONTROL PROCEDURES THAT PROVIDE A BASIS FOR INSPECTION CONTROL OF THE WORKMANSHIP AND THE FABRICATOR'S ABILITY TO CONFORM TO APPROVED CONSTRUCTION DOCUMENTS AND REFERENCED STANDARDS. THE SPECIAL INSPECTOR SHALL REVIEW THE PROCEDURES FOR CODE REQUIREMENTS FOR THE FABRICATOR'S SCOPE OF WORK. EXCEPTION: SPECIAL INSPECTIONS SHALL NOT BE REQUIRED WHERE THE FABRICATOR IS ENROLLED IN A NATIONALLY ACCEPTED INSPECTIONS PROGRAM ACCEPTABLE TO THE REGISTERED DESIGN PROFESSIONAL IS RESPONSIBLE CHARGE.	IBC 1705.5	TECHNICAL REPRESENTATIVE UNDER DIRECTION OF LICENSED ENGINEER
B. SITE BUILT ASSEMBLIES	N/A	SITE BUILT ASSEMBLIES SHALL BE INSPECTED IN ACCORDANCE WITH IBC SECTION 1704.1	IBC 1705.5	LICENSED ENGINEER OR HIS/HER REPRESENTATIVE.
C. DIAPHRAGMS	N/A	HIGH LOAD DIAPHRAGMS SHALL BE INSPECTED IN ACCORDANCE WITH IBC SECTION 1704.1, AND SHEATHING CHECKED FOR PROPER GRADE, THICKNESS, SIZE OF FRAMING MEMBERS AT ADJOINING PANEL EDGES, NAIL/STAPLE DIAMETER AND LENGTH, AND FASTENER PATTERN.	IBC 1705.5.1	
D. TRUSS BRACING	N/A	CHECK ALL REQUIRED PERMANENT AND LATERAL BRACING HAS BEEN INSTALLED ACCORDING TO STRUCTURAL DRAWINGS AND FABRICATOR DESIGN/SHOP DRAWINGS.		
8. LIGHT GAGE FRAME CONSTRUCTION		IBC 1704.13		
A. PREFABRICATED STRUCTURAL ELEMENTS & ASSEMBLIES	N/A	INSPECT STRUCTURAL LOAD BEARING MEMBERS AND ASSEMBLIES. VERIFY THAT THE FABRICATOR MAINTAINS DETAILED FABRICATION AND QUALITY CONTROL PROCEDURES THAT PROVIDE A BASIS FOR INSPECTION CONTROL OF THE WORKMANSHIP AND THE FABRICATOR'S ABILITY TO CONFORM TO APPROVED CONSTRUCTION DOCUMENTS AND REFERENCED STANDARDS. THE SPECIAL INSPECTOR SHALL REVIEW THE PROCEDURES FOR CODE REQUIREMENTS FOR THE FABRICATOR'S SCOPE OF WORK. EXCEPTION: SPECIAL INSPECTIONS SHALL NOT BE REQUIRED WHERE THE FABRICATOR IS ENROLLED IN A NATIONALLY ACCEPTED INSPECTIONS PROGRAM ACCEPTABLE TO THE REGISTERED DESIGN PROFESSIONAL IS RESPONSIBLE CHARGE.	IBC 1705.5.1	TECHNICAL REPRESENTATIVE UNDER DIRECTION OF LICENSED ENGINEER
B. SITE BUILT ASSEMBLIES	N/A	SITE BUILT ASSEMBLIES SHALL BE INSPECTED IN ACCORDANCE WITH IBC SECTION 1704.1	IBC 1705.5.1	LICENSED ENGINEER OR HIS/HER REPRESENTATIVE.
C. DIAPHRAGMS	N/A	HIGH LOAD DIAPHRAGMS SHALL BE INSPECTED IN ACCORDANCE WITH IBC SECTION 1704.1, AND SHEATHING CHECKED FOR PROPER GRADE, THICKNESS, SIZE OF FRAMING MEMBERS AT ADJOINING PANEL EDGES, NAIL/STAPLE DIAMETER AND LENGTH, AND FASTENER PATTERN.	IBC 1705.10.3	
D. TRUSS BRACING	N/A	CHECK ALL REQUIRED PERMANENT AND LATERAL BRACING HAS BEEN INSTALLED ACCORDING TO STRUCTURAL DRAWINGS AND FABRICATOR DESIGN/SHOP DRAWINGS.		

NOTES:

1 THESE INSPECTIONS DO NOT RELIEVE ENGINEER FROM STRUCTURAL OBSERVATIONS AS MAY REQUIRED BY IBC 2015, SECTION 1709, AND/OR CONTRACTUAL REQUIREMENTS OF ARCHITECT/CLIENT, (I.E. C141).

2 DEFINITIONS/TERM: PERIODIC VS. CONTINUOUS INSPECTIONS – REF. IBC SECTION 1702
- ADSC – THE INTERNATIONAL ASSOCIATION OF FOUNDATION DRILLING
- ASNT – AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING
- ASTM – AMERICAN SOCIETY FOR TESTING MATERIALS
- AWS – AMERICAN WELDING SOCIETY
- CWI – CERTIFIED WELDING INSPECTOR
- CRSI – CONCRETE REINFORCING STEEL INSTITUTE
- PCI – PRECAST/PRESTRESSED CONCRETE INSTITUTE
- PTI – POST-TENSIONING INSTITUTE
- N/A – NOT APPLICABLE

*TESTING AND INSPECTION DIRECTED BY ASTM E329 GUIDELINES.

DEFERRED SUBMITTALS

BUILDING CONSTRUCTION	YES	NO	DESCRIPTION
STEEL		X	–
CONCRETE		X	–

Pursuant to IBC Chapter 17 (1704.2.1) provide the following Special Inspector Qualifications to the RDPiRC prior to start of inspections;

1. Testing Laboratory Qualifications meeting ASTM0329 and accreditation by AASHTO and/or A2LA, and CCRL of the National Bureau of Standards.
2. Special Inspector's name and proof of meeting the qualification requirements set forth in
   a. ASTM C1077 for concrete,
   b. ASTM D3740 for soils,
   c. ASTM C1093 for masonry.
   d. ASTM D-2922 and D-3017 for Density control of compaction

IBC 1704.2.1 "written documentation demonstrating the competence and relevant experience or training of special inspectors who will perform special inspections and tests during construction. Experience or training shall be considered relevant where the documented experience or training is related in complexity to the same type of *special inspection* or testing activities for projects of similar complexity and material qualities." These qualifications are in addition to qualifications specified in other sections of the IBC.

6. MASONRY CONSTRUCTION				
EMPIRICALLY DESIGNED MASONRY, GLASS UNIT MASONRY, AND MASONRY VENEER IN NON-ESSENTIAL FACILITIES.	N/A		IBC 1705.4	
LEVEL 1 INSPECTION:	N/A	ENGINEERED MASONRY IN NON-ESSENTIAL FACILITIES AND EMPIRICALLY DESIGNED MASONRY IN ESSENTIAL FACILITIES.	IBC 1705.4	QUALIFICATIONS BASED ON ASTM C1093
A. AS MASONRY CONSTRUCTION BEGINS, THE FOLLOWING SHALL BE VERIFIED TO ENSURE COMPLIANCE:	N/A	1. PROPORTIONS OF SITE-PREPARED MORTAR.		
	N/A	2. CONSTRUCTION OF MORTAR JOINTS.		
	N/A	3. LOCATION OF REINFORCEMENT AND CONNECTORS.		
	N/A	4. PRESTRESSING TECHNIQUE		
	N/A	5. GRADE AND SIZE OF PRESTRESSING TENDONS AND ANCHORAGES.		
B. THE INSPECTION PROGRAM SHALL VERIFY:	N/A	1. SIZE AND LOCATION OF STRUCTURAL ELEMENTS.		
	N/A	2. TYPE, SIZE AND LOCATION OF ANCHORS, INCLUDING OTHER DETAILS OF ANCHORAGE OF MASONRY TO STRUCTURAL MEMBERS, FRAMES, OR OTHER CONSTUCTION.		
	N/A	3. SPECIFIED SIZE, GRADE AND TYPE OF REINFORCEMENT.		
	N/A	4. WELDING OF REINFORCING BARS.		
	N/A	5. PROTECTION OF MASONRY DURING COLD WEATHER (TEMPERATURE BELOW 40 DEGREES F) OR HOT WEATHER (TEMPERATURE ABOVE 90 DEGREES F).		
	N/A	6. APPLICATION AND MEASUREMENT OF PRESTRESSING FORCE.		
C. PRIOR TO GROUTING, THE FOLLOWING SHALL BE VERIFIED TO ENSURE COMPLIANCE:	N/A	1. GROUT SPACE IS CLEAN.		
	N/A	2. PLACEMENT OF REINFORCEMENT AND CONNECTORS AND PRESTRESSING TENDONS AND ANCHORAGES.		
	N/A	3. PROPORTIONS OF SITE-PREPARED GROUT AND PRESTRESSING GROUT FOR BONDED TENDONS.		
	N/A	4. CONSTRUCTION OF MORTAR JOINTS.		
D. GROUT PLACEMENT	N/A	1. VERIFY COMPLIANCE WITH CODE AND CONSTRUCTION DOCUMENTS PROVISIONS.		
	N/A	2. GROUTING OF PRESTRESSING BONDED TENDONS.		
E. PREPARATION OF ANY REQUIRED GROUT SPECIMENS, MORTAR SPECIMENS AND/OR PRISMS SHALL BE OBSERVED.	N/A	1. VERIFY COMPLIANCE WITH CODE AND CONSTRUCTION DOCUMENTS PROVISIONS.		QUALIFICATIONS BASED ON C1093
F. COMPLIANCE WITH REQUIRED INSPECTION PROVISION OF THE CONSTRUCTION DOCUMENTS AND THE APPROVED SUBMITTALS SHALL BE VERIFIED.	N/A	1. VERIFY COMPLIANCE WITH CODE AND CONSTRUCTION DOCUMENTS PROVISIONS.		
G. TESTING OF GROUT SPECIMENS, MORTAR SPECIMENS AND/OR PRISMS.	N/A	1. TEST ONE SET OF MORTAR CUBES PER 2000 sf OR PORTION THEREOF. 2. TEST ONE SET OF GROUT CYLINDERS PER 2000 sf OR PORTION THEREOF. 3. TEST ONE PRISM PER 6000 sf OR PORTION THEREOF. (SUBMITTED PRISM WILL BE ACCEPTABLE FOR FIRST PRISM TEST).		QUALIFICATIONS BASED ON C1093
LEVEL 1 INSPECTION CONT.:	N/A	ENGINEERED MASONRY IN NON-ESSENTIAL FACILITIES AND EMPIRICALLY DESIGNED MASONRY IN ESSENTIAL FACILITIES.	IBC 1704.5.1, IBC 1704.5.2	QUALIFICATIONS BASED ON ASTM C1093
H. POST INSTALLED REINFORCING & ANCHORS (EXPANSION ANCHORS, SCREW ANCHORS ADHESIVE ANCHORS, ECT.).	N/A	THE SPECIAL INSPECTOR SHALL BE ON THE JOB SITE CONTINUOUSLY DURING ANCHOR INSTALLATION TO VERIFY ANCHOR TYPE, ANCHOR DIMENSIONS, MASONRY TYPE AND COMPRESSION STRENGTH, PRE-DRILLED HOLE DIMENSIONS, ANCHOR SPACING, EDGE DISTANCES, MASONRY THICKNESS AND ANCHOR EMBEDMENT.	ACI 318 APPENDIX D-CH. D.9.1	*QUALIFICATIONS BASED ON ASTM E329 & ASTM C1077 OR CERTIFIED MANUFACTURER REPRESENTATIVE
6. MASONRY CONSTRUCTION CONT.:				
LEVEL 2 INSPECTION:	N/A	ENGINEERED MASONRY IN ESSENTIAL FACILITIES.	IBC 1704.5.3	QUALIFICATIONS BASED ON C1093
A. FROM THE BEGINNING OF MASONRY CONSTRUCTION, THE FOLLOWING SHALL BE VERIFIED TO ENSURE COMPLIANCE:	N/A	1. PROPORTIONS OF SITE-PREPARED MORTAR, GROUT, AND PRESTRESSING GROUT FOR BONDED TENDONS.		
	N/A	2. PLACEMENT OF MASONRY UNITS AND CONSTRUCTION OF MORTAR JOINTS.		
	N/A	3. PLACEMENT OF REINFORCEMENT, CONNECTORS, AND PRESTRESSING TENDONS AND ANCHORAGES.		
	N/A	4. GROUT SPACE PRIOR TO GROUTING.		
	N/A	5. PLACEMENT OF GROUT.		
	N/A	6. PLACEMENT OF PRESTRESSING GROUT.		
B. THE INSPECTION PROGRAM SHALL VERIFY:	N/A	1. SIZE AND LOCATION OF STRUCTURAL ELEMENTS.		
	N/A	2. TYPE, SIZE AND LOCATION OF ANCHORS, INCLUDING OTHER DETAILS OF ANCHORAGE OF MASONRY TO STRUCTURAL MEMBERS, FRAMES, OR OTHER CONSTRUCTION.		
	N/A	3. SPECIFIED SIZE, GRADE AND TYPE OF REINFORCEMENT.		
	N/A	4. WELDING OF REINFORCEMENT.		
	N/A	PROTECTION OF MASONRY DURING COLD WEATHER (TEMPERATURE BELOW 40 DEGREES F) OR HOT WEATHER (TEMPERATURE ABOVE 90 DEGREES F).		
	N/A	6. APPLICATION AND MEASUREMENT OF PRESTRESSING FORCE.		
C. PREPARATION OF ANY REQUIRED GROUT SPECIMENS, MORTAR SPECIMENS AND/OR PRISMS SHALL BE OBSERVED.	N/A	1. VERIFY COMPLIANCE WITH CODE AND CONSTRUCTION DOCUMENTS PROVISIONS.		QUALIFICATIONS BASED ON C1093
D. COMPLIANCE WITH REQUIRED INSPECTION PROVISIONS OF THE CONSTRUCTION DOCUMENTS AND THE APPROVED SUBMITTALS SHALL BE VERIFIED.	N/A			
E. TESTING OF GROUT SPECIMENS, MORTAR SPECIMENS AND/OR PRISMS.	N/A	1. TEST ONE SET OF MORTAR CUBES PER 2000 sf OR PORTION THEREOF. 2. TEST ONE SET OF GROUT CYLINDERS PER 2000 sf OR PORTION THEREOF. 3. TEST ONE PRISM PER 6000 sf OR PORTION THEREOF. (SUBMITTED PRISM WILL BE ACCEPTABLE FOR FIRST PRISM TEST).		QUALIFICATIONS BASED ON C1093

3. CONCRETE CONSTRUCTION CONT.				
G. PLACEMENT OF CONCRETE & SHOTCRETE.	CONTINUOUS		ACI 318-CH. 5.9, 5.10	*QUALIFICATIONS BASED ON ASTM C1077
H. MAINTENANCE OF SPECIFIED CURING TEMPERATURE & TECHNIQUES.	PERIODIC	EACH CONCRETE POUR	ACI 318-CH. 5.11, 5.13	*QUALIFICATIONS BASED ON ASTM C1077
I. PRE-STRESSED CONCRETE	N/A	1. APPLICATION OF PRESTRESSING FORCE. 2. GROUTING OF BOUNDED PRESTRESSING TENDONS IN SEISMIC-FORCE RESISTING SYSTEMS.		*QUALIFICATIONS BASED ON ASTM C1077
J. ERECTION OF PRECAST CONCRETE MEMBERS.	N/A			TECHNICIAN TRAINED IN FIELD OF WORK AND HAS AT LEAST ONE YEAR OF EXPERIENCE.
K. POST-TENSIONED CONCRETE:	N/A	1. VERIFY IN-SITU CONCRETE STRENGTH PRIOR TO STRESSING OF TENDONS.		*QUALIFICATIONS BASED ON ASTM E329
	N/A	2. THE POST-TENSIONING ENGINEER, OR A MEMBER OF HIS STAFF, SHALL INSPECT THE TENDON PLACEMENT AND CHAIRING TO INSURE COMPLIANCE WITH THE INTENT OF THE DESIGN.		
	N/A	3. CONTINUOUS INSPECTION IS REQUIRED DURING ALL STRESSING ACTIVITIES.		
	N/A	4. RECORDS OF ALL JACKING FORCES AND ELINGATIONS SHALL BE MADE IN ACCORDANCE WITH THE PTI FIELD MANUAL AND RECORDS SHALL BE PROMPTLY SUBMITTED TO THE ARCHITECT AND ENGINEER.		
L. REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS.	PERIODIC	VERIFY IN-SITU CONCRETE STRENGTH PRIOR TO REMOVAL.	ACI 318-CH. 5.11, 5.13	*QUALIFICATIONS BASED ON ASTM E329
M. POST INSTALLED REINFORCING & ANCHORS (EXPANSION ANCHORS, SCREW ANCHORS ADHESIVE ANCHORS, ECT.).	CONTINUOUS	THE SPECIAL INSPECTOR SHALL BE ON THE JOB SITE CONTINUOUSLY DURING ANCHOR INSTALLATION TO VERIFY ANCHOR TYPE, ANCHOR DIMENSIONS, CONRETE TYPE AND COMPRESSION STRENGTH, PRE-DRILLED HOLE DIMENSIONS, ANCHOR SPACING, EDGE DISTANCES, CONCRETE THICKNESS AND ANCHOR EMBEDMENT.	ACI 318 APPENDIX D-CH. D.9.1	*QUALIFICATIONS BASED ON ASTM E329 & ASTM C1077 OR CERTIFIED MANUFACTURER REPRESENTATIVE
4. STEEL CONSTRUCTION			IBC 1705.2	
A. MATERIAL VERIFICATION OF HIGH-STRENGTH BOLTS, NUTS AND WASHERS:	PERIODIC	1. IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS.	STRUCTURAL STEEL GENERAL NOTES	CWI/ASSOCIATE/TECHNICAL RADIATE, AWS OR CRSI
	PERIODIC	2. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED.	APPLICABLE ASTM MATERIAL SPECIFICATIONS; AISC 335, SECTION A3.4; AISC LRFD, SECTION A3.3	
4. STEEL CONSTRUCTION CONT.:			IBC 1704.3	
B. HIGH STRENGTH BOLTING:	PERIODIC	1. BEARING-TYPE CONNECTIONS.	IBC 1705.2 STRUCTURAL STEEL GENERAL NOTES	CWI/ASSOCIATE/TECHNICAL RADIATE, AWS OR CRSI
	CONTINUOUS OR PERIODIC	2. SLIP-CRITICAL CONNECTIONS.	AISC LRFD SECTION M2.5	
C. MATERIAL VERIFICATION OF STRUCTURAL STEEL:	PERIODIC	1. IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS.	IBC 1705.2 STRUCTURAL STEEL GENERAL NOTES	CWI/ASSOCIATE/TECHNICAL RADIATE, AWS OR CRSI
	PERIODIC	2. MANUFACTURERS' CERTIFIED MILL TEST REPORTS.	ASTM A 6 OR ASTM A 568	
D. MATERIAL VERIFICATION OF WELD FILLER MATERIALS:	PERIODIC	1. IDENTIFICATION MARKINGS TO CONFORM TO AWS SPECIFICATION IN THE APPROVED CONSTRUCTION DOCUMENTS.	STRUCTURAL STEEL GENERAL NOTES	CWI/ASSOCIATE/TECHNICAL RADIATE, AWS OR CRSI
	PERIODIC	2. MANUFACTURERS' CERTIFIED OF COMPLIANCE REQUIRED.	AISC, ASD, SECTION A3.6; AISC LRFD, SECTION A3.5	
E. WELDING: OF STRUCTURAL STEEL:	CONTINUOUS	1. COMPLETE & PARTIAL PENETRATION GROOVE WELDS.	IBC 1705.2.2.1 STRUCTURAL STEEL GENERAL NOTES	CWI AND ASNT
	CONTINUOUS	2. MULTIPASS FILLET WELDS.	AWS D1.1	CWI AND ASNT OR LICENSED ENGINEER
	CONTINUOUS	3. SINGLE-PASS FILLET WELDS > 5/16"		
	PERIODIC	4. SINGLE-PASS FILLET WELDS ≤ 5/16"		
	PERIODIC	5. FLOOR AND DECK WELDS.	AWS D1.3	
F. WELDING OF REINFORCING STEEL:	PERIODIC	1. VERIFICATION OF WELD ABILITY OF REINFORCING STEEL OTHER THAN A706.	IBC 1705.2.2.1.2	CWI/ASSOCIATE/TECHNICIAN TRAINED IN FIELD OF WORK AND HAS AT LEAST ONE YEAR OF EXPERIENCE.
	CONTINUOUS	2. REINFORCING STEEL-RESISTING FLEXURAL AND AXIAL FORCES IN INTERMEDIATE AND SPECIAL MOMENT FRAMES, AND BOUNDARY ELEMENTS OF SPECIAL REINFORCED CONCRETE SHEAR WALLS AND SHEAR REINFORCEMENT.		
	CONTINUOUS	3. SHEAR REINFORCEMENT.		
	PERIODIC	4. OTHER REINFORCING STEEL.		
G. STEEL FRAME JOINT DETAILS; COMPLIANCE WITH APPROVED CONSTRUCTION DOCUMENTS:	PERIODIC	1. DETAILS SUCH AS BRACING & STIFFENING.	IBC 1705.2.1 STRUCTURAL DRAWINGS	PROJECT OF COMPLEX DETAILS: – ASSOCIATE CWI PROJECTS OF RELATIVELY SIMPLE DETAILS: – TECHNICIAN TRAINED IN FIELD OF WORK AND HAS AT LEAST ONE YEAR OF EXPERIENCE.
	PERIODIC	2. MEMBER LOCATIONS.		
	PERIODIC	3. APPLICATION OF JOINT DETAILS AT EACH CONNECTION.		
H. POST INSTALLED REINFORCING & ANCHORS (EXPANSION ANCHORS, SCREW ANCHORS ADHESIVE ANCHORS, ECT.).	CONTINUOUS	THE SPECIAL INSPECTOR SHALL BE ON THE JOB SITE CONTINUOUSLY DURING ANCHOR INSTALLATION TO VERIFY ANCHOR TYPE, ANCHOR DIMENSIONS, CONCRETE OR MASONRY TYPE AND COMPRESSION STRENGTH, PRE-DRILLED HOLE DIMENSIONS, ANCHOR SPACING, EDGE DISTANCES, CONCRETE OR MASONRY THICKNESS AND ANCHOR EMBEDMENT.	ACI 318 APPENDIX D-CH. D.9.1	*QUALIFICATIONS BASED ON ASTM E329 & ASTM C1077 OR CERTIFIED MANUFACTURER REPRESENTATIVE
5. INSPECTION OF FABRICATORS FOR STRUCTURAL STEEL				
FABRICATION & IMPLEMENTATION PROCEDURES	PERIODIC	FABRICATION AND IMPLEMENTATION PROCEDURES. THE SPECIAL INSPECTOR SHALL VERIFY THAT THE FABRICATOR MAINTAINS DETAILED FABRICATION AND QUALITY CONTROL OF THE WORKMANSHIP AND THE FABRICATOR'S ABILITY TO CONFORM TO APPROVED CONSTRUCTION DOCUMENTS AND REFERENCED STANDARDS. THE SPECIAL INSPECTOR SHALL REVIEW THE PROCEDURES FOR COMPLETENESS AND ADEQUACY RELATIVE TO THE CODE REQUIREMENTS FOR THE FABRICATOR'S SCOPE OF WORK. EXCEPTION: SPECIAL INSPECTIONS SHALL NOT BE REQUIRED WHERE THE WORK IS DONE ON THE PREMISES OF A FABRICATOR THAT IS ENROLLED IN A NATIONALLY ACCEPTED INSPECTIONS PROGRAM ACCEPTABLE TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE. AT COMPLETION OF FABRICATION, THE APPROVED FABRICATOR SHALL SUBMIT A CERTIFICATE OF COMPLIANCE TO BUILDING OFFICIAL UPON REQUEST AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE STATING THAT THE WORK WAS PERFORMED IN ACCORDANCE WITH THE APPROVED CONSTRUCTION DOCUMENTS.	IBC 1705.2.1	CWI, ASNT, LICENSED ENGINEER

TESTING & INSPECTION REQUIREMENTS (INCLUDING SPECIAL INSPECTIONS)

REQUIRED INSPECTION VERIFICATION, OR TEST	*VERIFICATION MONITORING FREQUENCY*	*TYPE AND/OR FREQUENCY OF TESTING*	*IBC SECTION & REFERENCE CRITERIA*	*INSPECTOR QUALIFICATIONS*
1. SOILS (SLAB ON GRADE)		SITE PREPARATION	IBC 1705.6	
A. SUB-GRADE 1. VISUAL OBSERVATION	PERIODIC	AT THE CONTRACTORS EXPENSE, INSTRUMENT READINGS SHALL BE TAKEN BY A LICENSED SURVEYOR TO VERIFY FINAL SUBGRADE ELEVATIONS AND SLOPES.	GEOTECHNICAL REPORT, BUILDING PAD GENERAL NOTES	*QUALIFICATIONS BASED ON ASTM D3740 LICENSED SURVEYOR
2. PROOFROLLING OBSERVATIONS	CONTINUOUS	PROOFROLLING SHALL BE MONITORED BY A GEOTECHNICAL ENGINEER. THE GEOTECHNICAL ENGINEER SHALL BE APPROVE THE TYPE OF PROOFROLLING EQUIPMENT AND PROCEDURES.	GEOTECHNICAL REPORT, BUILDING PAD GENERAL NOTES	*QUALIFICATIONS BASED ON ASTM D3740
3. MOISTURE CONDITIONING & RECOMPACTION	CONTINUOUS OR PERIODIC	PROVIDE (1) ON DENSITY TEST FOR EACH 3000 SQ. FT. REFER TO UNDERFLOOR FILL NOTES FOR TESTING SPECIFICATIONS.	GEOTECHNICAL REPORT, BUILDING PAD GENERAL NOTES	*QUALIFICATIONS BASED ON ASTM D3740
B. CHEMICAL INJECTION	N/A	QUALITY CONTROLLED TESTING AND EVALUATION PRIOR AND SUBSEQUENT TO INJECTION SHALL BE PERFORMED BY THE GEOTECHNICAL ENGINEER TO DETERMINE THE EFFECTIVENESS OF THE CHEMICAL INJECTION PROCESS. THE GEOTECHNICAL ENGINEER OR HIS REPRESENTATIVE SHALL MONITOR THE INJECTION PROCESS TO VERIFY AREA COVERAGE, INJECTION DEPTH AND TO REVIEW AND MONITOR THE SWELL TEST RESULTS.	GEOTECHNICAL REPORT, BUILDING PAD GENERAL NOTES	*QUALIFICATIONS BASED ON ASTM D3740
C. DURING FILL PLACEMENT	CONTINUOUS OR PERIODIC	VISUAL OBSERVATIONS: DURING PLACEMENT AND COMPACTION OF FILL, SPECIAL INSPECTOR SHALL DETERMINE THE MATERIAL BEING USED AND THE MAXIMUM LIFT THICKNESS COMPLY WITH ADDITIONAL SAMPLES TESTED EACH DAY, OR MORE OFTEN IF MATERIAL APPEARS TO VARY.	IBC 1705.6 GEOTECHNICAL REPORT, BUILDING PAD GENERAL NOTES	*QUALIFICATIONS BASED ON ASTM D3740
D. EVALUATION OF IN-PLACE DENSITY OF FILL	CONTINUOUS OR PERIODIC	PROVIDE (1) ON DENSITY TEST FOR EACH 3000 SQ. FT. REFER TO UNDERFLOOR FILL NOTES FOR TESTING SPECIFICATIONS.	IBC 1705.6 GEOTECHNICAL REPORT, BUILDING PAD GENERAL NOTES	*QUALIFICATIONS BASED ON ASTM D3740
E. TRENCH BACKFILLING:	CONTINUOUS OR PERIODIC	TRENCH BACKFILLING: TRENCH BACKFILLING WITH CLAY CAP AND PLACING OF CLAY PLUG SHALL BE MONITORED BY GEOTECHNICAL ENGINEER.		
2A. PILE FOUNDATIONS				
A. THE GEOTECHNICAL ENGINEER OR A QUALIFIED E.I.T. INVOLVED IN THE ORIGINAL GEOTECHNICAL INVESTIGATION AND UNDER THE DIRECT SUPERVISION OF THE GEOTECHNICAL ENGINEER SHALL BE PRESENT DURING THE EXCAVATION OF THE FIRST PILE.	N/A	1. VERIFY THE BEARING STRATUM IS ENCOUNTERED AT THE ANTICIPATED DEPTH. 2. ADDRESS UNFORESEEN SUBSURFACE CONDITIONS, IF ANY. 3. VERIFY CONFORMANCE WITH THE FOUNDATION RECOMMENDATIONS PROVIDE IN THE PROJECT "GEOTECHNICAL ENGINEERING STUDY" AND THE STRUCTURAL DRAWINGS ISSUED FOR THE PROJECT.	IBC 1705.7 GEOTECHNICAL REPORT;	GRADUATE ENGINEER *QUALIFICATIONS BASED ON ASTM E329 & ASTM C1077
B. ALL FOOTINGS SHALL BE OBSERVED AND MONITORED BY A REPRESENTATIVE OF THE GEOTECHNICAL ENGINEER. THE CONTRACTOR SHALL PROVIDE THE GEOTECHNICAL ENGINEER WITH A COMPLETE SET OF STRUCTURAL DRAWINGS THAT ARE TO REMAIN WITH THE GEOTECHNICAL ENGINEER OR HIS REPRESENTATIVE.	N/A	1. PROVIDE RECORD OF EACH PILE INSTALLED. 2. RECORD LOAD TESTS, CUTOFF AND TIP OF EACH PILE.	IBC 1705.7 GEOTECHNICAL REPORT;	*QUALIFICATIONS BASED ON ASTM E329 & ASTM C1077
2B. PIER FOUNDATIONS				
A. THE GEOTECHNICAL ENGINEER OR A QUALIFIED E.I.T. INVOLVED IN THE ORIGINAL GEOTECHNICAL INVESTIGATION AND UNDER THE DIRECT SUPERVISION OF THE GEOTECHNICAL ENGINEER SHALL BE PRESENT DURING THE EXCAVATION OF THE FIRST PIER SHAFT.	N/A	1. VERIFY THE BEARING STRATUM IS ENCOUNTERED AT THE ANTICIPATED DEPTH. 2. ADDRESS UNFORESEEN SUBSURFACE CONDITIONS, IF ANY. 3. VERIFY CONFORMANCE WITH THE FOUNDATION RECOMMENDATIONS PROVIDE IN THE PROJECT "GEOTECHNICAL ENGINEERING STUDY" AND THE STRUCTURAL DRAWINGS ISSUED FOR THE PROJECT.	IBC 1705.8 GEOTECHNICAL REPORT;	GRADUATE ENGINEER *QUALIFICATIONS BASED ON ASTM E329 & ASTM C1077
B. ALL FOOTINGS SHALL BE OBSERVED AND MONITORED BY A REPRESENTATIVE OF THE GEOTECHNICAL ENGINEER. THE CONTRACTOR SHALL PROVIDE THE GEOTECHNICAL ENGINEER WITH A COMPLETE SET OF STRUCTURAL DRAWINGS THAT ARE TO REMAIN WITH THE GEOTECHNICAL ENGINEER OR HIS REPRESENTATIVE.	N/A	1. PROVIDE RECORD OF EACH PIER INSTALLED. 2. RECORD LOAD TESTS, CUTOFF AND TIP OF EACH PIER.	IBC 1705.8 GEOTECHNICAL REPORT;	*QUALIFICATIONS BASED ON ASTM E329 & ASTM C1077
3. CONCRETE CONSTRUCTION				
A. REINFORCING STEEL	PERIODIC	PROVIDE PERIODIC INSPECTION OF REINFORCING SIZES, SPACING, GRADE OF REBAR; AND PLACEMENT AT THE FOLLOWING FREQUENCY: COLUMNS: 10% BEAMS: 30% JOIST: 10% OTHER MEMBERS: RANDOMLY @ 20%	IBC 1705.3 ACI 318: CH. 3.5, 7.1-7.7; CONCRETE AND REINFORCING GENERAL NOTES.	*QUALIFICATIONS BASED ON ASTM E329
B. REINFORCING STEEL WELDING	–	NO FIELD WELDING PERMITTED.	AWS D1.4 ACI 318: 3.5.2	CWI OR ASSOCIATE CWI
C. BOLTS TO BE INSTALLED IN CONCRETE PRIOR TO & DURING PLACEMENT OF CONCRETE WHERE ALLOWABLE LOADS HAVE BEEN INCREASED.	CONTINUOUS	VERIFY LOCATION, SIZE AND SPACING OF ANCHORS.	IBC 1705.3	**TECHNICIAN TRAINED IN FIELD OF WORK AND HAS AT LEAST ONE YEAR EXPERIENCE.
D. ANCHORS TO BE INSTALLED IN EXISTING CONCRETE	CONTINUOUS	VERIFY LOCATION, SIZE AND SPACING OF ANCHORS.	IBC 1705.3	**TECHNICIAN TRAINED IN FIELD OF WORK AND HAS AT LEAST ONE YEAR EXPERIENCE.
E. VERIFY USE OF CONCRETE MIX DESIGN	PERIODIC	EACH CONCRETE POUR.	ACI 318-CH. 4, 5.2-5.4	*QUALIFICATIONS BASED ON ASTM C1077
F. SAMPLING OF FRESH CONCRETE.	CONTINUOUS EACH CONCRETE POUR;	1. ALL CONCRETE TESTING IS TO BE MADE AFTER WATER, IF ANY, IS ADDED AT SITE. 2. TAKE SAMPLES & PERFORM SLUMP, AIR & COMPRESSION TESTS IN ACCORDANCE WITH ASTM C-39 ON CONCRETE PLACED EACH DAY AT THE RATE OF ONHE SET OF FOUR CYLINDERS FOR EACH 80 cu. yds. OR FRACTION THEREOF. WHEN MORE THAN 80 cu. yds. IS BEING CONTINUOUSLY PLACED, THE INTERVAL BETWEEN TEST SAMPLES SHALL BE AT LEAST 50 cu. yds. SO AS TO BE REPRESENTATIVE OF THE WHOLE DAYS POUR. SAMPLES SHALL BE TAKEN AT THE THE POINT OD DEPOSIT IN THE FIELD & ALL CYLINDERS SHALL BE ACCURATELY MARKED & REFERENCED TO SHOW DATE, TIME & EXACT LOCATION IN THE STRUCTURE FROM WHICH THEY CAME. MAKE 7-DAY TEST ON TWO CYLINDERS & 28-DAY TEST ON TWO CYLINDERS. REPORST OF TESTS SHALL BE PROMPTLY SENT AS FOLLOWS: TWO TO THE PDPIRC (ARCHITECT), ONE TO THE ENGINEER AND ONE TO THE CONTRACTOR.	ACI 318-CH. 5.6, 5.8	*QUALIFICATIONS BASED ON ASTM C1077

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TX FIRM REG. #3388

DATE: 01/10/18

STATE OF TEXAS
SHAWN J. FRANKE
82639
LICENSED PROFESSIONAL ENGINEER

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VISIONWORKS 210 524-6572
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OWNER:
SAHA SAN ANTONIO HOUSING AUTHORITY Opportunity Lives Here
SAN ANTONIO HOUSING AUTHORITY
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SAN ANTONIO, TX 78204
T. 210.477.6262

LOCATION:
SAN ANTONIO HOUSING AUTHORITY VICTORIA PLAZA MODERNIZATION-PHASE 1
411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
ISSUE	DESCRIPTION	DATE

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

SHEET NUMBER
S101

LA PROJECT NO.: 60-044-00
LA FILE NO.: SVPS101

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TX FIRM REG. #3388

DATE: 01/10/18

STATE OF TEXAS
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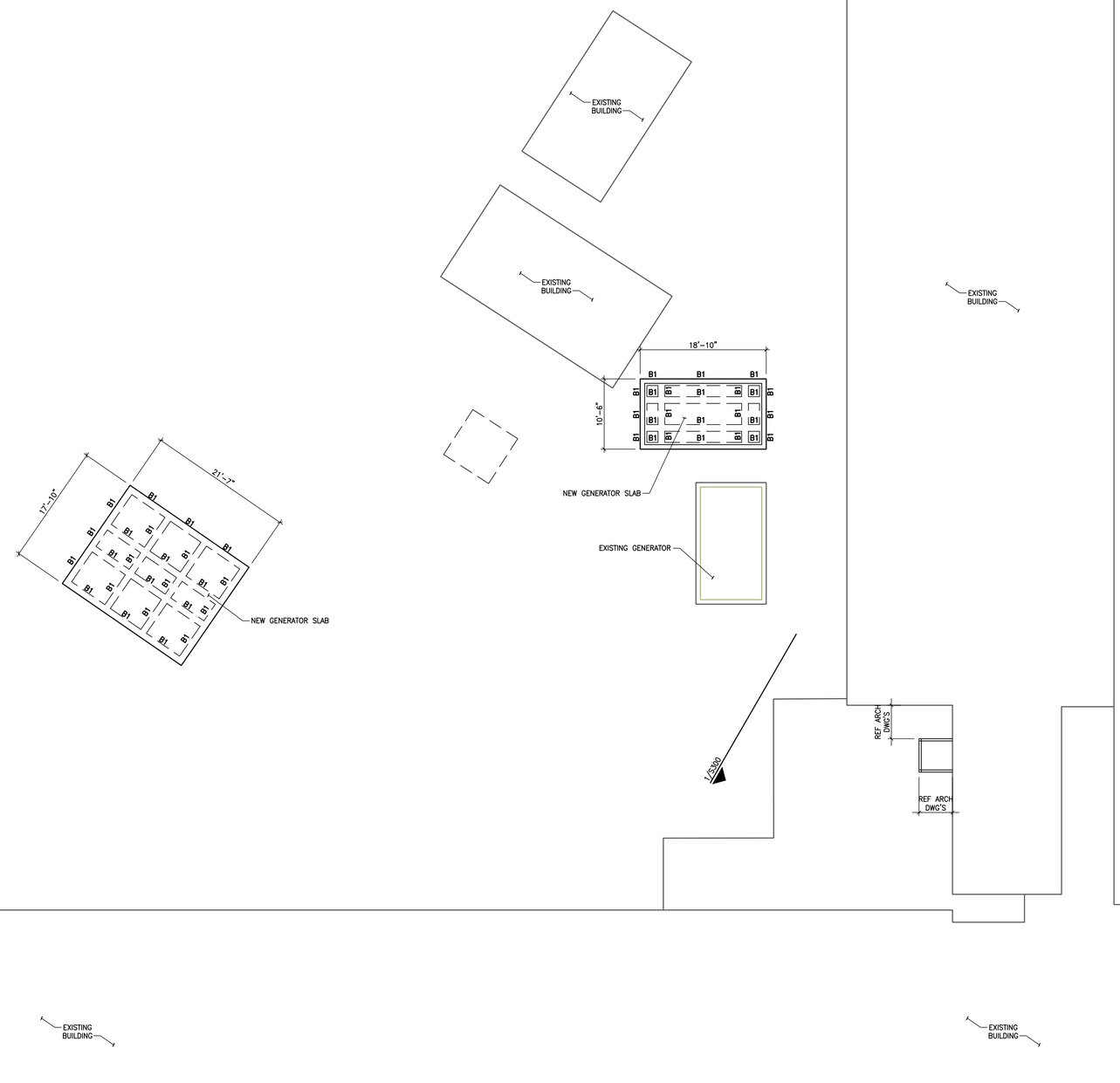
LICENSED
PROFESSIONAL ENGINEER



FOUNDATION PLAN

SCALE: 1/8" = 1'-0"

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REVISIONS		
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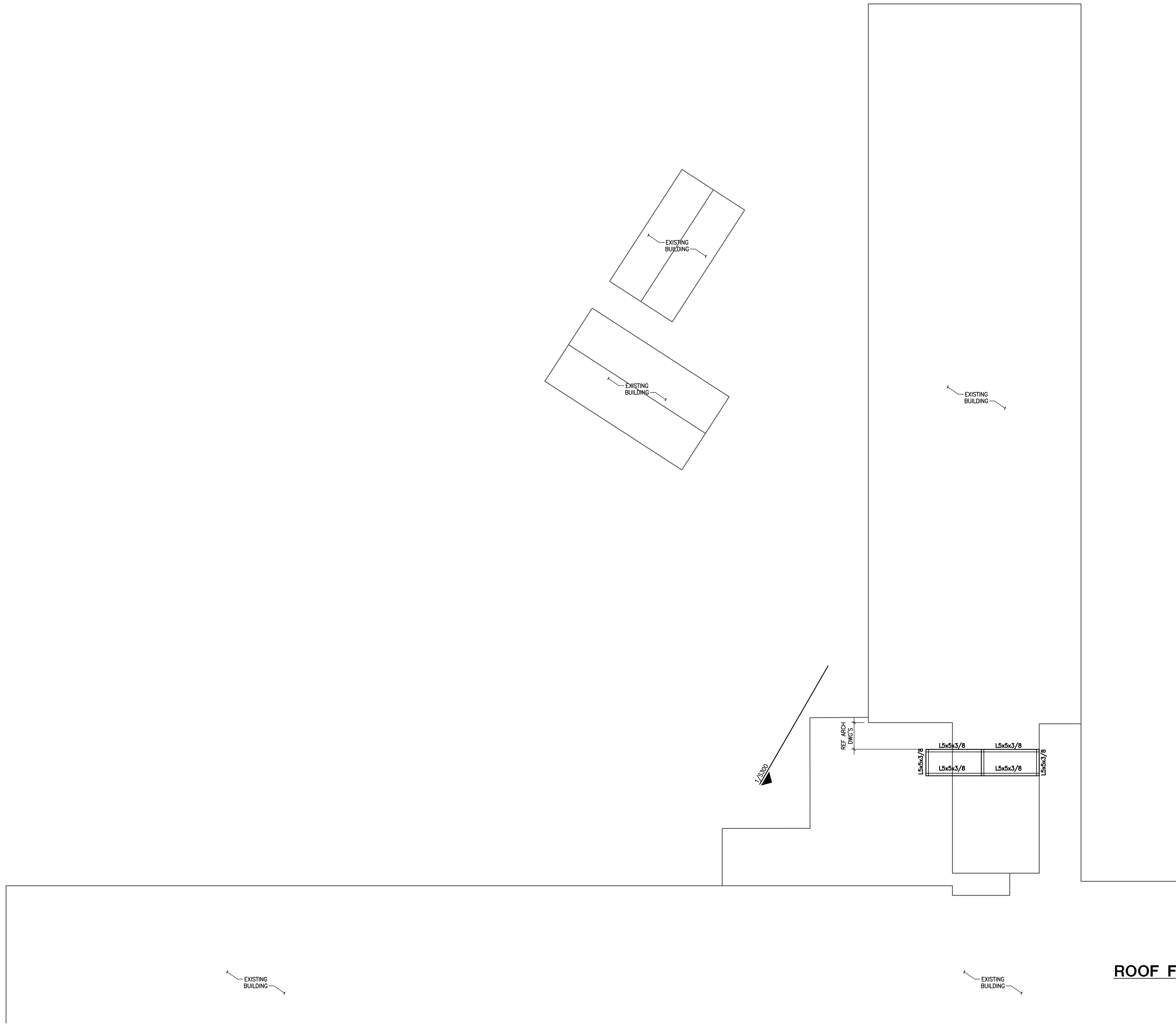
PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 15481

SHEET NUMBER
S200

LA PROJECT NO.: 60-044-00
LA FILE NO.: SVPS200



ROOF FRAMING PLAN

SCALE: 1/8" = 1'-0"

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DATE: 01/10/18

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LOCATION:

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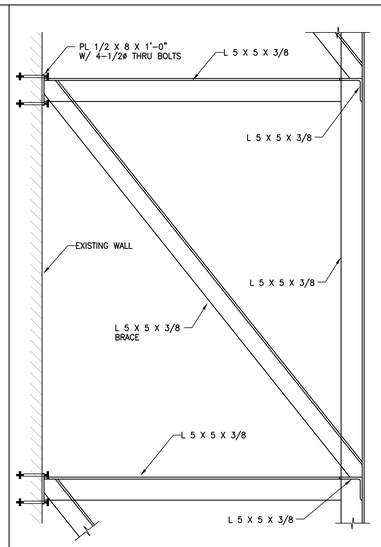
411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
ISSUE	DESCRIPTION	DATE

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

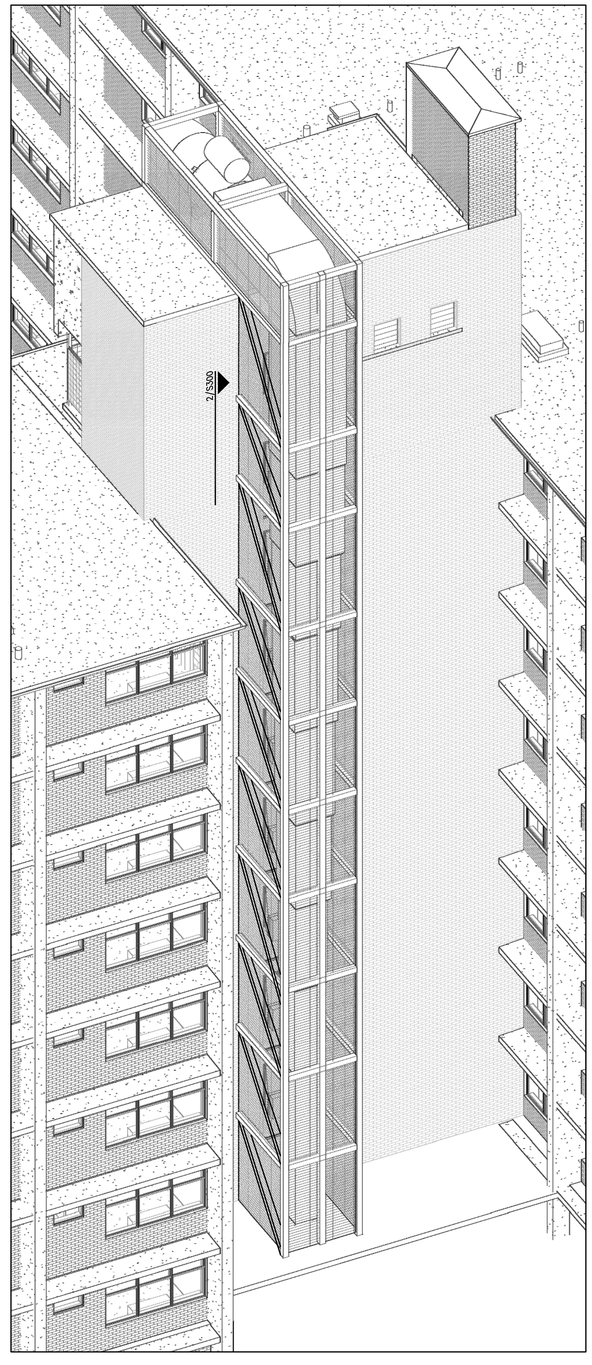
SHEET NUMBER
S201

LA PROJECT NO.: 60-044-00
LA FILE NO.: SVPS201



2 **SECTION**

SCALE: 3/4" = 1'-0"



1 **DETAIL**

N.T.S.

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DATE: 01/10/18

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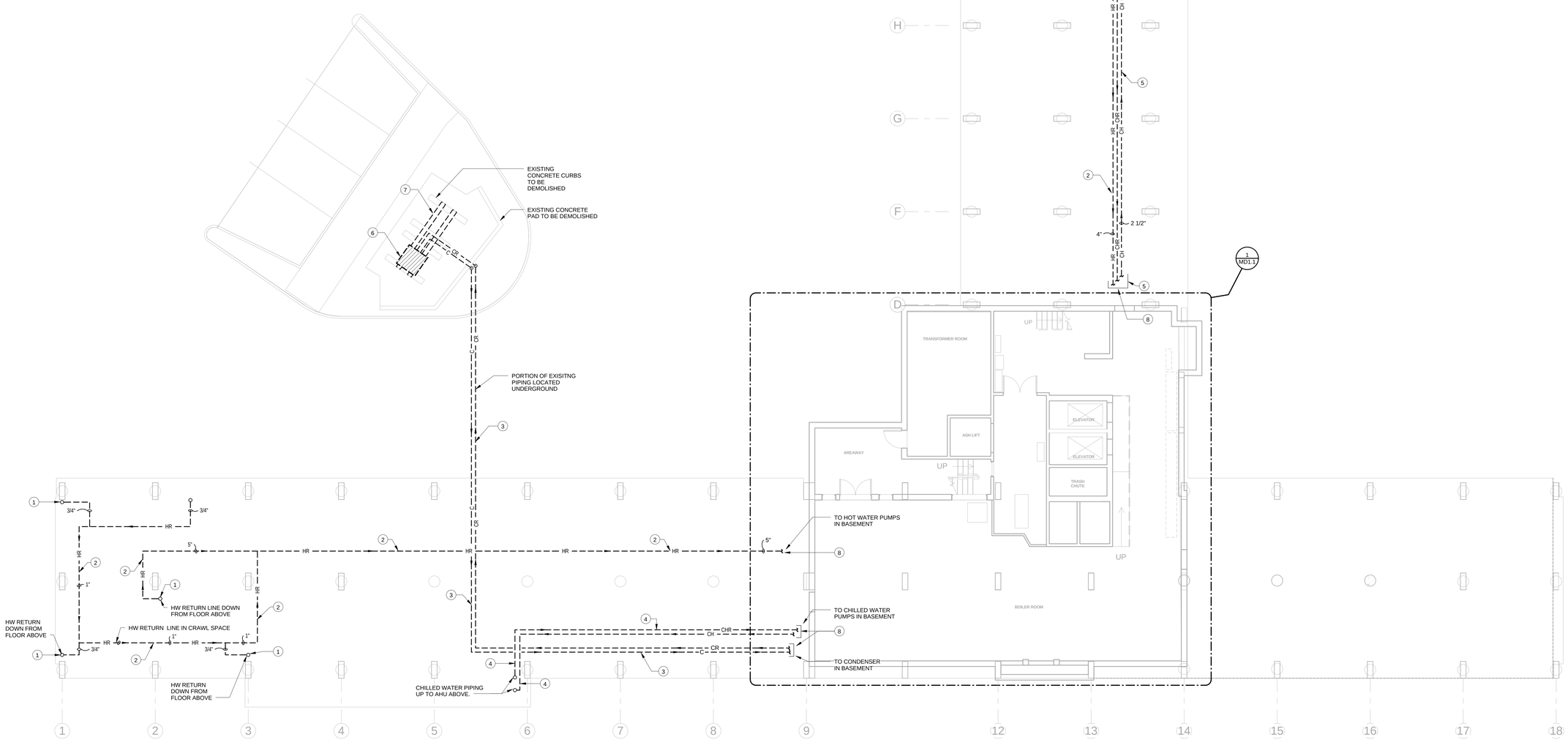
REVISIONS		
ISSUE	DESCRIPTION	DATE

PROJECT ARCHITECT
RACHEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 12468T

SHEET NUMBER
S300

LA PROJECT NO.: 60-044-00
LA FILE NO.: SVPS300



1 MD1.0 BASEMENT PLAN - DEMOLITION - HVAC
1/8" = 1'-0"

HVAC DEMO LEGEND:

- EXISTING MECHANICAL EQUIPMENT (WORK SHOWN IN HALF TONE LINES).
- EXISTING TO BE DEMOLISHED (WORK SHOWN IN DASHED DARK LINES).
- DISCONNECT FROM EXISTING TO REMAIN

HVAC DEMO GENERAL NOTES:

1. MECHANICAL CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS PRIOR TO BEGINNING ANY WORK.
2. ALL EXISTING HYDRONIC PIPING SHALL BE DEMOLISHED UNLESS INDICATED OTHERWISE. THERE ARE SOME INSTANCES WHERE EXACT PIPE ROUTING COULD NOT BE VERIFIED. IN SOME INSTANCES PIPE ROUTING MAY DIFFER FROM PLANS.
3. CONTRACTOR SHALL COLLECT ALL COPPER PIPING AND/OR MATERIALS DEMOLISHED TO BE RETURNED TO THE OWNER FOR RECYCLE.
4. SHEET MD1.4 IS REPRESENTATIVE OF DEMOLITION WORK TO BE COMPLETE ON EACH LEVEL. FOR LEVELS 2,3,4,5,6,7,8, AND 9.
5. THE PIPING SHOWN ON THIS PLAN IS DIAGRAMATIACAL, IT IS SHOWN HERE FOR CLARITY. CONTRACTOR SHALL FIELD VERIFY EXACT ROUTING.

DEMO KEYED NOTES MD1.0

1 DEMOLISH EXISTING HOT WATER RISER PIPING (TYPICAL). REFER TO SHEET MD1.3 FOR CONTINUATION.
2 DEMOLISH EXISTING HOT WATER PIPING WITHIN CRAWL SPACE UP TO FLOOR ABOVE.
3 DEMOLISH EXISTING CONDENSER PIPING BETWEEN COOLING TOWER AND CONDENSER WITHIN BASEMENT.
4 DEMOLISH EXISTING CHILLED WATER RISER FROM AIR HANDLER ABOVE. REFER TO SHEET MD1.3 FOR CONTINUATION.
5 EXISTING CHILLED WATER PIPING TO BE DEMOLISHED.
6 EXISTING COOLING TOWER TO BE DEMOLISHED.
7 EXISTING STEEL WIDE FLANGE SUPPORT RUNNERS TO BE DEMOLISHED.
8 FOR CONTINUATION REFER TO SHEET MD1.1.

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SAN ANTONIO HOUSING AUTHORITY
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LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

05/25/18
PERMIT SET

STATE OF TEXAS
MEHDI J. MIRMOMENI
113121
LICENSED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

BASEMENT PLAN - DEMOLITION - PIPING

SHEET NUMBER
MD1.0

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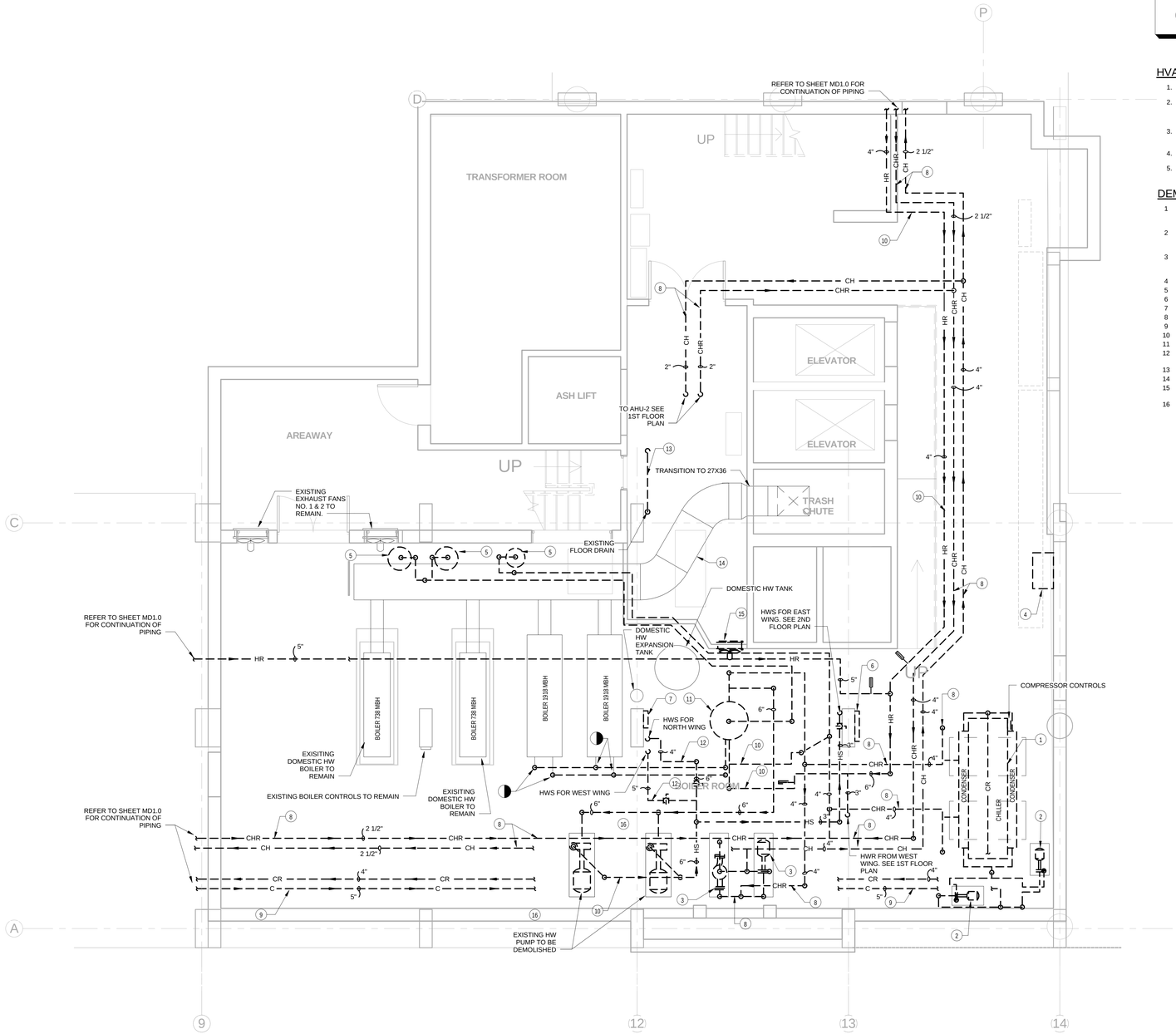

1 MD1.1 ENLARGED BASEMENT PLAN - DEMOLITION - HVAC
1/4" = 1'-0"

HVAC DEMO LEGEND:

- EXISTING MECHANICAL EQUIPMENT (WORK SHOWN IN HALF TONE LINES).
- EXISTING TO BE DEMOLISHED (WORK SHOWN IN DASHED DARK LINES).
- DISCONNECT FROM EXISTING TO REMAIN

HVAC DEMO GENERAL NOTES:

1. MECHANICAL CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS PRIOR TO BEGINNING ANY WORK.
2. ALL EXISTING HYDRONIC PIPING SHALL BE DEMOLISHED UNLESS INDICATED OTHERWISE. THERE ARE SOME INSTANCES WHERE EXACT PIPE ROUTING COULD NOT BE VERIFIED. IN SOME INSTANCES PIPE ROUTING MAY DIFFER FROM PLANS.
3. CONTRACTOR SHALL COLLECT ALL COPPER PIPING AND/OR MATERIALS DEMOLISHED TO BE RETURNED TO THE OWNER FOR RECYCLE.
4. SHEET MD1.4 IS REPRESENTATIVE OF DEMOLITION WORK TO BE COMPLETE ON EACH LEVEL, FOR LEVELS 2,3,4,5,6,7,8, AND 9.
5. THE PIPING SHOWN ON THIS PLAN IS DIAGRAMATICAL. IT IS SHOWN HERE FOR CLARITY. CONTRACTOR SHALL FIELD VERIFY EXACT ROUTING.

DEMO KEYED NOTES MD1.1

1 EXISTING CHILLER TO BE REMOVED AND HOUSE KEEPING PADS TO BE DEMOLISHED. COORDINATE WITH GENERAL CONTRACTOR FOR REMOVAL OF HOUSEKEEPING PAD.
2 EXISTING CONDENSER WATER PUMPS AND HOUSE KEEPING PAD TO BE DEMOLISHED. COORDINATE WITH GENERAL CONTRACTOR FOR REMOVAL OF HOUSEKEEPING PAD.
3 EXISTING CHILLED WATER PUMPS AND HOUSE KEEPING PADS TO BE DEMOLISHED. COORDINATE WITH GENERAL CONTRACTOR FOR REMOVAL OF HOUSEKEEPING PAD.
4 EXISTING HVAC AIR COMPRESSOR TO BE DEMOLISHED.
5 EXISTING EXPANSION TANK TO BE DEMOLISHED.
6 EXISTING HVAC CONTROL PANEL TO BE DEMOLISHED.
7 EXISTING HALON CONTROL PANEL TO BE DEMOLISHED.
8 EXISTING CHILLED WATER PIPING TO BE DEMOLISHED.
9 EXISTING CONDENSER PIPING TO BE DEMOLISHED.
10 EXISTING HOT WATER PIPING TO BE DEMOLISHED.
11 EXISTING BUFFER TANK TO BE DEMOLISHED.
12 EXISTING HOT WATER PIPING TO BE DEMOLISHED FROM 1ST FLOOR TO POINT INDICATED.
13 EXISTING CONDENSATE PIPING FROM AHU-2 TO BE DEMOLISHED.
14 EXISTING BOILER VENTING TO REMAIN.
15 EXISTING WALL MOUNTED FAN TO BE REMOVED. COORDINATE WITH ELECTRICAL CONTRACTOR FOR REMOVAL OF WIRING.
16 EXISTING HOT WATER PUMPS AND HOUSE KEEPING PADS TO BE DEMOLISHED. COORDINATE WITH GENERAL CONTRACTOR FOR REMOVAL OF HOUSEKEEPING PAD.

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LOCATION:

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411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS

ISSUE	DESCRIPTION	DATE

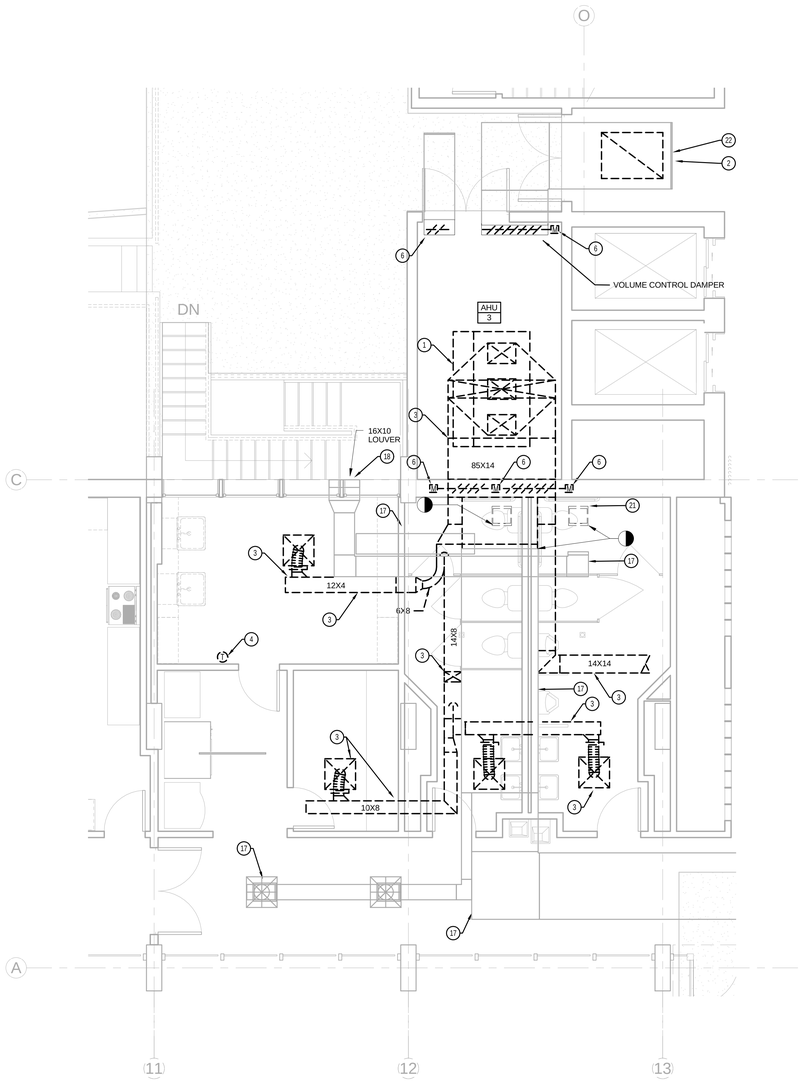
05/25/18
PERMIT SET

STATE OF TEXAS
MEHDI J. MIRMOMENI
113121
LICENSED
PROFESSIONAL ENGINEER
05/25/18

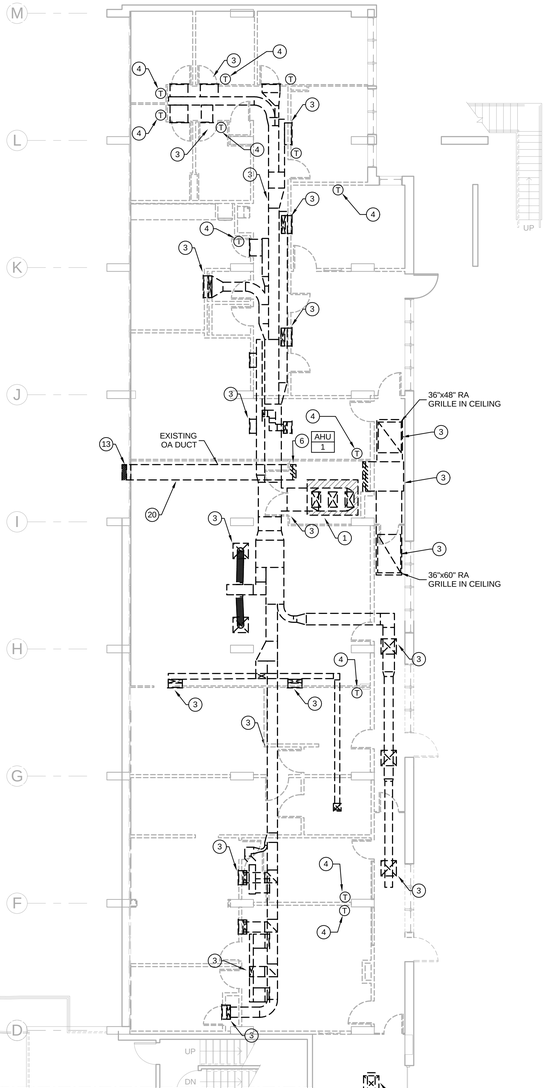
PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

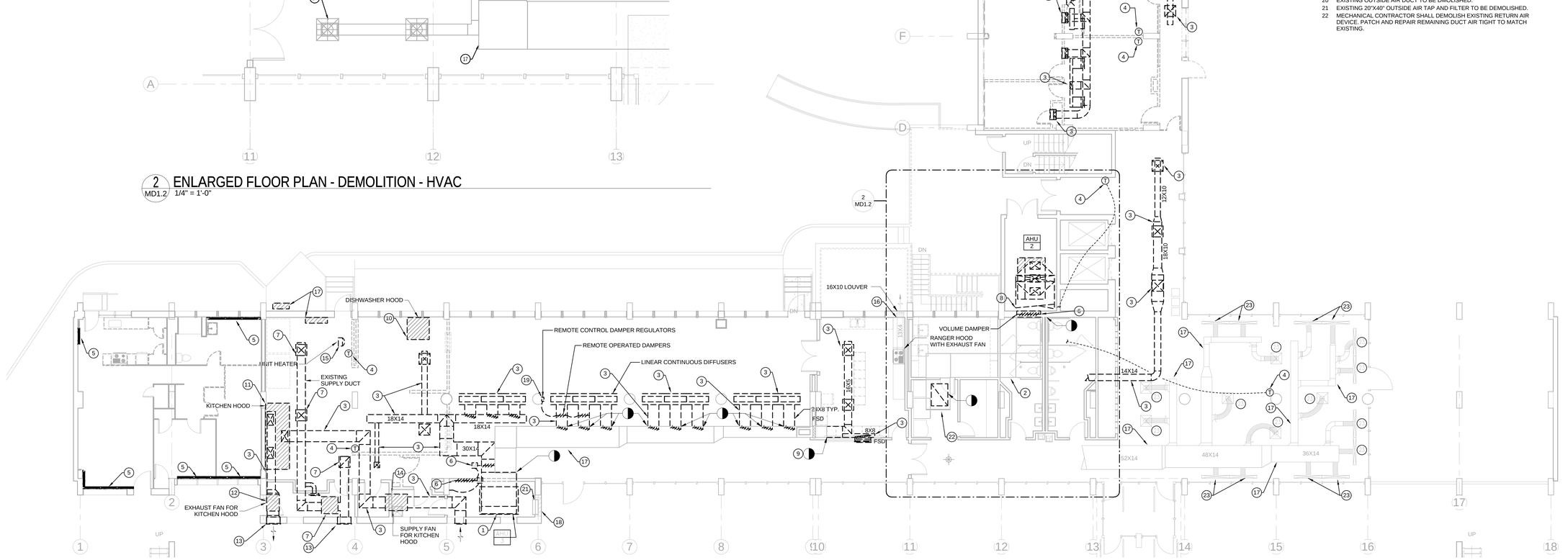
ENLARGED BASEMENT PLAN - DEMOLITION - PIPING

SHEET NUMBER
MD1.1



2 ENLARGED FLOOR PLAN - DEMOLITION - HVAC
MD1.2 1/4" = 1'-0"





1 FLOOR PLAN - DEMOLITION - LEVEL 1 - HVAC
MD1.2 1/8" = 1'-0"

HVAC DEMO LEGEND:

- EXISTING MECHANICAL EQUIPMENT (WORK SHOWN IN HALF TONE LINES).
- EXISTING TO BE DEMOLISHED (WORK SHOWN IN DASHED DARK LINES).
- DISCONNECT FROM EXISTING TO REMAIN

HVAC DEMO GENERAL NOTES:

1. MECHANICAL CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS PRIOR TO BEGINNING ANY WORK.
2. ALL EXISTING HYDRONIC PIPING SHALL BE DEMOLISHED UNLESS INDICATED OTHERWISE. THERE ARE SOME INSTANCES WHERE EXACT PIPE ROUTING COULD NOT BE VERIFIED. IN SOME INSTANCES PIPE ROUTING MAY DIFFER FROM PLANS.
3. CONTRACTOR SHALL COLLECT ALL COPPER PIPING AND/OR MATERIALS DEMOLISHED TO BE RETURNED TO THE OWNER FOR RECYCLE.
4. SHEET MD1.4 IS REPRESENTATIVE OF DEMOLITION WORK TO BE COMPLETE ON EACH LEVEL, FOR LEVELS 2,3,4,5,6,7,8, AND 9.
5. THE PIPING SHOWN ON THIS PLAN IS DIAGRAMATIACAL. IT IS SHOWN HERE FOR CLARITY. CONTRACTOR SHALL FIELD VERIFY EXACT ROUTING.

DEMO KEYED NOTES MD1.2

1 EXISTING AIR HANDLER TO BE DEMOLISHED. CONTRACTOR SHALL DEMOLISH ASSOCIATED CONDENSATE PIPING.
2 EXISTING RETURN DUCT TO REMAIN. SHOWN FOR CLARITY. NOT SHOWN ON ENLARGED PLAN 2/MD1.2 FOR CLARITY. LOCATED BLOW SUPPLY DUCT.
3 EXISTING DUCT WORK AND ASSOCIATED AIR DEVICES TO BE DEMOLISHED.
4 EXISTING THERMOSTAT TO BE DEMOLISHED. CONTRACTOR SHALL FIELD VERIFY EXISTING LOCATION FOR ALL THERMOSTATS AND DEMOLISH ALL ASSOCIATED WIRING AND MOTORIZED DAMPERS.
5 EXISTING HOT WATER HEATING COIL TO BE DEMOLISHED.
6 EXISTING MOTORIZED DAMPER AND ACTUATOR TO BE DEMOLISHED.
7 EXISTING FAN COIL AND ASSOCIATED DUCTWORK TO BE DEMOLISHED.
8 FOR CONTINUATION OF SUPPLY DUCTWORK REFER TO ENLARGED PLAN 2/MD1.2.
9 DEMOLISH DUCTWORK UP TO POINT SHOWN.
10 EXISTING DISHWASHER EXHAUST HOOD TO BE DEMOLISHED. CONTRACTOR SHALL DEMOLISH ALL ASSOCIATED DUCT WORK, LOUVERS AND/OR WALL CAPS. COORDINATE WITH GENERAL CONTRACTOR FOR REPAIR OF WALL OPENING.
11 EXISTING KITCHEN HOOD TO BE DEMOLISHED. CONTRACTOR SHALL DEMOLISH ALL ASSOCIATED EXHAUST DUCT, SUPPRESSION EQUIPMENT AND PIPING.
12 EXISTING INLINE EXHAUST FAN LOCATED ABOVE CEILING TO BE DEMOLISHED. CONTRACTOR SHALL DEMOLISH ALL ASSOCIATED DUCT, WALL LOUVERS AND/OR WALL CAPS. COORDINATE WITH GENERAL CONTRACTOR FOR REPAIR OF WALL PENETRATION.
13 EXISTING EXTERIOR WALL LOUVER TO BE DEMOLISHED. COORDINATE WITH GENERAL CONTRACTOR FOR REPAIR OF THE WALL.
14 EXISTING SUPPLY FAN FOR KITCHEN HOOD TO BE DMOLISHED. CONTRACTOR SHALL DEMOLISH ALL ASSOCIATED DUCT WORK, WALL LOUVER AND/OR WALL CAP. COORDINATE WITH GENERAL CONTRACTOR FOR REPAIR OF WALL PENETRATION.
15 EXISTING HEATER LOCATED ABOVE CEILING TO BE DEMOLISHED. CONTRACTOR SHALL DEMOLISH ALL ASSOCIATED CONTROLS, AND HYDRONIC PIPING.
16 EXISTING RANGE HOOD AND DUCTWORK TO REMAIN.
17 EXISTING DUCTWORK TO REMAIN (TYPICAL).
18 EXISITNG OUTSIDE AIR INTAKE TO REMAIN.
19 EXISTING DAMPER REGULATORS TO BE DEMOLISHED.
20 EXISTING OUTSIDE AIR DUCT TO BE DMOLISHED.
21 EXISTING 20"X40" OUTSIDE AIR TAP AND FILTER TO BE DEMOLISHED.
22 MECHANICAL CONTRACTOR SHALL DEMOLISH EXISTING RETURN AIR DEVICE. PATCH AND REPAIR REMAINING DUCT AIR TIGHT TO MATCH EXISTING.

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REVISIONS		
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PERMIT SET

STATE OF TEXAS
MEHDI J. MIRMOMENI
113121
LICENSED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10-181

FLOOR PLAN - DEMOLITION - LEVEL 1 - HVAC

SHEET NUMBER
MD1.2

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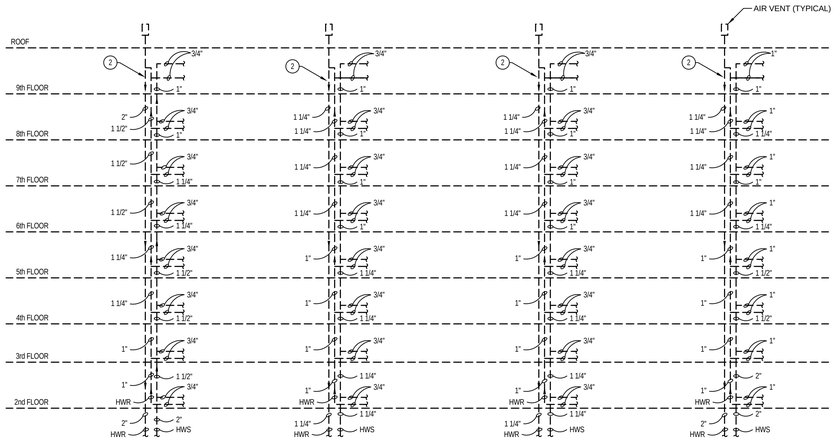
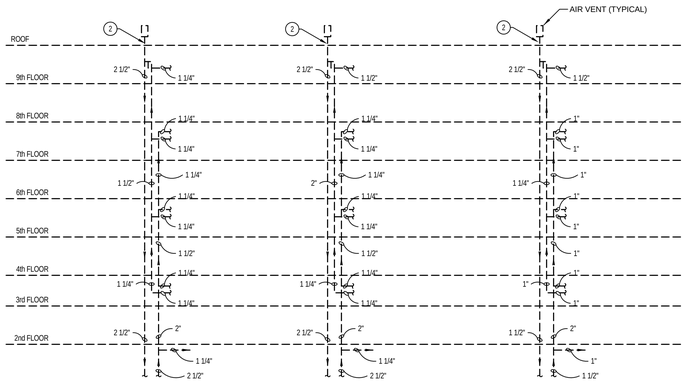
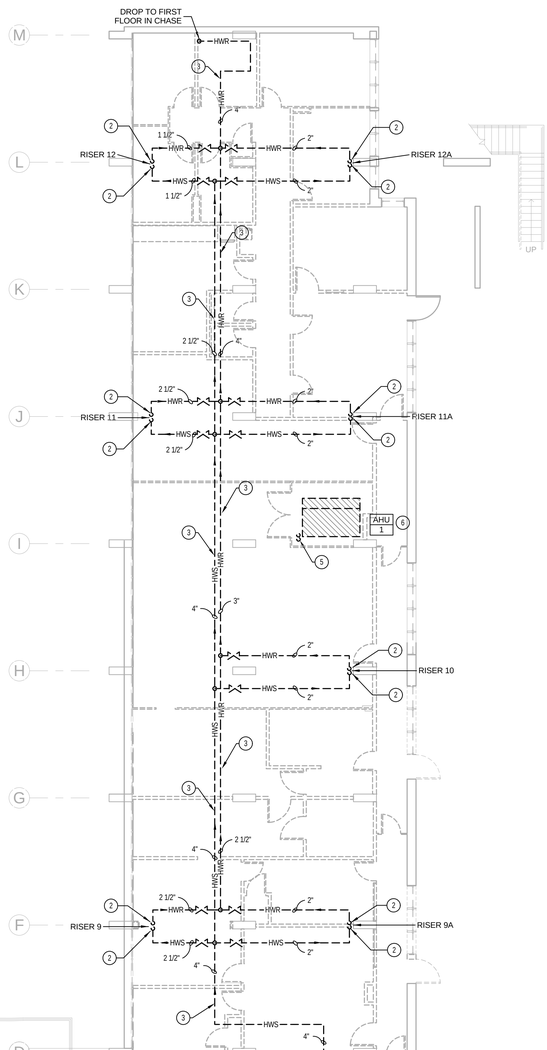
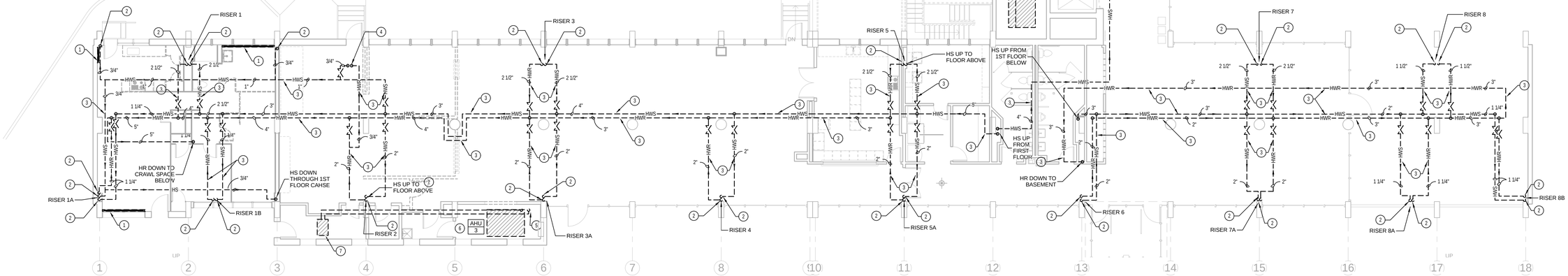


RISER 2,3A,4,5A,7A, 9A,10,11A & 12A | RISER 1A, & 8B | RISER 1B, & 8A | RISER 6



RISER 1,7 & 9 | RISER 3,5 & 11 | RISER 8 & 12





1 MD1.3 FLOOR PLAN - DEMOLITION - LEVEL 1 - PIPING
1/8" = 1'-0"

HVAC DEMO LEGEND:

- EXISTING MECHANICAL EQUIPMENT (WORK SHOWN IN HALF TONE LINES).
- EXISTING TO BE DEMOLISHED (WORK SHOWN IN DASHED DARK LINES).
- DISCONNECT FROM EXISTING TO REMAIN

HVAC DEMO GENERAL NOTES:

1. MECHANICAL CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS PRIOR TO BEGINNING ANY WORK.
2. ALL EXISTING HYDRONIC PIPING SHALL BE DEMOLISHED UNLESS INDICATED OTHERWISE. THERE ARE SOME INSTANCES WHERE EXACT PIPE ROUTING COULD NOT BE VERIFIED. IN SOME INSTANCES PIPE ROUTING MAY DIFFER FROM PLANS.
3. CONTRACTOR SHALL COLLECT ALL COPPER PIPING AND/OR MATERIALS DEMOLISHED TO BE RETURNED TO THE OWNER FOR RECYCLE.
4. SHEET MD1.4 IS REPRESENTATIVE OF DEMOLITION WORK TO BE COMPLETE ON EACH LEVEL, FOR LEVELS 2,3,4,5,6,7,8, AND 9.
5. THE PIPING SHOWN ON THIS PLAN IS DIAGRAMATICAL. IT IS SHOWN HERE FOR CLARITY. CONTRACTOR SHALL FIELD VERIFY EXACT ROUTING.

DEMO KEYED NOTES MD1.3

1 DEMOLISH EXISTING HOT WATER HEATING COIL , ASSOCIATED PIPING, THERMOSTAT AND ASSOCIATED WIRING. TYPICAL.
2 DEMOLISH EXISTING HOT WATER RISER PIPING TO FLOORS ABOVE. REFER TO SPECIFIC RISER DIAGRAM ON THIS SHEET. TYPICAL.
3 DEMOLISH EXISTING HOT WATER PIPING ABOVE CEILING. TYPICAL.
4 DEMOLISH HOT WATER PIPING DOWN TO UNIT HEATER. UNIT HEATER TO BE DEMOLISHED.
5 DEMOLISH EXISTING CHILLED WATER PIPING FROM EXISITNG UNIT DOWN TO CRAWL SPACE. REFER TO MD1.0 FOR CONTINUATION.
6 EXISTING AHU TO BE DEMOLISHED. CONTRACTOR SHALL DEMOLISH ALL ASSOCIATED CONTROL WIRING AND PIPING.
7 EXISTING FAN COIL UNIT LOCATED ABOVE CEILING TO BE DEMOLISH. CONTRACTOR SHALL DEMOLISH ALL ASSOCIATED CONTROL WIRING AND PIPING.

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REVISIONS		
ISSUE	DESCRIPTION	DATE

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PERMIT SET

STATE OF TEXAS
MEHDI J. MIRMOMENI
113121
LICENSED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

FLOOR PLAN - DEMOLITION - LEVEL 1 - PIPING

SHEET NUMBER
MD1.3

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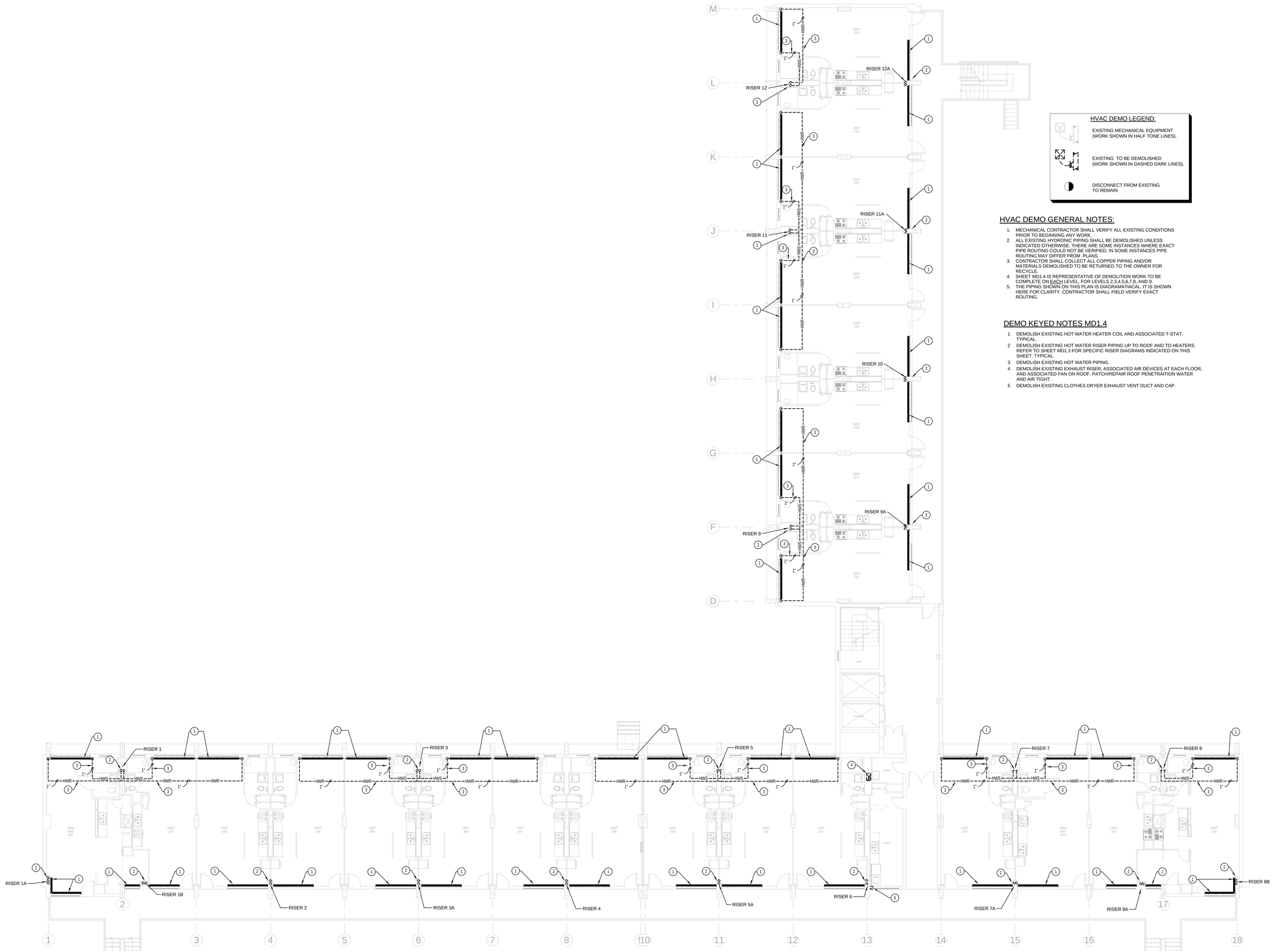

HVAC DEMO LEGEND:

- EXISTING MECHANICAL EQUIPMENT (WORK SHOWN IN HALF TONE LINES).
- EXISTING TO BE DEMOLISHED (WORK SHOWN IN DASHED DARK LINES).
- DISCONNECT FROM EXISTING TO REMAIN

HVAC DEMO GENERAL NOTES:

1. MECHANICAL CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS PRIOR TO BEGINNING ANY WORK.
2. ALL EXISTING HYDRONIC PIPING SHALL BE DEMOLISHED UNLESS INDICATED OTHERWISE. THERE ARE SOME INSTANCES WHERE EXACT PIPE ROUTING COULD NOT BE VERIFIED. IN SOME INSTANCES PIPE ROUTING MAY DIFFER FROM PLANS.
3. CONTRACTOR SHALL COLLECT ALL COPPER PIPING AND/OR MATERIALS DEMOLISHED TO BE RETURNED TO THE OWNER FOR RECYCLE.
4. SHEET MD1.4 IS REPRESENTATIVE OF DEMOLITION WORK TO BE COMPLETE ON EACH LEVEL, FOR LEVELS 2,3,4,5,6,7,8, AND 9.
5. THE PIPING SHOWN ON THIS PLAN IS DIAGRAMATIACAL. IT IS SHOWN HERE FOR CLARITY. CONTRACTOR SHALL FIELD VERIFY EXACT ROUTING.

DEMO KEYED NOTES MD1.4

1 DEMOLISH EXISTING HOT WATER HEATER COIL AND ASSOCIATED T-STAT. TYPICAL.
2 DEMOLISH EXISTING HOT WATER RISER PIPING UP TO ROOF AND TO HEATERS. REFER TO SHEET MD1.3 FOR SPECIFIC RISER DIAGRAMS INDICATED ON THIS SHEET. TYPICAL.
3 DEMOLISH EXISTING HOT WATER PIPING.
4 DEMOLISH EXISTING EXHAUST RISER, ASSOCIATED AIR DEVICES AT EACH FLOOR, AND ASSOCIATED FAN ON ROOF. PATCH/REPAIR ROOF PENETRAITION WATER AND AIR TIGHT.
5 DEMOLISH EXISTING CLOTHES DRYER EXHAUST VENT DUCT AND CAP.

1 MD1.4 FLOOR PLAN - LEVEL 2 THRU 9 - DEMOLITION - HVAC
1/8" = 1'-0"

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FLOOR PLAN - DEMOLITION - LEVEL 2 THRU 9 - HVAC/ PIPING

SHEET NUMBER
MD1.4

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1 MD1.5 ROOF PLAN - DEMOLITION - HVAC
1/8" = 1'-0"

HVAC DEMO LEGEND:

- EXISTING MECHANICAL EQUIPMENT (WORK SHOWN IN HALF TONE LINES).
- EXISTING TO BE DEMOLISHED (WORK SHOWN IN DASHED DARK LINES).
- DISCONNECT FROM EXISTING TO REMAIN

HVAC DEMO GENERAL NOTES:

1. MECHANICAL CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS PRIOR TO BEGINNING ANY WORK.
2. ALL EXISTING HYDRONIC PIPING SHALL BE DEMOLISHED UNLESS INDICATED OTHERWISE. THERE ARE SOME INSTANCES WHERE EXACT PIPE ROUTING COULD NOT BE VERIFIED. IN SOME INSTANCES PIPE ROUTING MAY DIFFER FROM PLANS.
3. CONTRACTOR SHALL COLLECT ALL COPPER PIPING AND/OR MATERIALS DEMOLISHED TO BE RETURNED TO THE OWNER FOR RECYCLE.
4. SHEET MD1.4 IS REPRESENTATIVE OF DEMOLITION WORK TO BE COMPLETE ON EACH LEVEL, FOR LEVELS 2,3,4,5,6,7,8, AND 9.
5. THE PIPING SHOWN ON THIS PLAN IS DIAGRAMATIACAL. IT IS SHOWN HERE FOR CLARITY. CONTRACTOR SHALL FIELD VERIFY EXACT ROUTING.

KEYED NOTES MD1.5

1 EXISTING PENTHOUSE TO BE DEMOLISHED. PATCH/REPAIR ROOF PENETRAITION WATER AND AIR TIGHT.

2 EXISTING RESTOOM FAN AND ROOF CURB TO BE DEMOLISHED. PATCH/REPAIR ROOF PENETRAITION WATER AND AIR TIGHT.

3 EXISTING CONDENSING UNIT, ROOF SUPPORTS AND ASSOCIATED PIPING TO BE DEMOLISHED.

4 EXISTING MINI-SPLIT, THERMOSTAT, AND ASSOCIATED WIRING TO BE DEMOLISHED. DEMOLISH ALL REFRIGERANT PIPING BETWEEN INDOOR AND OUTDOOR UNIT. PATCH/REPAIR ROOF PENETRAITION WATER AND AIR TIGHT.

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PROJECT ARCHITECT
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TEXAS LICENSE NO. 10–881

ROOF PLAN - DEMOLITION - HVAC

SHEET NUMBER
MD1.5

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MECHANICAL LEGEND

(NOTE: ALL SYMBOLS SHOWN ARE NOT NECESSARILY USED ON DRAWINGS)

SYMBOL LEGEND

DUCTWORK

- DUCTWORK SIZE, 1st NO. VISIBLE DIMENSION
- DUCTWORK TURNING VANES
- BRANCH DUCT TAKEOFF
- DUCT TEE
- TRANSITION (RECTANGULAR)
- TRANSITION (RECTANGULAR TO ROUND)
- FLEXIBLE DUCT
- FLEXIBLE CONNECTION
- VOLUME DAMPER
- FIRE DAMPER OR SMOKE DAMPER
- SUPPLY DUCT SECTION RECTANGULAR, FLAT, OVAL, ROUND
- RETURN/EXHAUST/OUTSIDE AIR DUCT SECTION
- SIDEWALL GRILLE OR REGISTER (SUPPLY)
- SIDEWALL GRILLE OR REGISTER (RETURN OR EXHAUST)
- CEILING GRILLE OR REGISTER (SUPPLY)
- CEILING GRILLE OR REGISTER (EXHAUST OR RETURN)
- SD — SMOKE DETECTOR (DIVISION 16)
- H — HUMIDISTAT
- T — THERMOSTAT
- R — CHANGE IN ELEVATION (R), (F)
- SD — DUCT SMOKE DETECTOR

VALVES

- TWO-WAY CONTROL VALVE
- THREE-WAY CONTROL VALVE
- UNION
- BUTTERFLY VALVE
- TEMPERATURE/ PRESSURE RELIEF VALVE
- GLOBE VALVE
- CHECK VALVE
- GATE VALVE
- GATE VALVE IN C.I. VALVE BOX
- PRESSURE REDUCING VALVE
- STRAINER W/ BLOWDOWN GATE VALVE
- THERMOWELL W/ THERMOMETER (TI)
- PRESSURE GAUGE W/ GAUGE COCK (PI)
- BALL VALVE
- CIRCUIT SETTER, BALANCING VALVE
- VALVE IN VERTICAL
- DIRT LEG (6" LONG)

- FS — FIRE CONTROL
- FS — FIRE SPRINKLER LINE
- F — FIRE SUPPLY MAIN
- FDC — FIRE DEPARTMENT CONNECTION LINE

PIPING

- DOMESTIC COLD WATER (DOMESTIC/POTABLE)
- DOMESTIC HOT WATER (DOMESTIC/POTABLE)
- DOMESTIC HOT WATER RETURN (DOMESTIC/POTABLE)
- SANITARY SEWER
- SANITARY VENT
- SD — STORM DRAIN
- EOD — EMERGENCY OVERFLOW DRAIN
- DIRECTION OF FLOW
- CD — CONDENSATE DRAIN
- WATER HAMMER ARRESTOR (ISOMETRIC)
- WATER HAMMER ARRESTOR (FLAT RISER)
- WATER HAMMER ARRESTOR (PLAN)
- CHS — CHILLED WATER SUPPLY
- CHR — CHILLED WATER RETURN
- HWS — HOT WATER SUPPLY
- HWR — HOT WATER RETURN

- FCO / WCO — FLOOR CLEANOUT / WALL CLEANOUT
- P - TRAP
- FLANGE CONNECTION
- DROP AT 45° ANGLE
- ELBOW TURNING DOWN
- ELBOW TURNING UP
- CAPPED PIPE
- FLEXIBLE CONNECTION
- CONCENTRIC PIPE REDUCER/INCREASER
- ECCENTRIC PIPE REDUCER/INCREASER
- PIPE SLEEVE
- SLOPE — DIRECTION OF SLOPE (DNWARD)
- FLOOR DRAIN
- VENT THRU ROOF (RISER)
- VENT THRU ROOF (PLAN)
- P / 1 — SANITARY WASTE OR VENT STACK WASTE OR VENT NO.
- DS / 1 — STORM DRAIN DOWNSPOUT STORM DRAIN DOWNSPOUT NO.
- A,100 — DIFFUSER TYPE, DIFFUSER CFM
- AHU / 1 — EQUIPMENT TYPE EQUIPMENT NUMBER

GENERAL NOTES

1. THESE GENERAL NOTES APPLY TO ALL SHEETS
2. IN ANY CASE WHERE A PIPE OR DUCT SHOWN ON A PLAN SHEET DIFFERS FROM THAT SHOWN IN A SCHEMATIC OR DETAIL, USE THE LARGER OF THE TWO SIZES SHOWN.
3. PIPING SHOWN ON EACH PLAN IS RUN ABOVE THE CEILING ON THE FLOOR WHERE IT IS SHOWN UNLESS OTHERWISE NOTED.
4. MOUNT THERMOSTATS 48 INCHES ABOVE FINISHED FLOOR AND CENTERED ABOVE THE LIGHT SWITCHES WHERE BOTH OCCUR IN THE SAME LOCATION, UNLESS OTHERWISE NOTED.
5. NORMAL DESIGN CONDITIONS:

	OUTSIDE	INSIDE
SUMMER:	98 °F db, 78 °F wb	75 °F db, 50% RH
WINTER:	20 °F db	75 °F db

6. ALL DUCT DIMENSIONS SHOWN ARE CLEAR AIRSTREAM DIMENSIONS.
7. DO NOT RUN AIR HANDLERS OR EXHAUST FANS UNTIL ALL INTERIOR CLEANING AND PAINTING IS COMPLETE. THE CLEANING OF FOULED COILS OR FAN ASSEMBLIES DUE TO PAINT OR CONSTRUCTION DEBRIS WILL BE THE RESPONSIBILITY OF THE HVAC CONTRACTOR.
8. CONTRACTOR SHALL COMPLY WITH LOCAL AMENDMENTS TO THE ENERGY CODE.
9. IN ANY CASE WHERE A DISCREPANCY IS SHOWN ON THE DRAWINGS, THE CONTRACTOR SHALL PRICE THE MOST EXPSENSIVE OPTION.

OUTSIDE AIR CALCULATIONS

O.A. REQUIRED BY CURRENT COSA CODE:

OFFICES O.A. = 5 CFM/P + 0.06 x SF

LOBBIES O.A. = 7.5 CFM/P + 0.06 x SF

MULTIUSE ASSEMBLY O.A. = 7.5 CFM/P + 0.06 x SF

FLOOR AREA:

LEVEL 1 11,524 SF

LEVELS 2 THRU 9 397 SF (ELEVATOR LOBBY PER FLOOR)

OUTSIDE AIR REQUIRED FOR LEVEL 1:

O.A.R. = (0.06 x 4,694 SF) + (5 CFM/P x 36P) = 462 CFM

O.A.R. = (0.06 x 5,979 SF) + (7.5 CFM/P x 146P) = 1454 CFM

OUTSIDE AIR REQUIRED FOR LEVELS 2 THRU 9:

O.A.R. = (0.06 x 397 SF) + (7.5 CFM/P x 1P) = 32 CFM

O.A.R. = 32 CFM PER FLOOR x 8 FLOORS = 256 CFM

TOTAL BUILDING REQUIRED O.A.

O.A.R. = 462 + 1454 + 256

O.A.R = 2172 CFM

O.A. ACTUAL = 2200 CFM

ABBREVIATIONS

B	B. VA.	BALL VALVE
	BAL. VA.	CKT. SETTER BALANCING VALVE
C	CHS	CHILLED WATER SUPPLY
	CHR	CHILLED WATER RETURN
	CO	CLEANOUT
	CW	DOM. COLD WTR. (POTABLE)
D	D	CONDENSATE DRAIN LINE
E	EOD	EMERGENCY OVERFLOW DRAIN
	EXT FCO	EXTERIOR FLOOR CLEANOUT
F	FS	FIRE SPRINKLER
	FCO	FLOOR CLEANOUT
	F	FIRE LINE (BUILDING MAIN)
	FD (OR) SD	FIRE / SMOKE DAMPER
H	DHWS	DOMESTIC HOT WATER 140°F
	HWS	HOT WATER SUPPLY
	HWS	HOT WATER RETURN
M	MVD	MOTORIZED VOLUME DAMPER
N	NPW	NON-POTABLE WATER (COLD)
	NPHW	NON-POTABLE WATER (HOT)
O	OA, RA, EXH	O.A.,R.A. EXH. AIR DUCT
P	PRV	PRV RELIEF VENT
	PW	DOMESTIC COLD WATER
	PRV	PRESSURE REDUCING VALVE
	PI	PRESSURE INDICATOR (GAUGE)
R	RED.	REDUCER
S	SAN	SOIL & WASTE (ABOVE GRADE)
	SD	STORM DRAIN
T	TI	TEMP. INDICATOR (THERMOMETER)
	T.&P.	TEMP. & PRESS. RELIEF VALVE
V	VD	VOLUME DAMPER
	VTR	VENT THRU ROOF
	V	SANITARY VENT
W	WHA	WATER HAMMER ARRESTOR
	WCO	WALL CLEANOUT

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05/25/18

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GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–867

MECHANICAL SYMBOLS LEGEND

SHEET NUMBER
M0.1

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AIR HANDLING UNIT SCHEDULE

MARK	LOCATION	TOTAL AIR FLOW (CFM)	MAX. OUTSIDE AIR (CFM)	MIN. OUTSIDE AIR (CFM)	EXT SP. (IN. WG.)	TOTAL SP. (IN. WG.)	ELECTRICAL				COOLING COIL							HEATING COIL							PRE-WIRED LIGHTS/RECEPTS TO JUNCTION BOX (YES/NO)	VFD (YES/NO)	WEIGHT (LBS)	REMARKS	EMERGENCY POWER
							MCA (AMPS)	MOCP (AMPS)	MTR (HP)	VOLTS/ PH/HZ	SENSIBLE CAP (BTUH)	TOTAL CAP (BTUH)	MIN ROWS/ FINS PER IN (FT)	GPM	EWT°F / LWT °F	MAX FACE VEL (FPM)	EDB °F/ EWB °F	LDB °F/ LWB °F	MAX FACE VEL. FPM	EAT/LAT °F	EWT °F	LWT °F	MIN. ROWS	GPM	TOTAL CAP (BTUH)					
AHU 1	NORTH WING	8,500	500	150	2.0	4.03	15.63	25.00	10	460/3/60	213,900	228,900	6/9	33	44/58	500	78.3/63.8	55/54	--	--	--	--	--	--	--	Yes	Yes	2175	TRANE CSIA017	No
AHU 2	LOBBY	7,600	500	150	1.5	3.31	15.63	25.00	10	460/3/60	162,500	180,800	6/9	26	44/58	500	78.7/63.8	55/54	452	64.0/95.0	180	150	1	17.0	254,000	Yes	Yes	2256	TRANE CSIA017	No
AHU 3	WEST WING	7,050	1100	330	1.5	3.4	15.63	25.00	10	460/3/60	208,600	208,600	6/9	38	44/58	500	82.4/66.1	55/54	--	--	--	--	--	--	--	Yes	Yes	1921	TRANE CSIA017	No
AHU 4	BASEMENT	2,400	0	0	0.8	1.89	4.13	15.00	1.5	277/1/60	68,100	96,200	6/9	14	44/58	500	80/67	55/54	--	--	--	--	--	--	--	No	No	295	TRANE BCHD072G2	No

ALL AHU-1,2,3 SHALL BE PROVIDED WITH THE FOLLOWING UNLESS OTHERWISE NOTED:

1. SINGLE POINT ELECTRICAL CONNECTION.
2. INTERNALLY ISOLATED FAN.
3. ALTERNATE MANUFACTURER SHALL ADHERE TO SIZE AND PERFORMANCE SHOWN ON PLANS.
4. COIL SUPPORTS AND COIL CASINGS SHALL BE STAINLESS STEEL.
5. CASING PANELS, FLOOR AND DOORS SHALL HAVE NO THRU METAL BREAKS.
6. SEPERATE 120v/1Ø POWER TO BE PROVIDED BY ELECTRICAL CONTRACTOR FOR PRE-WIRED LIGHTS/RECEPTICALS.
7. PROVIDE WITH (2) SETS OF MERV 8 FILTERS.
8. PROVIDE WITH HUMIDISTAT IN RETURN AIR DUCTWORK, CO2 SENSOR PER PLAN, AND DEMAND CONTROL VENTILATION. REFER TO CONTROL DRAWINGS.
9. MODULATING DAMPERS FOR OUTSIDE AIR AND RETURN AIR INLETS AT MIXING BOX.
10. AHU-1 SHALL BE PROVIDED WITH ECONOMIZER

AHU-4 SHALL BE PROVIDED WITH THE FOLLOWING.

1. STAINLESS STEEL DRAIN PAN, AUX. DRAIN PAN AROUND ENTIRE UNIT, MERV 8 2" PLEATED FILTERS, FUSING TRANSFORMER, BASE RAIL, FOIL FACED INSULATION, 3-SPEED SWITCH, BOTTOM BLOWER ACCESS PANEL, SIDE ACCESS FILTER RACK, DISCONNECT SWITCH, AND PRE-WIRED SINGLE POINT ELECTRICAL CONNECTION.

FAN COIL UNIT SCHEDULE

MARK	LOCATION	TOTAL AIR FLOW (CFM)	ELECTRICAL				COOLING COIL (CHILLED WATER)				HEATING COIL (HOT WATER)						WEIGHT (LBS)	REMARKS
			MOTOR (HP)	MCA (AMPS)	MOCP (AMPS)	VOLTS/ PH/HZ	SEN CAP (BTUH)	TOT CAP (BTUH)	GPM	EWT / LWT (°F)	EDB / EWB (°F)	EDB (°F)	LDB (°F)	EWT (°F)	LWT (°F)	FLOW (GPM)	TOT. CAP. (BTUH)	
FCU A	LIVING ROOM	305	0.13	2.75	15.0	115 / 1	6,500	8,000	1.1	44 / 56	75 / 63	68	90.0	180	150	0.5	7,150	125	TRANE FCHB04
FCU B	BED ROOM 2	125	0.22	2.75	15.0	115 / 1	2,200	2,700	0.4	44 / 56	75 / 63	68	90.0	180	150	0.2	2,400	97	TRANE FCHB02
FCU C	ELEVATOR LOBBY	600	0.22	3.88	15.0	115 / 1	13,000	16,000	2.3	44 / 56	75 / 63	68	90.0	180	150	1.0	14,300	164	TRANE FCHB08
FCU D	1ST FLOOR RES. KITCHEN	415	0.22	3.88	15.0	115 / 1	9,000	11,100	1.6	44 / 56	75 / 63	68	90.0	180	150	0.7	10,000	155	TRANE FCHB06
FCU E	1ST FLOOR RES. LIVING	245	0.13	2.75	15.0	115 / 1	5,400	6,700	1.0	44 / 56	75 / 63	68	90.0	180	150	0.4	5,950	97	TRANE FCHB03

ALL NEW FAN COIL UNITS SHALL BE PROVIDED WITH THE FOLLOWING UNLESS OTHERWISE NOTED:

1. UNIT MOUNTED THERMOSTAT WITH TEMPERATURE RANGE LOCKOUT CAPABILITY. THROUGH DDC.
2. FACTORY INSTALLED PIPING PACKAGE. REFER TO DETAILS AND RISER DIAGRAMS FOR SPECIFIC CONFIGURATIONS. ISOLATION VALVES TO BE INSTALLED IN THE FIELD FOR EVERY FAN COIL. REFER TO 2-WAY AND 3-WAY COIL DETAILS. REFER TO THE RISER DIAGRAM FOR LOCATIONS OF 2-WAY AND 3-WAY COILS.
3. PROVIDE UNITS WITH FLAT TOP, MULTI-DIRECTIONAL QUAD BAR GRILLE SUPPLY, TOE INLET SPACE RETURN, AND 1" PLEATED FILTER ACCESSIBLE WITHOUT TOOLS.
4. INCLUDE STAINLESS STEAL DRAIN PAN (GALVANIZED IS NOT ACCEPTABLE).
5. CABINET PAINT SHALL BE SELECTED BY ARCHITECT DURING SUBMITTAL PROCESS. A MINIMUM OF 5 COLORS MUST BE OFFERED.
6. PROVIDE WITH UNIT MOUNTED MICROPROCESSOR WITH ROOM TEMPERATURE SENSOR AND CONDENSATE FLOAT SENSOR.
7. HOT WATER COIL SHALL BE PLACED IN REHEAT POSITION. CAPACITY IS BASED ON 180°F ENTERING WATER CONDITION.
8. INCLUDE A MINIMUM 3" FALSE BACK ON ALL FAN COIL UNITS.
9. REFER TO PLANS FOR QUANTITIES.

AIR DEVICE SCHEDULE

MARK	CFM RANGE	SUPPLY	RETURN	EXHAUST	INLET SIZE (IN.)	MODULE SIZE (IN.)	P.D. (IN. H² O)	MAX N.C.	MATERIAL	REFERENCE SELECTION -TITUS (U.N.O.)	REMARKS
A	140-240	X			8" Ø	24"X24"	.05	15	ALUMINUM	TITUS TMS AA	
B	245-380	X			10" Ø	24"X24"	.08	18	ALUMINUM	TITUS TMS AA	
C	385-550	X			12" Ø	24"X24"	.05	21	ALUMINUM	TITUS TMS AA	
D	3000-7700	X			24"X58"	26"X60"	.12	35	ALUMINUM	TITUS AEROBLADE 271FS	
E	0-150			X	8"X8"	10"X10"	.05	-	ALUMINUM	50F	
F	0-135	X			6"Ø	12"X12"	.06	13	ALUMINUM	TITUS TMS AA	
G	120-215	X			8" Ø	60" 3/4" 3-SLOT	.08	21	STEEL/ALUMINUM	TITUS TBD 30	
H	220-265	X			10" Ø	60" 3/4" 3-SLOT	.08	23	STEEL/ALUMINUM	TITUS TBD 30	
J	330	X			30x6	32x8	.06	18	ALUMINUM	TITUS AEROBLADE 272FL	
K	230-460	X			22X6	24"X8"	.06	16	ALUMINUM	TITUS AEROBLADE 272FL	
L	190-375	X			18X6	20X8	.06	16	ALUMINUM	TITUS AEROBLADE 272FL	
M	125 - 285	X			12X6	14"X8"	.09	18	ALUMINUM	TITUS AEROBLADE 272FL	
N	0-2200		X		22"X22"	24"X24"	.05	20	ALUMINUM	TITUS 50F	
P	0-700		X		22"X10"	24"X12"	.05	13	ALUMINUM	TITUS 50F	
R	400-1160		X		36"X12"	38"X14"	.08	30	STEEL/ALUMINUM	TITUS 3FL	
S	450-890	X			24"X10"	26"X12"	.07	19	ALUMINUM	TITUS AEROBLADE 272FL	
X	--	--	--	--	--	--	--	--	--	--	EXISTING AIR DEVICE

NOTES APPLY TO ALL TYPES UNLESS OTHERWISE NOTES:

1. PROVIDE WITH FACTORY WHITE FINISH.
2. PROVIDE WITH OPTIONAL T-BAR
3. PROVIDE WITH INSULATED PLENUM BOX FOR TYPE G AND H ONLY.
4. PROVIDE INSULATED BACKING.
5. VERIFY MOUNTING SURFACE. PROVIDE AIR DEVICE WITH APPROPRIATE MOUNTING TYPE AND ACCESSORIES FOR PROPER INSTALLATION.

AIR COOLED CHILLER SCHEDULE

MARK	CAPACITY (TONS)	VOLTS/PH/HZ	GPM	EWT (°F)	LWT (°F)	NO. PASSES	FOULING FACTOR	MAX HEAD LOSS (FT.)	COND. EAT (°F)	MCA (AMPS)	MCB (AMPS)	IPLV	ARI EER	REMARKS	WEIGHT (LBS.)
CH 1	184	460 / 3 / 60	325	54	42	2	0.000100	11	105	423	500	14.23	10.48	TRANE RATC	14,500
CH 2	184	460 / 3 / 60	325	54	42	2	0.000100	11	105	423	500	14.23	10.48	TRANE RATC	14,500

PROVIDE ALL CHILLERS WITH THE FOLLOWING UNLESS SPECIFICALLY NOTED BELOW:

1. TWO REFRIGERANT CIRCUITS.
2. FACTORY INSULATION ON EVAPORATOR AND SUCTION ELBOW. INCLUDE FACTORY INSTALLED INLET STRAINER AND IFM EFECTOR FLOW PROVING DEVICE.
3. CONTROL POWER TRANSFORMER FOR UNIT CONTROLS. PROVIDE SEPARATE 120/1 POWER FOR EVAPORATOR FREEZE PROTECTION TO -20°F.
4. COOLING FROM 25-125°F AMBIENT.
5. LOUVER PANELS TO COVER THE CONDENSER COIL AND SERVICE AREA BELOW THE COIL. WIRE GUARDS ARE NOT ACCEPTABLE.
6. FIELD INSTALLED ELASTOMERIC VIBRATION ISOLATORS.
7. BACNET INTERFACE CARD TO CONNECT TO BAS.
8. 5 YEAR PARTS, LABOR AND REFRIGERANT WARRANTY WITH FACTORY START UP.
9. LOW NOISE POLYMER CONDENSER FANS AND COMPRESSOR SOUND ENCLOSURE.

SINGLE DUCT VAV BOX SCHEDULE

MARK	MAX DESIGN AIR FLOW (CFM)	MIN. DESIGN AIR FLOW (CFM)	HEATING AIR FLOW (CFM)	MAX INLET STATIC PRESS. (IN. H20)	INLET SIZE (IN. DIA)	HOT WATER REHEAT COIL					REMARKS
						FLOW (GPM)	TOTAL HEATING CAP.(MBH)	# OF ROWS	EAT °F	LAT °F	
VAV 1-1	230	115	115	0.75	5"	0.5	6.34	1	55	90	TRANE VCWF05
VAV 1-2	125	65	65	0.75	4"	0.5	4.93	1	55	90	TRANE VCWF04
VAV 1-3	320	160	160	0.75	5"	0.5	7.37	1	55	90	TRANE VCWF05
VAV 3-1	1240	620	620	0.75	12"	1.75	26.23	1	55	90	TRANE VCWF12
VAV 3-2	620	310	310	0.75	8"	0.83	12.49	1	55	90	TRANEVCWF08
VAV 3-3	310	155	155	0.75	6"	0.5	7.18	1	55	90	TRANE VCWF06
VAV 3-4	550	275	275	0.75	8"	0.5	10.43	1	55	90	TRANE VCWF08
VAV 3-5	300	150	150	0.75	6"	0.5	7.09	1	55	90	TRANE VCWF06

NOTES:

PROVIDE ALL VAV BOXES WITH 1/2" FOIL FACED INSULATION, CONTROLS TRANSFORMER, POWER DISCONNECT, ACCESS PANEL, DDC ZONE SENSOR, AIRFLOW SWITCH, TOTAL AIRFLOW SENSOR, NIGHT SETBACK, AND HANGER BRACKETS, DIGITAL FACE TEMP SENSOR WITH LOCK-OUT FUNCTION.

FAN SCHEDULE

MARK	SERVICE	TYPE	CFM	ESP IN. WG.	WATTS(HP) /VOLTS/PH/HZ	FAN SPEED (RPM)	INTERLOCK WITH	DRIVE TYPE	EMERGENCY POWER	REMARKS
EF 1	ADMINISTRATION RR	CEILING	100	0.25	128 / 120 / 1 / 60	708	AHU-1	DIRECT	No	GREENHECK SP-B150 (4)
EF 2	ADMINISTRATION RR	CEILING	100	0.25	128 / 120 / 1 / 60	708	AHU-1	DIRECT	No	GREENHECK SP-B150 (4)
EF 3	ADMINISTRATION RR	CEILING	100	0.25	128 / 120 / 1 / 60	708	AHU-1	DIRECT	No	GREENHECK SP-B150 (4)
EF 4	LOBBY RESTROOM	CEILING	300	0.25	121 / 115 / 1 / 60	912	AHU-2	DIRECT	No	GREENHECK SP-A410
EF 5	LOBBY RESTROOM	CEILING	300	0.25	121 / 115 / 1 / 60	708	AHU-1	DIRECT	No	GREENHECK SP-B150 (4)
EF 6	APT BATHROOM	CENTRIFUGAL	1200	0.75	0.75 / 120 / 1 / 60	1966	RUN CONTINOUOUSLY	BELT	No	GREENHECK GB-143-HP-VG (3)
SPF 1	STAIR PRESSURIZATION	AXIAL	35000	3.0	(50) / 460 / 3 / 60	1211	FIRE ALARM PANEL	BELT	Yes	GREENHECK TBI-FS-4H54-500 (1),(2)

1. PROVIDE WITH EXTENDED LUBE LINES, L50-400-000HR BEARINGS; FIGURE ONE MOTOR MOUNT W/MOTOR/BELT GUARD; TEFC MOTOR (VFD COMPATIBLE), MOUNTING RAILS, INLET GUARD, COMPANION FLANGES, SHAFT SEAL, EASY ACCESS DOOR; VENTED BELT AND BEARING TUBE; ISOLATED BEARING PLATE; BEARING COVER AND BEARING TUBE; DUAL DRIVES; HIGH TEMPERATURE BEARINGS UL LISTED FOR 500°F MAXIMUM TEMPERATURE FOR MINIMUM OF 4 HOURS OPERATION AND 572°F MAXIMUM TEMPERATURE FOR MINIMUM 2 HOURS OF OPERATION; RATED FOR 180°F CONTINUOUS OPERATION; BELT DRIVE WITH 1.5X NUMBER OF BELTS REQUIRED FOR DESIGN DUTY WITH MINIMUM NUMBER OF BELTS BEING 3. SUBMIT FAN CURVES FOR REVIEW BY AHJ: STACK AND WIND EFFECT REQUIRES 0.3" W.G.E.S.P. OVER DUCT/SYSTEM S.P.
2. FAN TO BE CAPABLE OF PROVIDING 40,000 CFM AT 0.5" W.C. WITH 50HP MOTOR PROVIDED.
3. PROVIDE WITH ELECTRICAL DISCONNECT, SINGLE POINT ELECTRICAL CONNECTION, ROOF CURB COMPATIBLE WITH ROOF TYPE, BACKDRAFT DAMPER AND BIRD SCREEN.
4. PROVIDE WITH ELECTRICAL DISCONNECT, SINGLE POINT ELECTRICAL CONNECTION, AND BACKDRAFT DAMPER.

SERIES FAN POWERED VAV BOX SCHEDULE

MARK	PRIMARY AIR FLOW		INTERMITTENT FAN DATA				HOT WATER REHEAT COIL					INLET SIZE (IN. DIA.)	REMARKS
	MAX (CFM)	MIN (CFM)	FAN AIR FLOW (CFM)	HP	VOLTS/PH/HZ	EXT. SP. (IN. H2O)	FLOW (GPM)	TOTAL HEATING CAP. (BTUH)	MAT (°F)	LAT (°F)	COIL MIN. ROWS		
FPVAV 1-1	680	205	680	0.33	277/1/60	0.5.	1.4	21,665	68	90	1	10"	TRANE VSWF
FPVAV 1-2	1040	315	1040	0.33	277/1/60	0.5.	2.2	33,134	68	90	1	12"	TRANE VSWF
FPVAV 1-3	1550	465	1550	1.0	277/1/60	0.5.	3.3	49,383	68	90	1	14"	TRANE VSWF
FPVAV 1-4	760	230	760	0.33	277/1/60	0.5.	1.6	24,214	68	90	1	10"	TRANE VSWF
FPVAV 1-5	1285	385	1285	0.5	277/1/60	0.5.	2.7	40,941	68	90	1	12"	TRANE VSWF
FPVAV 1-6	630	190	630	0.33	277/1/60	0.5.	1.3	20,172	68	90	1	8"	TRANE VSWF
FPVAV 1-7	1040	315	1040	0.33	277/1/60	0.5.	2.2	33,134	68	90	1	12"	TRANE VSWF
FPVAV 1-8	480	145	480	0.33	277/1/60	0.5.	1.0	15,292	68	90	1	8"	TRANE VSWF
FPVAV 1-9	1950	585	1950	1.0	277/1/60	0.5.	4.1	62,127	68	90	1	14"	TRANE VSWF
FPVAV 3-1	565	170	565	0.33	277/1/60	0.5.	1.2	18,001	68	90	1	8"	TRANE VSWF
FPVAV 3-2	750	225	750	0.33	277/1/60	0.5.	1.6	23,895	68	90	1	10"	TRANE VSWF
FPVAV 3-3	1100	330	1100	0.5	277/1/60	0.5.	2.3	35,046	68	90	1	12"	TRANE VSWF
FPVAV 3-4	1100	330	1100	0.5	277/1/60	0.5.	2.3	35,046	68	90	1	12"	TRANE VSWF
FPVAV 3-5	750	225	750	0.33	277/1/60	0.5.	1.6	23,895	68	90	1	10"	TRANE VSWF
FPVAV 3-6	500	150	500	0.33	277/1/60	0.5.	1.1	15,930	68	90	1	8"	TRANE VSWF

NOTES:

PROVIDE ALL FAN POWERED VAV BOXES WITH 1/2" FOIL FACED INSULATION, EC MOTORS, CONTROLS TRANSFORMER, POWER DISCONNECT, ACCESS PANEL, DDC ZONE SENSOR, AIRFLOW SWITCH, TOTAL AIRFLOW SENSOR, NIGHT SETBACK, DIGITAL FACE TEMP SENSOR WITH LOCK-OUT FUNCTION, AND HANGER BRACKETS. FAN POWERED VAV BOXES ARE TO BE INTERLOCKED WITH THEIR RESPECTIVE RTU TO SHUT-DOWN UPON SMOKE DETECTION.

PUMP SCHEDULE

MARK	SERVICE	TYPE	SIZE		GPM	TOTAL HEAD H2O	HP/VOLTS/PH/HZ	RPM	REMARKS (1) (2)	VFD (YES/NO)
			SUCTION	DISCHARGE						
PCHWP 1	CHILLED WATER	END SUCTION	4	3	368	40	5 / 460 / 3 / 60	1187	GRUNDFOS L430707	Yes
PCHWP 2	CHILLED WATER	END SUCTION	4	3	368	40	5 / 460 / 3 / 60	1187	GRUNDFOS L430707	Yes
SCHWP 1	CHILLED WATER	END SUCTION	5	4	631	75	20 / 460 / 3 / 60	1760	GRUNDFOS 40957LC	Yes
SCHWP 2	CHILLED WATER	END SUCTION	5	4	631	75	20 / 460 / 3 / 60	1760	GRUNDFOS 40957LC	Yes
SHWP 1	HOT WATER	END SUCTION	3	2.5	264	75	7.5 / 460 / 3 / 60	1775	GRUNDFOS LF25957	Yes
SHWP 2	HOT WATER	END SUCTION	3	2.5	264	75	7.5 / 460 / 3 / 60	1775	GRUNDFOS LF25957	Yes

(1) PUMPS ARE N+1 SECONDARY. PROVIDE WITH SEALS AND INERTIA BASE. INSULATE PUMPS WITH ARMAFLEX.
(2) PROVIDE WITH OIL BATH BEARINGS. PUMPS TO HAVE MECHANICAL SEALS. INSULATE PUMPS WITH ARMAFLEX.

ELECTRIC UNIT HEATER SCHEDULE

Mark	TYPE	CFM	AMPS/VOLTS/PH/HZ	HEATING CAPACITY (KW)	REMARKS
EUH 1	HORIZONTAL FAN FORCED UNIT HEATER	575	27.1/277/1/60	7.5	MARKEL F1FUH07CA1

PROVIDE UNIT WITH WALL MOUNTED THERMOSTAT, SUMMER FAN SWITCH, WALL/CEILING BRACKET AND OSHA FAN GUARD. MOUNT UNIT AT 9'-0" A.F.F. UNLEASS OTHERWISE NOTED. WEIGHT = APPROX 40 LBS.

MINI-SPLIT CONDENSING UNIT SCHEDULE

MARK	INTERLOCK WITH	MIN. CAP. (BTUH)	REFRIGERANT	VOLTS/ PH/ HZ	MCA	MCB	MIN. SEER	COMPRESSOR		CONDENSER		REMARKS
								CU NO.	CU MAX. SUCT. TEMP °F	MAX. COND. TEMP (°F)	AMB TEMP (°F)	
CU 1	FCU 1	36,000	R-410A	208 / 1 / 60	23	35	16	1	45	125	105	TRANE 4TXK8536A1
CU 2	FCU-2	24,000	R-410A	208 / 1 / 60	16	25	16	1	45	125	105	TRANE 4TYK6524A1
CU 3	FCU 3	12,000	R-410A	208 / 1 / 60	12	15	16	1	45	125	105	TRANE 4TXK6512A1

MINI-SPLIT AIR HANDLER SCHEDULE

MARK	LOCATION	INTERLOCK WITH	VOLTS/ PH/ HZ	FLA (AMPS)	MCB (AMPS)	MIN. TOTAL CAPACITY (BTUH)	REFRIGERANT	EDB (°F)	EWB (°F)	REMARKS
FCU 1	ELEVATOR MACHINE ROOM	CU 1	208 / 1 / 60	SEE NOTE (1)	SEE NOTE (1)	36,000	R-410A	75	63	TRANE 4MXW8536A1
FCU 2	1ST FLOOR IT ROOM	CU 2	208 / 1 / 60	SEE NOTE (1)	SEE NOTE (1)	24, 000	R-410A	75	63	TRANE 4MYW6524A1
FCU 3	EMERGENCY POWER ROOM	CU 3	208 / 1 / 60	SEE NOTE (1)	SEE NOTE (1)	12,000	R-410A	75	63	TRANE 4MYW6512A1

PROVIDE MIN-SPLIT SYSTEMS WITH THE FOLLOWING:

1. SINGLE POINT ELECTRICAL CONNECTION FOR COMBINED POWER TO INDOOR AND OUTDOOR UNIT (WIRING BETWEEN UNITS BY ELECTRICAL CONTRACTOR).
2. LOW AMBIENT CONTROL.
3. FAN AND CONDENSER HAIL GUARDS.
4. WIRED, WALL MOUNTED THERMOSTAT.
5. VERIFY LENGTH OF REFRIGERANT PIPING ROUTING BETWEEN INDOOR AND OUTDOOR UNITS AND PROVIDE ADDITIONAL REFRIGERANT AS NEEDED TO PROVIDE SCHEDULED CAPACITIES.
6. CONTRACTOR SHALL LOCK OUT THERMOSTAT IN FIELD TO COOLING ONLY.

VFD SCHEDULE

MARK	HP	VOLTS/PH/HZ	SERVICE	EMERGENCY POWER (YES/NO)	REMARKS (1)
VFD AHU-1	10	460/3/60	AHU-1	No	YASKAWA
VFD AHU-2	10	460/3/60	AHU-2	No	YASKAWA
VFD AHU-3	10	460/3/60	AHU-3	No	YASKAWA
VFD PCHWP 1	5	460/3/60	PCHWP 1	No	YASKAWA
VFD PCHWP 2	5	460/3/60	PCHWP 2	No	YASKAWA
VFD SCHWP 1	20	460/3/60	SCHWP 1	No	YASKAWA
VFD SCHWP 2	20	460/3/60	SCHWP 2	No	YASKAWA
VFD SHWP 1	7.5	460/3/60	SHWP 1	No	YASKAWA
VFD SHWP 2	7.5	460/3/60	SHWP 2	No	YASKAWA
VFD SPF 1	50	460/3/60	SPF 1	Yes	YASKAWA

(1) PROVIDE WITH 2 SETS OF N.C./N.O. AUXILIARY CONTACTS FOR ALL VFD'S. VFD'S TO BE YASKAWA WITH UP TO 100FT SEPERATION FROM VFD TO MOTOR WITH NO WIRING REQUIREMENTS.

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REVISIONS		
ISSUE	DESCRIPTION	DATE

05/25/18

PERMIT SET

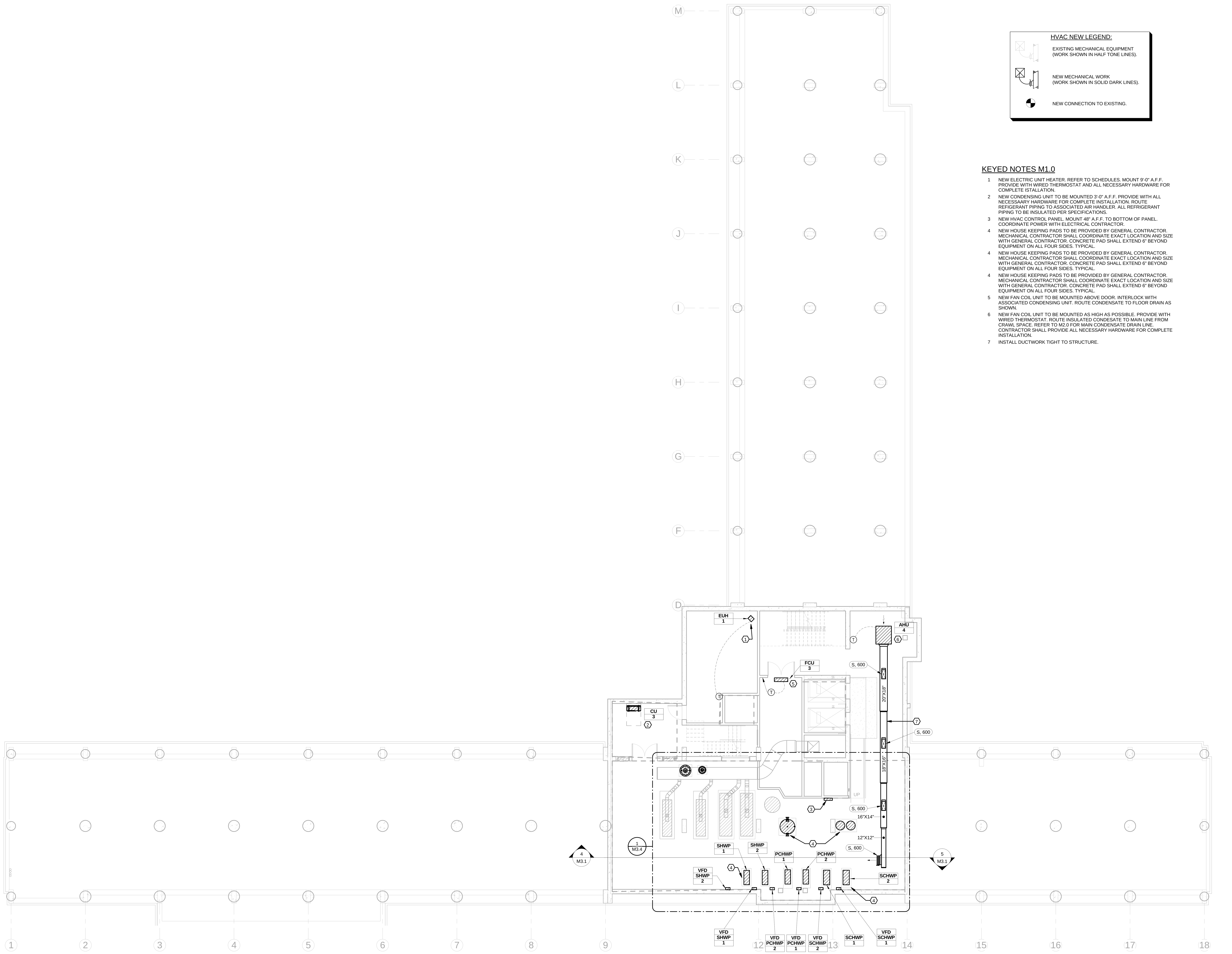
STATE OF TEXAS
MEHDI J. MIRMOMENI
113121
LICENSED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLS, AIA
TEXAS LICENSE NO. 10-681

MECHANICAL SCHEDULES

SHEET NUMBER

M0.2



1 M1.0 BASEMENT PLAN - HVAC - NEW
1/8" = 1'-0"

HVAC NEW LEGEND:

- EXISTING MECHANICAL EQUIPMENT (WORK SHOWN IN HALF TONE LINES).
- NEW MECHANICAL WORK (WORK SHOWN IN SOLID DARK LINES).
- NEW CONNECTION TO EXISTING.

KEYED NOTES M1.0

1 NEW ELECTRIC UNIT HEATER. REFER TO SCHEDULES. MOUNT 9'-0" A.F.F. PROVIDE WITH WIRED THERMOSTAT AND ALL NECESSARY HARDWARE FOR COMPLETE ISTALLATION.

2 NEW CONDENSING UNIT TO BE MOUNTED 3'-0" A.F.F. PROVIDE WITH ALL NECESSAARY HARDWARE FOR COMPLETE INSTALLATION. ROUTE REFIGERANT PIPING TO ASSOCIATED AIR HANDLER. ALL REFRIGERANT PIPING TO BE INSULATED PER SPECIFICATIONS.

3 NEW HVAC CONTROL PANEL. MOUNT 48" A.F.F. TO BOTTOM OF PANEL. COORDINATE POWER WITH ELECTRICAL CONTRACTOR.

4 NEW HOUSE KEEPING PADS TO BE PROVIDED BY GENERAL CONTRACTOR. MECHANICAL CONTRACTOR SHALL COORDINATE EXACT LOCATION AND SIZE WITH GENERAL CONTRACTOR. CONCRETE PAD SHALL EXTEND 6" BEYOND EQUIPMENT ON ALL FOUR SIDES. TYPICAL.

4 NEW HOUSE KEEPING PADS TO BE PROVIDED BY GENERAL CONTRACTOR. MECHANICAL CONTRACTOR SHALL COORDINATE EXACT LOCATION AND SIZE WITH GENERAL CONTRACTOR. CONCRETE PAD SHALL EXTEND 6" BEYOND EQUIPMENT ON ALL FOUR SIDES. TYPICAL.

4 NEW HOUSE KEEPING PADS TO BE PROVIDED BY GENERAL CONTRACTOR. MECHANICAL CONTRACTOR SHALL COORDINATE EXACT LOCATION AND SIZE WITH GENERAL CONTRACTOR. CONCRETE PAD SHALL EXTEND 6" BEYOND EQUIPMENT ON ALL FOUR SIDES. TYPICAL.

5 NEW FAN COIL UNIT TO BE MOUNTED ABOVE DOOR. INTERLOCK WITH ASSOCIATED CONDENSING UNIT. ROUTE CONDENSATE TO FLOOR DRAIN AS SHOWN.

6 NEW FAN COIL UNIT TO BE MOUNTED AS HIGH AS POSSIBLE. PROVIDE WITH WIRED THERMOSTAT. ROUTE INSULATED CONDESATE TO MAIN LINE FROM CRAWL SPACE. REFER TO M2.0 FOR MAIN CONDENSATE DRAIN LINE. CONTRACTOR SHALL PROVIDE ALL NECESSARY HARDWARE FOR COMPLETE INSTALLATION.

7 INSTALL DUCTWORK TIGHT TO STRUCTURE.

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05/25/18

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

BASEMENT PLAN - HVAC - NEW

SHEET NUMBER
M1.0

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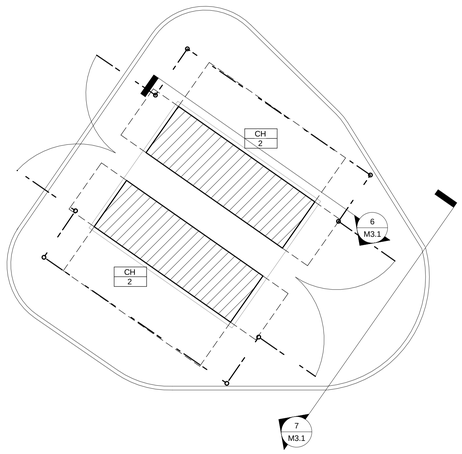

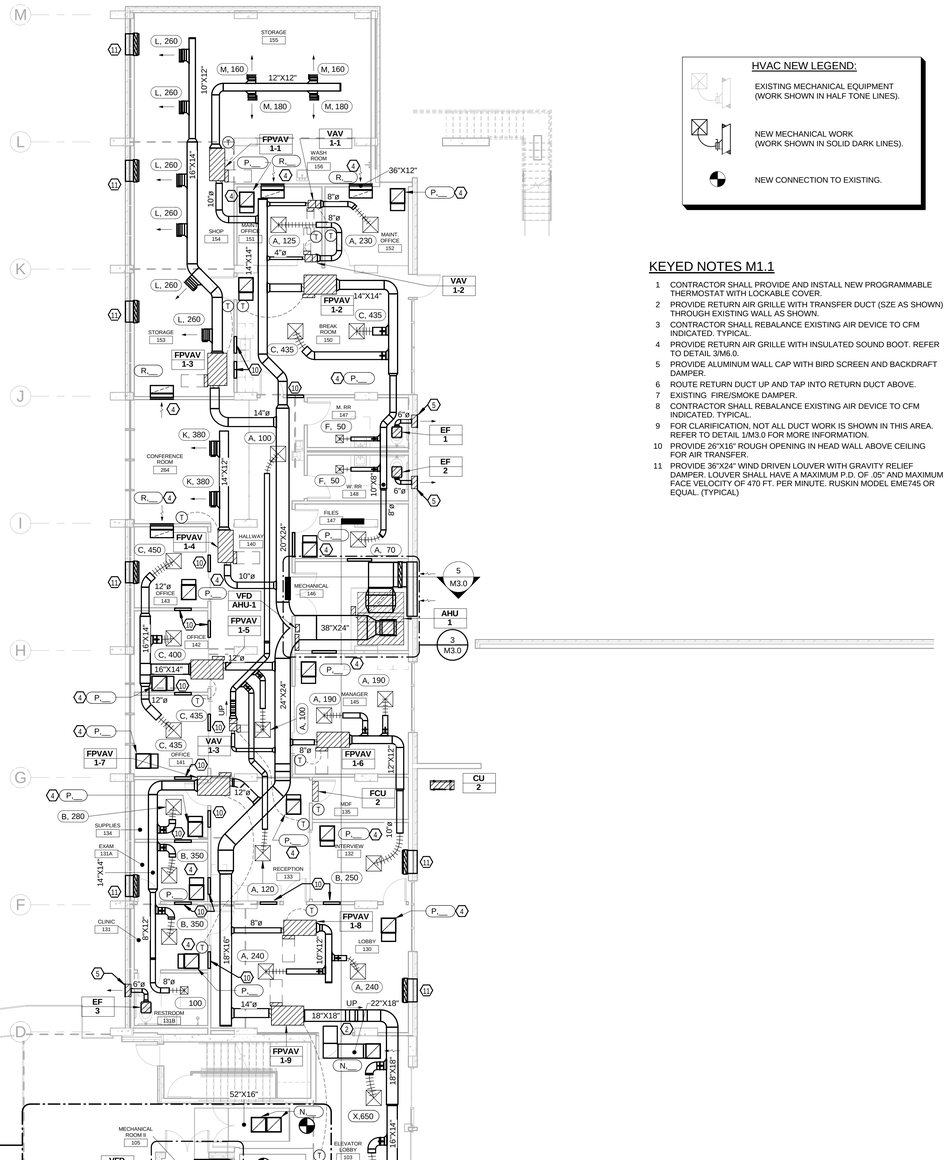

HVAC NEW LEGEND:

- EXISTING MECHANICAL EQUIPMENT (WORK SHOWN IN HALF TONE LINES).
- NEW MECHANICAL WORK (WORK SHOWN IN SOLID DARK LINES).
- NEW CONNECTION TO EXISTING.

KEYED NOTES M1.1

1. CONTRACTOR SHALL PROVIDE AND INSTALL NEW PROGRAMMABLE THERMOSTAT WITH LOCKABLE COVER.
2. PROVIDE RETURN AIR GRILLE WITH TRANSFER DUCT (SZE AS SHOWN) THROUGH EXISTING WALL AS SHOWN.
3. CONTRACTOR SHALL REBALANCE EXISTING AIR DEVICE TO CFM INDICATED. TYPICAL.
4. PROVIDE RETURN AIR GRILLE WITH INSULATED SOUND BOOT. REFER TO DETAIL 3/M6.0.
5. PROVIDE ALUMINUM WALL CAP WITH BIRD SCREEN AND BACKDRAFT DAMPER.
6. ROUTE RETURN DUCT UP AND TAP INTO RETURN DUCT ABOVE.
7. EXISTING FIRE/SMOKE DAMPER.
8. CONTRACTOR SHALL REBALANCE EXISTING AIR DEVICE TO CFM INDICATED. TYPICAL.
9. FOR CLARIFICATION, NOT ALL DUCT WORK IS SHOWN IN THIS AREA. REFER TO DETAIL 1/M3.0 FOR MORE INFORMATION.
10. PROVIDE 26"X16" ROUGH OPENING IN HEAD WALL ABOVE CEILING FOR AIR TRANSFER.
11. PROVIDE 36"X24" WIND DRIVEN LOUVER WITH GRAVITY RELIEF DAMPER. LOUVER SHALL HAVE A MAXIMUM P.D. OF .05" AND MAXIMUM FACE VELOCITY OF 470 FT. PER MINUTE. RUSKIN MODEL EME745 OR EQUAL. (TYPICAL)

1 M1.1 FLOOR PLAN - LEVEL 1 - HVAC - NEW

1/8" = 1'-0"

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05/25/18

PROJECT ARCHITECT
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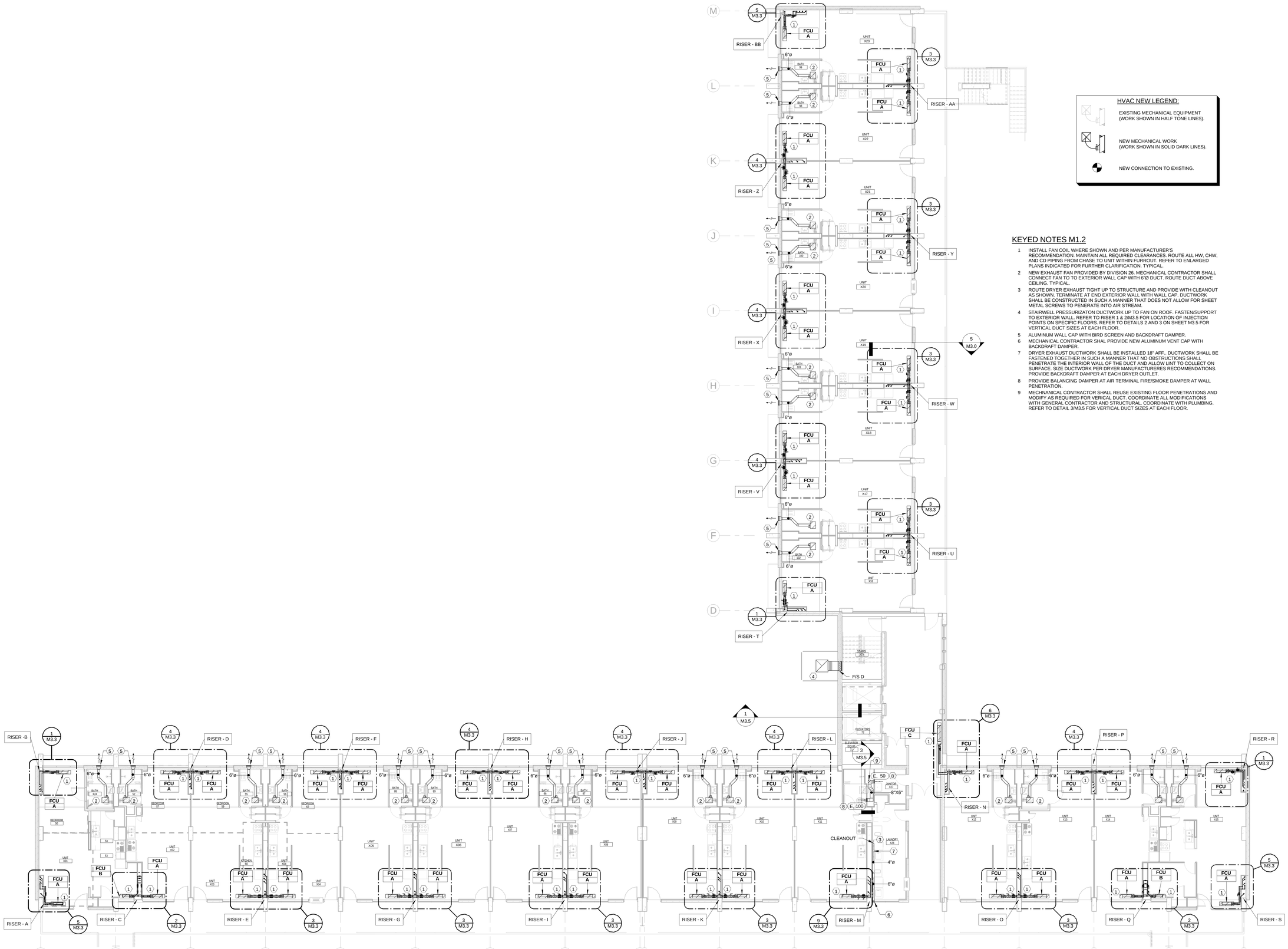
TEXAS LICENSE NO. 10–881

FLOOR PLAN - LEVEL 1 - HVAC

SHEET NUMBER

M1.1



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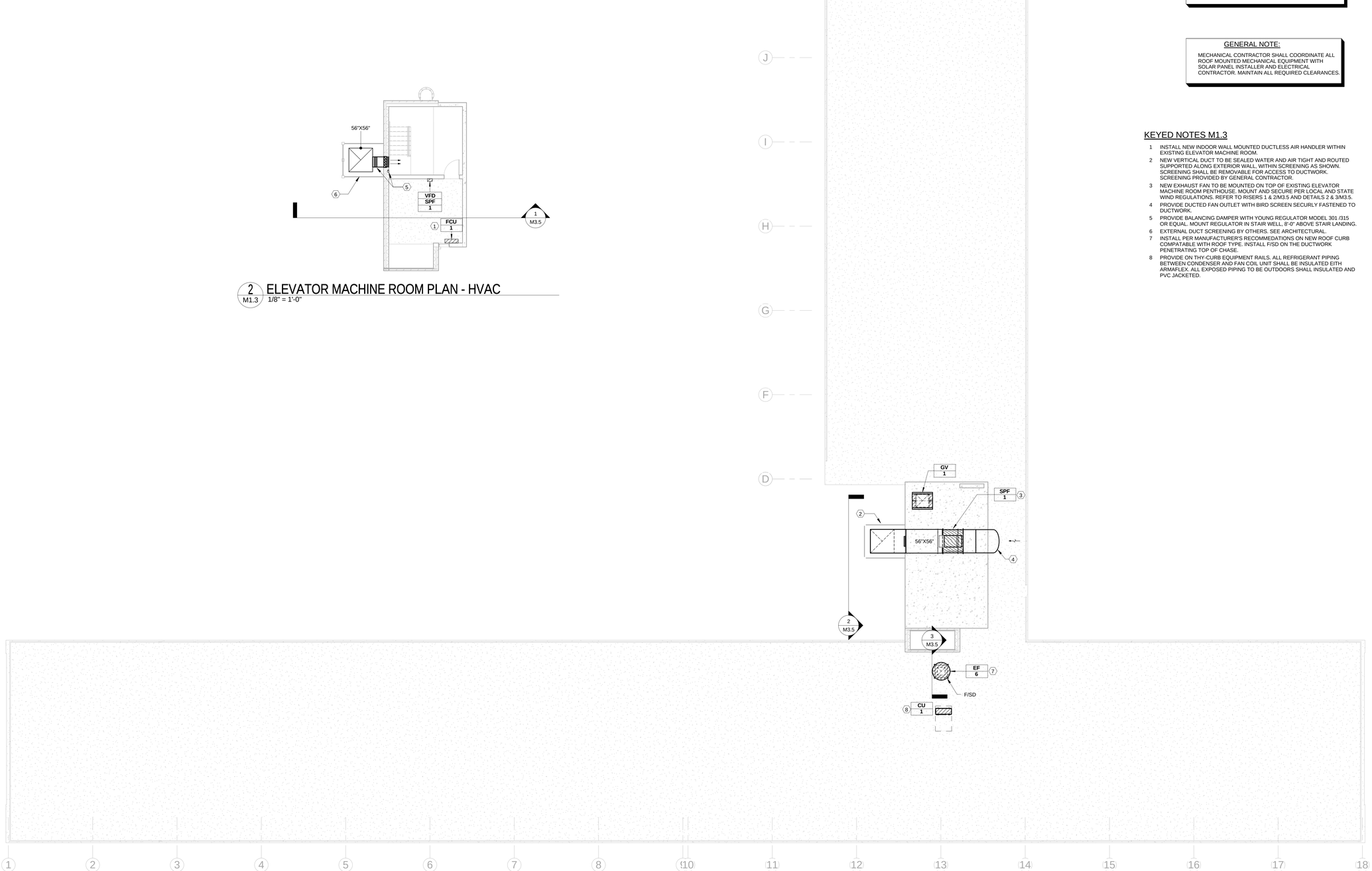
FLOOR PLAN - LEVEL 2 THRU 9 - HVAC/PIPING - NEW

SHEET NUMBER
M1.2

2 M1.3 ELEVATOR MACHINE ROOM PLAN - HVAC
1/8" = 1'-0"



1 M1.3 ROOF PLAN - HVAC
1/8" = 1'-0"

HVAC NEW LEGEND:

EXISTING MECHANICAL EQUIPMENT (WORK SHOWN IN HALF TONE LINES).

NEW MECHANICAL WORK (WORK SHOWN IN SOLID DARK LINES).

NEW CONNECTION TO EXISTING.

GENERAL NOTE:

MECHANICAL CONTRACTOR SHALL COORDINATE ALL ROOF MOUNTED MECHANICAL EQUIPMENT WITH SOLAR PANEL INSTALLER AND ELECTRICAL CONTRACTOR. MAINTAIN ALL REQUIRED CLEARANCES.

KEYED NOTES M1.3

1. INSTALL NEW INDOOR WALL MOUNTED DUCTLESS AIR HANDLER WITHIN EXISTING ELEVATOR MACHINE ROOM.
2. NEW VERTICAL DUCT TO BE SEALED WATER AND AIR TIGHT AND ROUTED SUPPORTED ALONG EXTERIOR WALL, WITHIN SCREENING AS SHOWN. SCREENING SHALL BE REMOVABLE FOR ACCESS TO DUCTWORK. SCREENING PROVIDED BY GENERAL CONTRACTOR.
3. NEW EXHAUST FAN TO BE MOUNTED ON TOP OF EXISTING ELEVATOR MACHINE ROOM PENTHOUSE. MOUNT AND SECURE PER LOCAL AND STATE WIND REGULATIONS. REFER TO RISERS 1 & 2/M3.5 AND DETAILS 2 & 3/M3.5.
4. PROVIDE DUCTED FAN OUTLET WITH BIRD SCREEN SECURLY FASTENED TO DUCTWORK.
5. PROVIDE BALANCING DAMPER WITH YOUNG REGULATOR MODEL 301 /315 OR EQUAL. MOUNT REGULATOR IN STAIR WELL, 8'-0" ABOVE STAIR LANDING.
6. EXTERNAL DUCT SCREENING BY OTHERS. SEE ARCHITECTURAL.
7. INSTALL PER MANUFACTURER'S RECOMMEDATIONS ON NEW ROOF CURB COMPATABLE WITH ROOF TYPE. INSTALL F/SD ON THE DUCTWORK PENETRATING TOP OF CHASE.
8. PROVIDE ON THY-CURB EQUIPMENT RAILS. ALL REFRIGERANT PIPING BETWEEN CONDENSER AND FAN COIL UNIT SHALL BE INSULATED EITH ARMAFLEX. ALL EXPOSED PIPING TO BE OUTDOORS SHALL INSULATED AND PVC JACKETED.

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113121
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PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

ROOF PLAN - HVAC - NEW

SHEET NUMBER
M1.3

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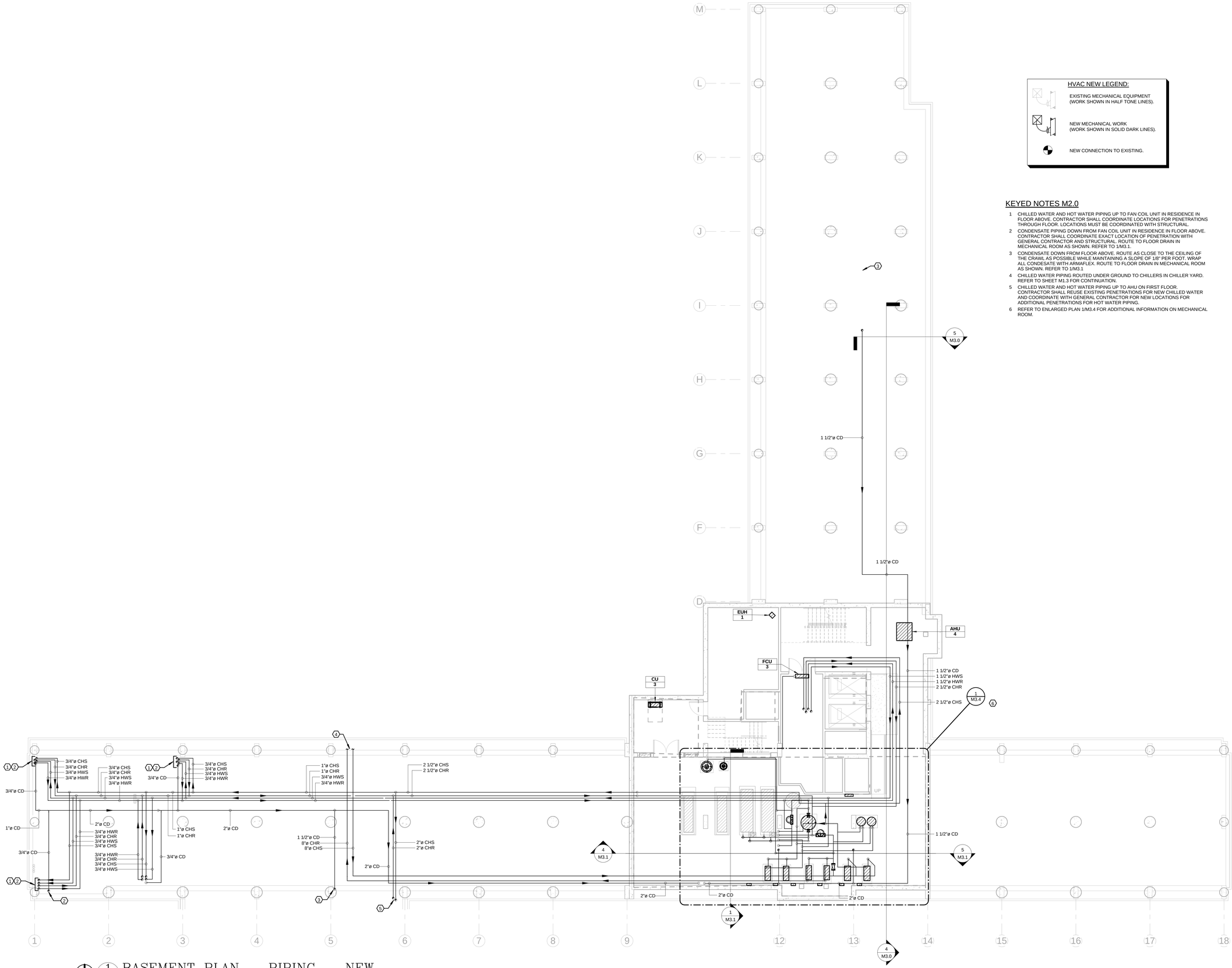

1 M2.0 BASEMENT PLAN – PIPING – NEW
1/8" = 1'-0"
NORTH

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PROJECT ARCHITECT
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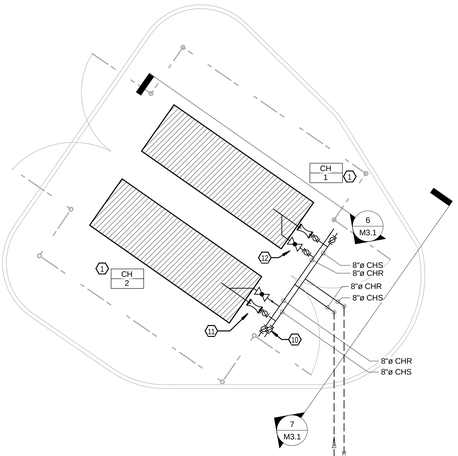
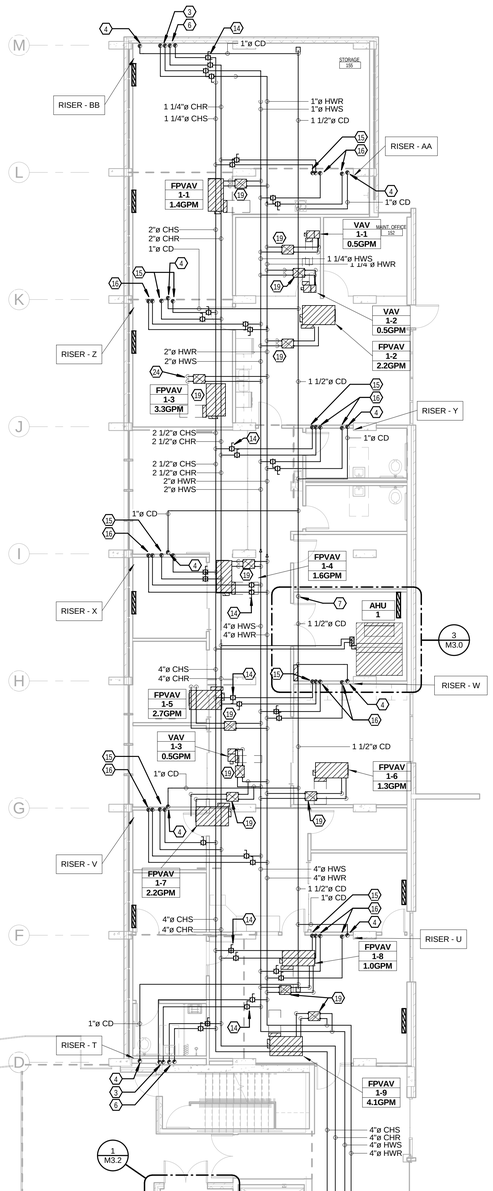
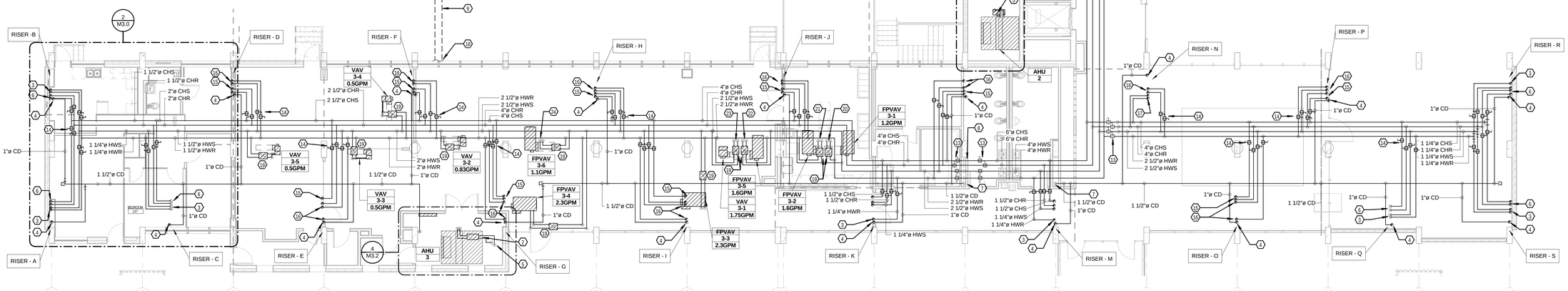
TEXAS LICENSE NO. 10–987

BASEMENT PLAN - PIPING - NEW

SHEET NUMBER
M2.0







1 M2.1 FLOOR PLAN – LEVEL 1 – PIPING – NEW
1/8" = 1'-0"
NORTH

HVAC NEW LEGEND:

- EXISTING MECHANICAL EQUIPMENT (WORK SHOWN IN HALF TONE LINES).
- NEW MECHANICAL WORK (WORK SHOWN IN SOLID DARK LINES).
- NEW CONNECTION TO EXISTING.

KEYED NOTES M2.1

1. PROVIDE AND INSTALL CHILLER ON 6" CONCRETE PAD PER MANUFACTURER'S RECOMMENDATIONS. MAINTAIN ALL OPERATIONAL AND MAINTENACE CLEARANCES.
2. CONTRACTOR SHALL CONNECT EXISTING VERTICAL HYDRONIC PIPING TO NEW PIPING COMING UP FROM BELOW.
3. CONTRACTOR SHALL ROUTE 1" HOT WATER PIPING UP CHASE PROVIDED BY GENERAL CONTRACTOR. COORDINATE WITH GENERAL CONTRACTOR AND STRUCTURAL FOR EXACT LOCATION OF FLOOR PENETRATIONS.
4. CONDENSATE PIPING DOWN FROM FLOORS ABOVE. COORDINATE EXACT LOCATION OF FLOOR PENETRATIONS WITH GENERAL CONTRACTOR AND STRUCTURAL.
5. NEW HYDRONIC PIPING DOWN TO MECHANICAL ROOM BELOW. CONTRACTOR SHALL UTILIZE EXISTING PENETRATIONS AND COORDINATE ANY NEW PENETRATIONS WITH GENERAL CONTRACTOR AND STRUCTURAL.
6. CONTRACTOR SHALL ROUTE 1 1/4" CHILLED WATER PIPING UP CHASE PROVIDED BY GENERAL CONTRACTOR. COORDINATE WITH GENERAL CONTRACTOR AND STRUCTURAL FOR EXACT LOCATION OF FLOOR PENETRATIONS.
7. CONTRACTOR SHALL ROUTE 1 1/2" CONDENSATE PIPING DOWN TO CRAWL SPACE BELOW.
8. HYDRONIC PIPING UP FROM MECHANICAL ROOM BELOW.
9. UNDER GROUND CHILLED WATER PIPING ROUTED FROM CRAWL SPACE TO CHILLERS. CONTRACTOR SHALL UTILIZE EXISTING TRENCH.
10. BUTTERFLY VALVE. TYPICAL
11. BI-DIRECTIONAL FLOW METER. TYPICAL.
12. CONTROL VALVE. TYPICAL.
13. PROVIDE ISOLATION VALVES AT BRANCH. TYPICAL.
14. PROVIDE ISOLATION VALVES FOR HOT AND CHILLED WATER RISER AT EACH BRANCH. PROVIDE ACCESS PANELS AS REQUIRED. TYPICAL.
15. CONTRACTOR SHALL ROUTE 1 1/2" CHILLED WATER PIPING UP CHASE PROVIDED BY GENERAL CONTRACTOR. COORDINATE WITH GENERAL CONTRACTOR AND STRUCTURAL FOR EXACT LOCATION OF FLOOR PENETRATIONS.
16. CONTRACTOR SHALL ROUTE 1 1/4" HOT WATER PIPING UP CHASE PROVIDED BY GENERAL CONTRACTOR. COORDINATE WITH GENERAL CONTRACTOR AND STRUCTURAL FOR EXACT LOCATION OF FLOOR PENETRATIONS.
17. CONTRACTOR SHALL ROUTE 2" CHILLED WATER PIPING UP CHASE PROVIDED BY GENERAL CONTRACTOR. COORDINATE WITH GENERAL CONTRACTOR AND STRUCTURAL FOR EXACT LOCATION OF FLOOR PENETRATIONS.
18. UNDER GROUND PIPING TO CRAWL SPACE. REFER TO SHEET M2.0 FOR CONTINUATION.
19. CONTRACTOR SHALL PROVIDE CONTROL VALVE ASSEMBLY AT OR NEAR EACH TERMINAL UNIT AS SHOWN. REFER TO RISER DIAGRAMS, CONTROL SHEETS AND VALVE ASSEMBLY DETAILS ON SHEET M5.2 FOR MORE INFORMATION. VALVE ASSEMBLY SHALL BE LOCATED ABOVE TERMINAL UNIT AND SHALL BE
20. CONTRACTOR SHALL ROUTE AND MAKE CONNECTION TO FPVAV3-1.
21. CONTRACTOR SHALL ROUTE AND MAKE CONNECTION TO FPVAV3-2.
22. CONTRACTOR SHALL ROUTE AND MAKE CONNECTION TO FPVAV3-5.
23. CONTRACTOR SHALL ROUTE AND MAKE CONNECTION TO VAV3-1.
24. CONTRACTOR SHALL ROUTE AND MAKE CONNECTION TO FPVAV1-3.

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PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–987

FLOOR PLAN - LEVEL 1 - PIPING - NEW

SHEET NUMBER
M2.1

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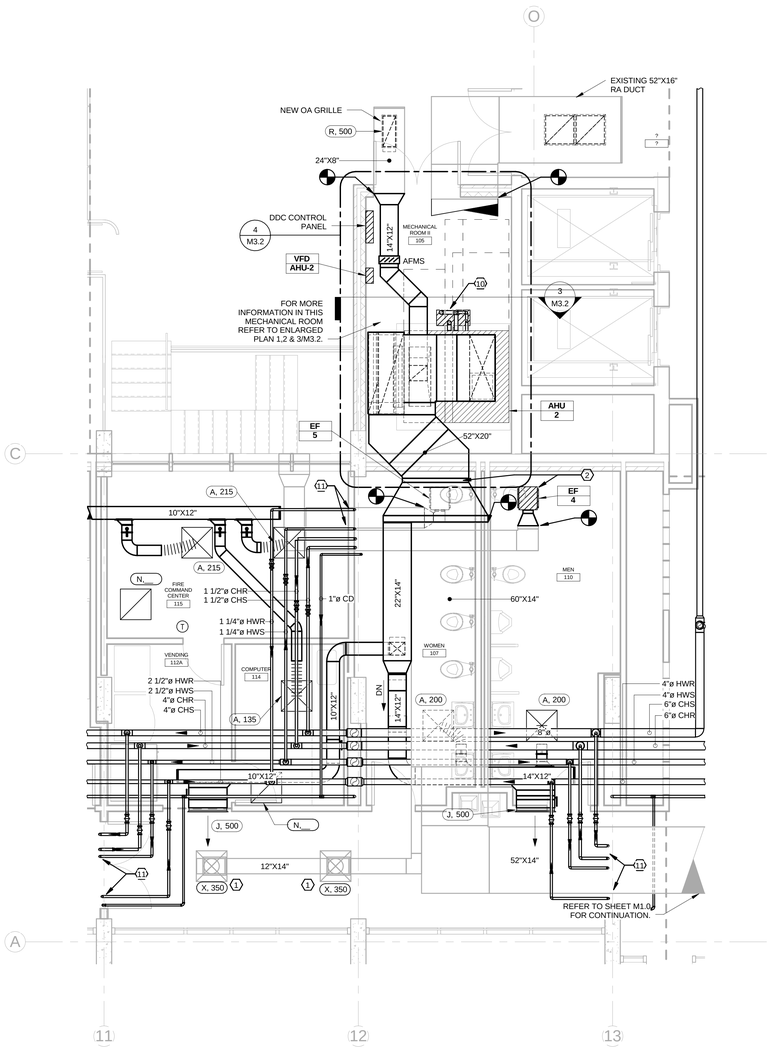
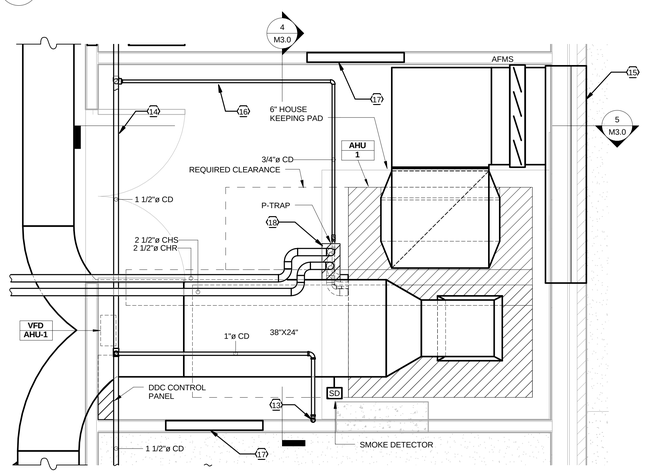
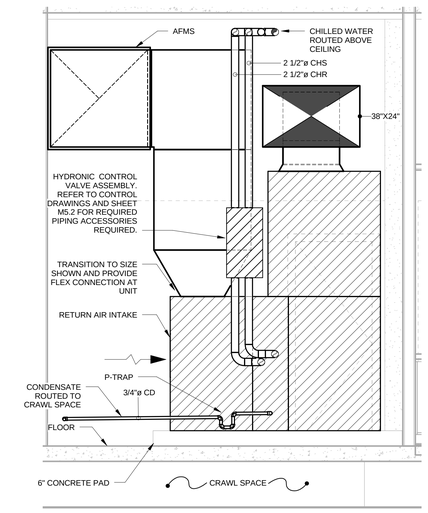


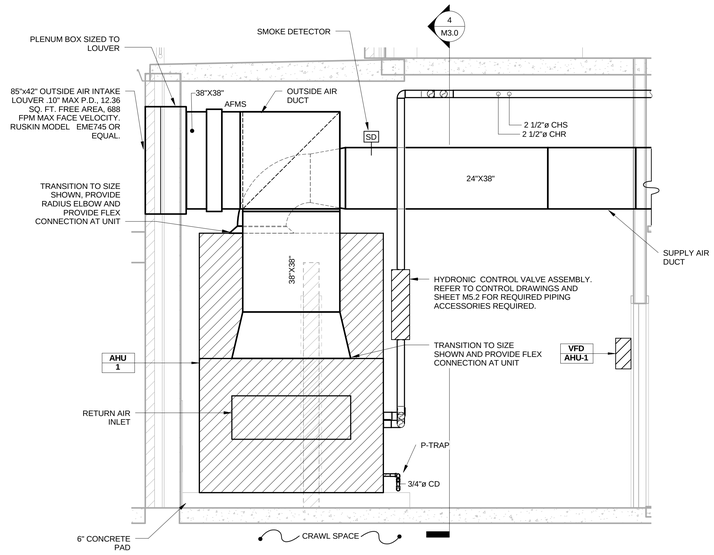
1 M3.0 ENLARGED FLOOR PLAN - LEVEL 1 - HVAC
1/4" = 1'-0"



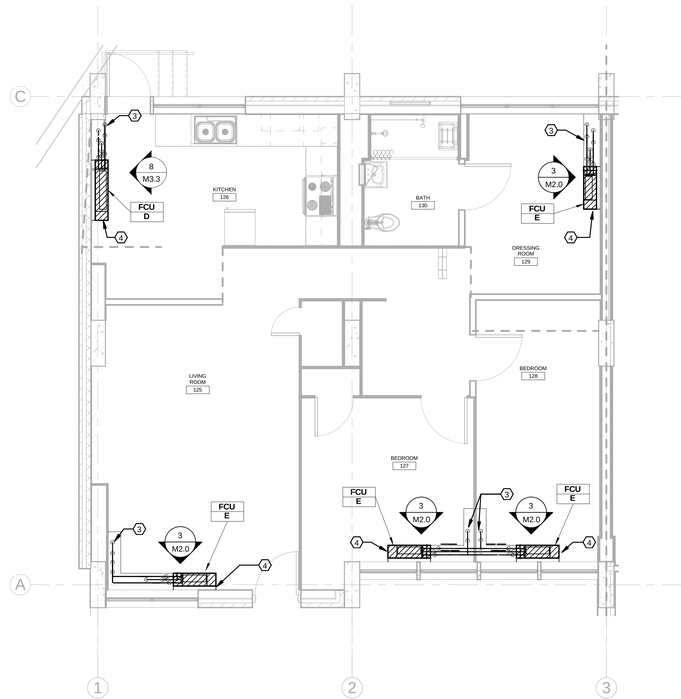
3 M3.0 ENLARGED PLAN VIEW - AHU 1
1/2" = 1'-0"



4 M3.0 AHU-1 WEST ELEVATION
1/2" = 1'-0"



5 M3.0 AHU-1 NORTH ELEVATION
1/2" = 1'-0"



2 M3.0 FLOOR PLAN - LEVEL 1 - RESIDENCE PIPING
1/4" = 1'-0"

HVAC NEW LEGEND:

- EXISTING MECHANICAL EQUIPMENT (WORK SHOWN IN HALF TONE LINES).
- NEW MECHANICAL WORK (WORK SHOWN IN SOLID DARK LINES).
- NEW CONNECTION TO EXISTING.

KEYED NOTES M3.0

1. RE-INSTALL EXISTING AIR DEVICE IN NEW CEILING AND BALANCE TO CFM INDICATED. TYPICAL.
2. PROVIDE NEW, PROVIDE WITH NECESSARY TRANSITIONS TO CONNECT TO EXISTING EXAUST DUCT AND BALANCE TO 300 CFM EACH.
3. CONTRACTOR SHALL ROUTE HYDRONIC PIPING WITHIN CHASE AND DROP TO CRAWL SPACE BELOW. COORDINATE FLOOR PENETRATIONS WITH GENERAL CONTRACTOR AND STRUCTURAL.
4. CONTRACTOR SHALL PROVIDE FCU WITH A 3" FALSE BACK FILLER PANEL.
5. NEW HOT WATER COIL AND FILTER RACK. CONTRACTOR SHALL INSTALL ON EXISTING AIR HANDLER PER MANUFACTURER'S RECOMMENDATIONS.
6. CONTRACTOR SHALL ROUTE 1 1/2"ø CONDENSATE DOWN TO CRAWL SPACE BELOW.
7. HYDRONIC PIPING ROUTED ABOVE CEILING. REFER TO SHEET M3.1 FO CONTINUATION.
8. HYDRONIC PIPING DOWN. CONNECT TO EXISTING AHU-1.
9. CONDENSATE PIPING ROUTED ABOVE CEILING. REFER TO SHEET M1.3 FOR CONTINUATION.
10. HYDRONIC CONTROL VALVE ASSEMBLY. REFER TO CONTROL DRAWINGS AND SHEET M5.2 FOR REQUIRED PIPING ACCESSORIES REQUIRED.
11. HYDRONIC FROM FLOORS ABOVE.
12. REFER TO DETAILS ON SHEET M5.2 FOR ALL PIPING ACCESORIES REQUIRED FOR CONNECTION TO COOLING AND HEATING COILS.
13. CONDENSATE DOWN FROM FLOORS ABOVE AND ROUTED ABOVE CEILING.
14. CONDENSATE PIPING ROUTED ABOVE CEILING TO DROP TO CRAWL SPACE BELOW. SEE SHEET M2.0 FOR CONTINUATION.
15. 85"x42" OUTSIDE AIR INTAKE WIND DRIVEN LOUVER .10" MAX P.D., 12.36 SQ. FT. FREE AREA, 688 FPM MAX FACE VELOCITY. RUSKIN MODEL EME745 OR EQUAL.
16. ROUTE CONDENSATE FROM AHU-1 ALONG FLOOR AS SHOWN AND TAP INTO VERTICLE LINE AS SHOWN. SLOPE 1/8" PER FOOT, AND INSULATE.
17. PROVIDE 38"X16" ROUGH OPENING IN HEAD WALL ABOVE CEILING FOR AIR TRANSFER.
18. HYDRONIC CONTROL VALVE ASSEMBLY. REFER TO CONTROL DRAWINGS AND SHEET M5.2 FOR REQUIRED PIPING ACCESSORIES REQUIRED.

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05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

MECHANICAL ENLARGED PLANS

SHEET NUMBER
M3.0

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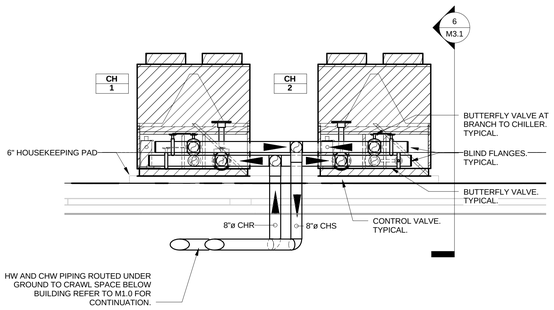
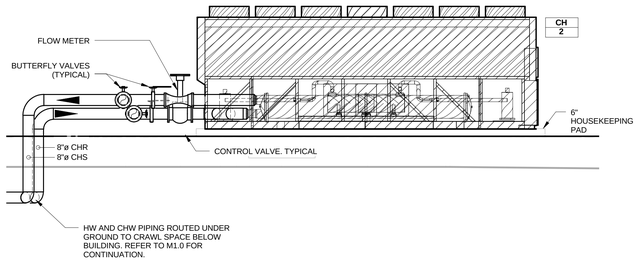
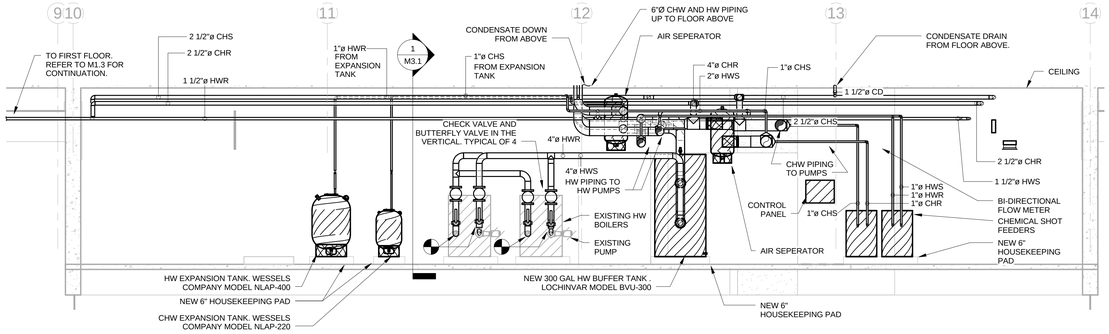


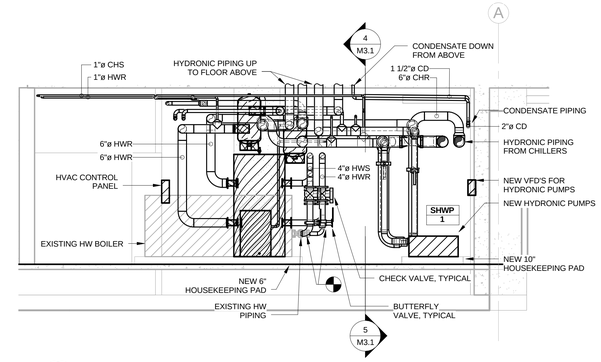
7 M3.1 MECHANICAL YARD ELEVATION 1
1/4" = 1'-0"



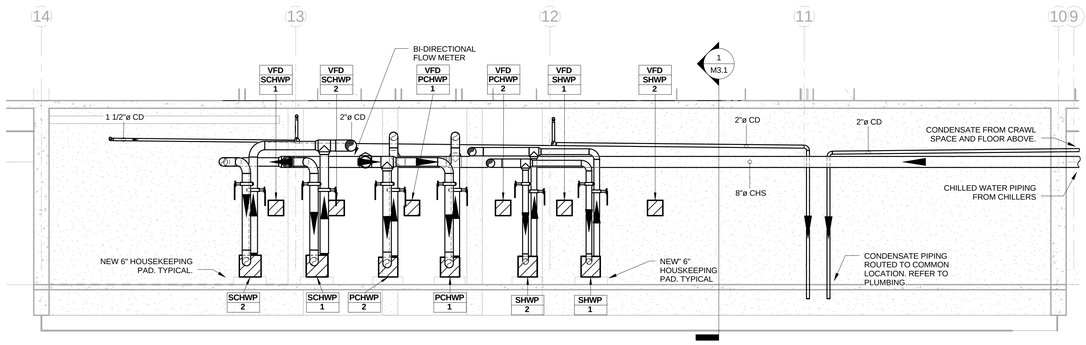
6 M3.1 MECHANICAL YARD ELEVATION 2
1/4" = 1'-0"



4 M3.1 ELEVATION MECHANICAL BASEMENT 2
1/4" = 1'-0"



1 M3.1 ELEVATION MECHANICAL BASEMENT 1
1/4" = 1'-0"



5 M3.1 ELVATION MECHANICAL BASEMENT 3
1/4" = 1'-0"

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TEXAS LICENSE NO. 10-881

MECHANICAL
ENLARGED PLANS

SHEET NUMBER
M3.1

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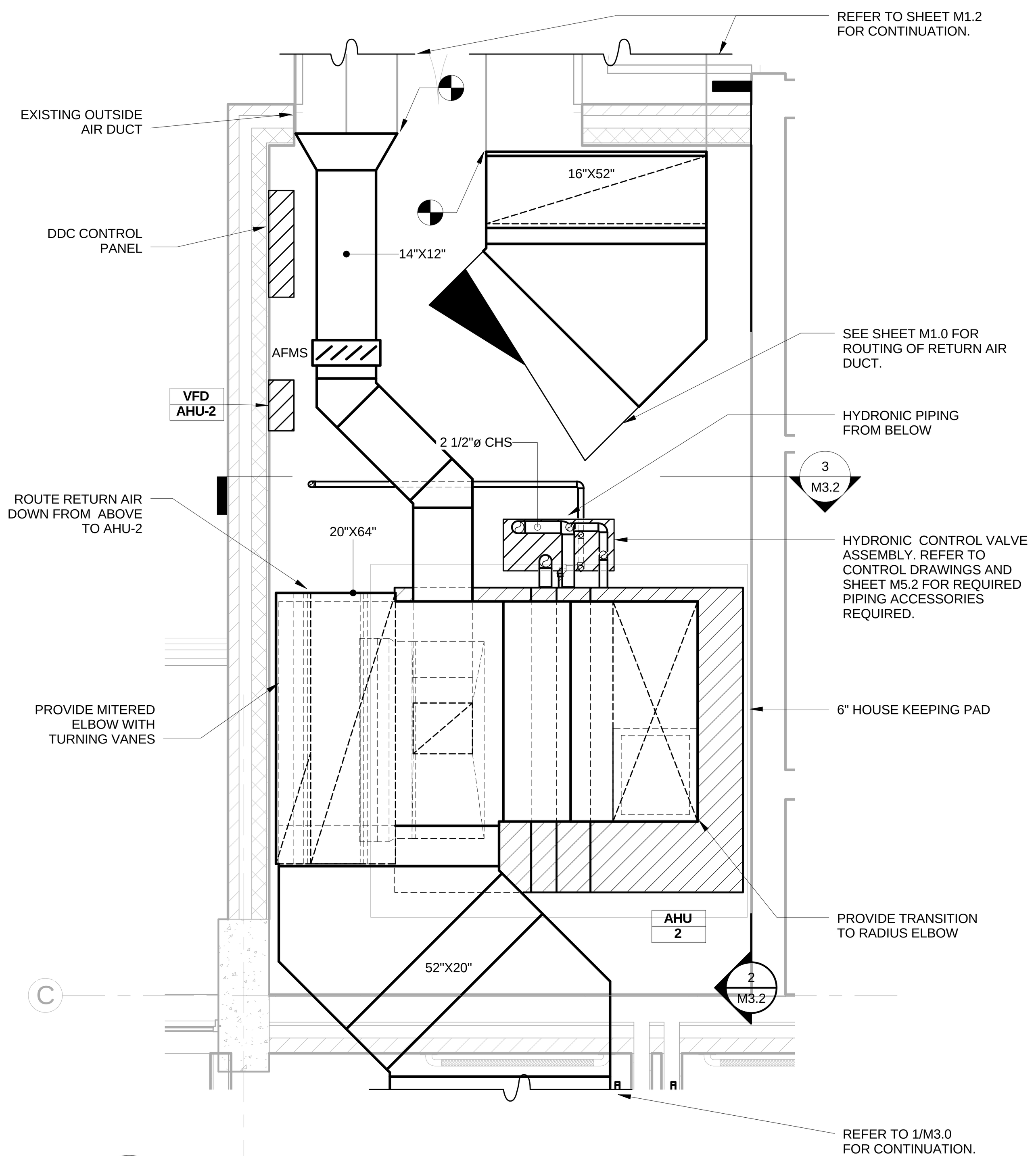
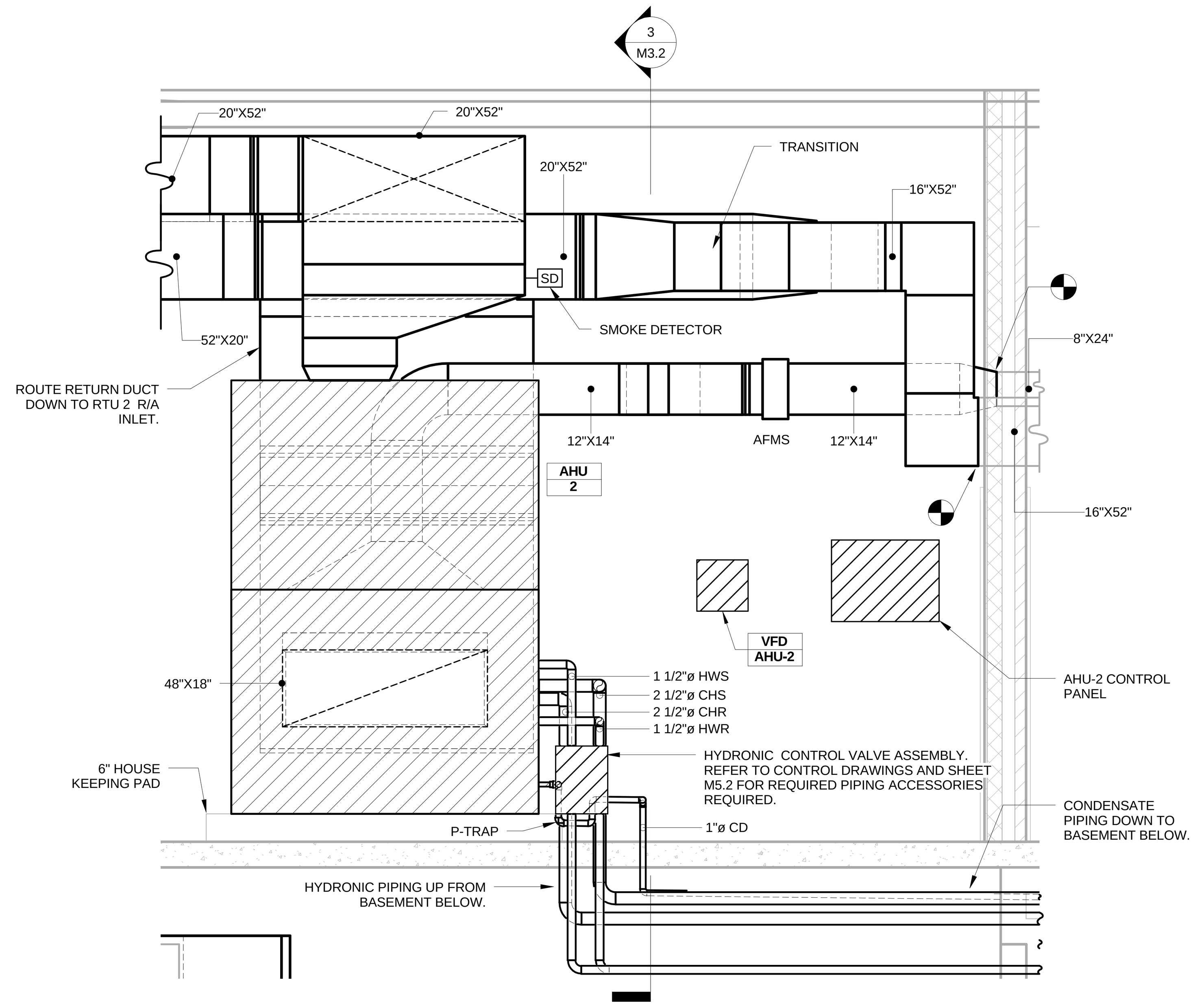
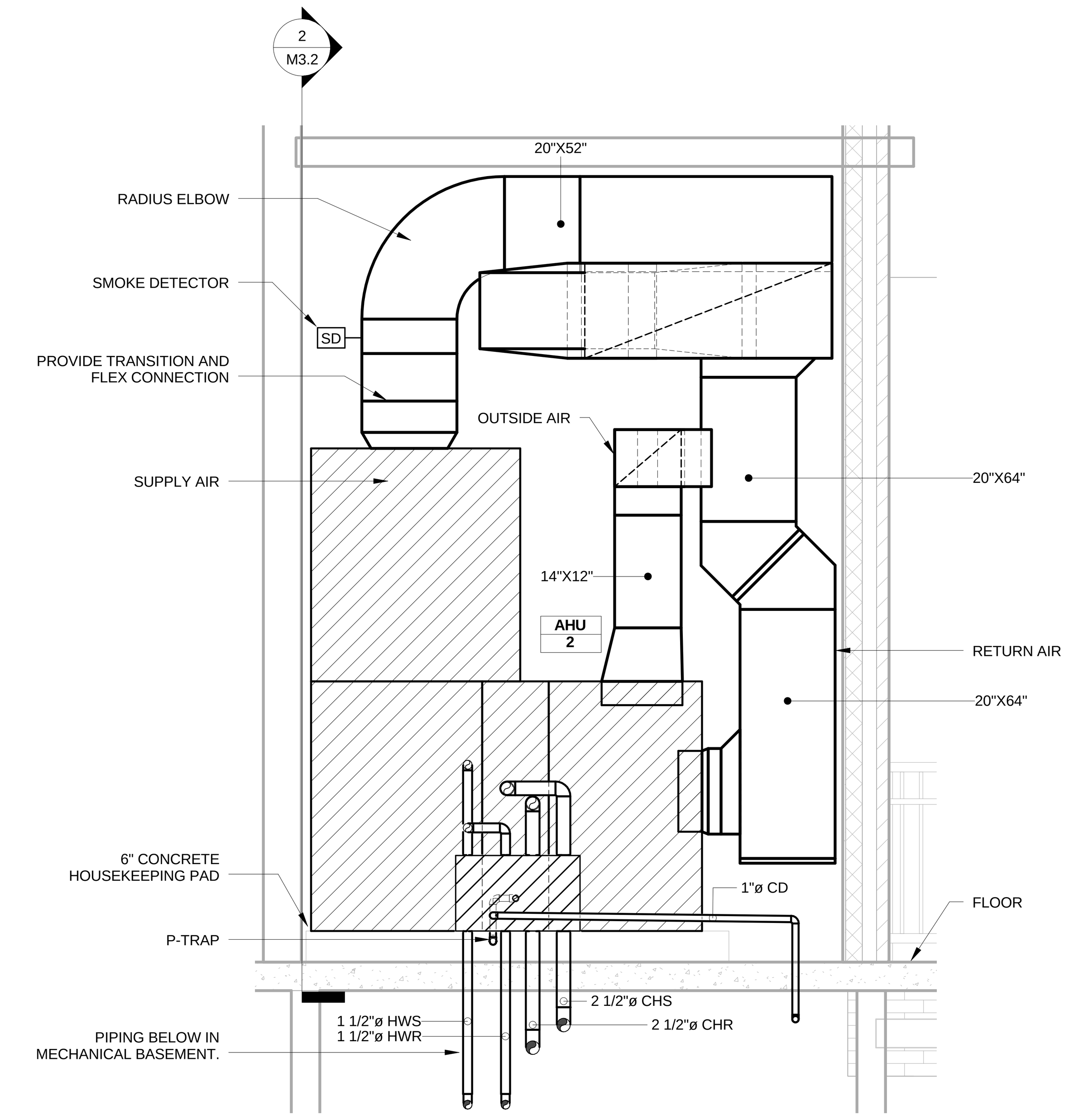


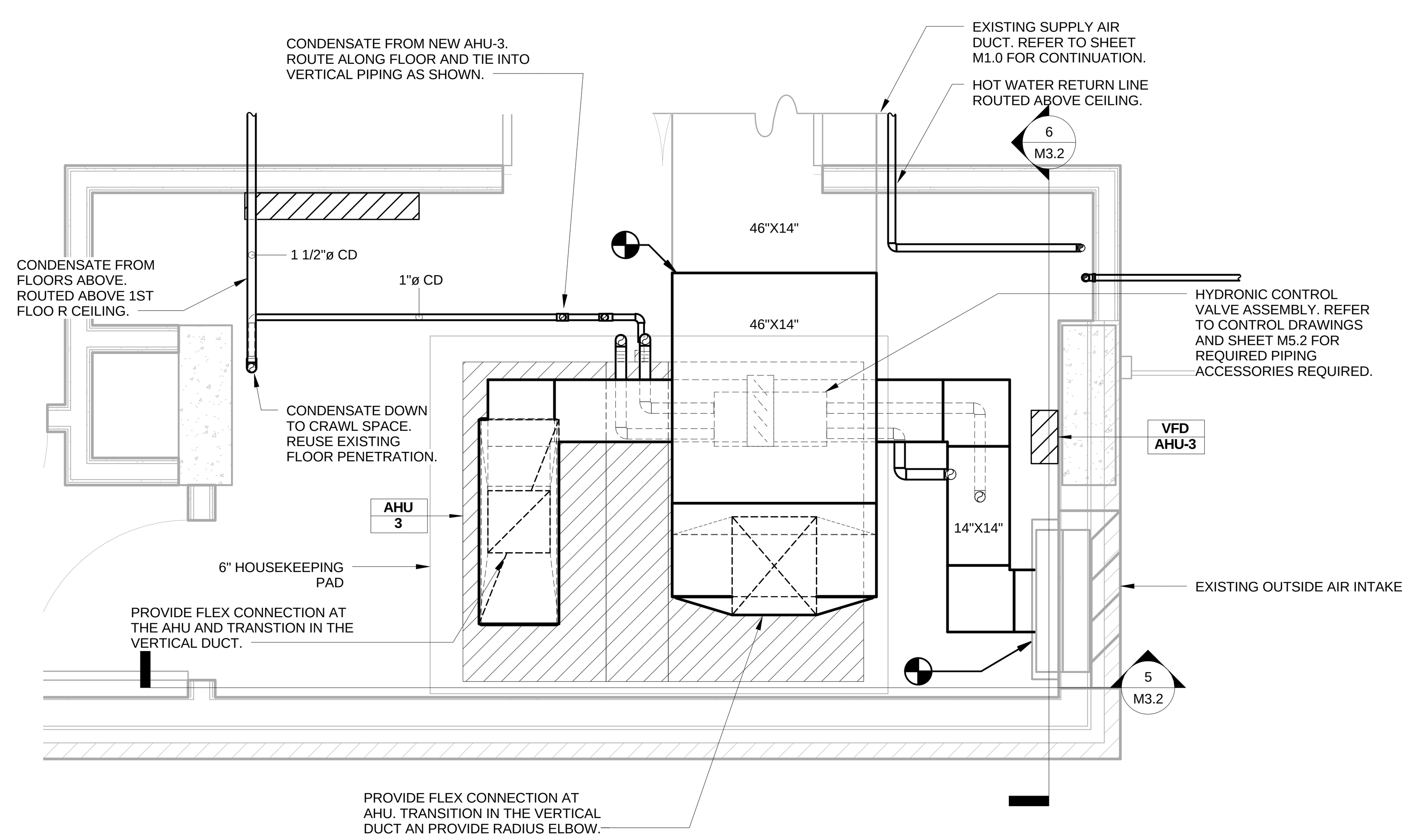
1 ENLARGED PLAN VIEW - AHU 2
M3.2 1/2" = 1'-0"



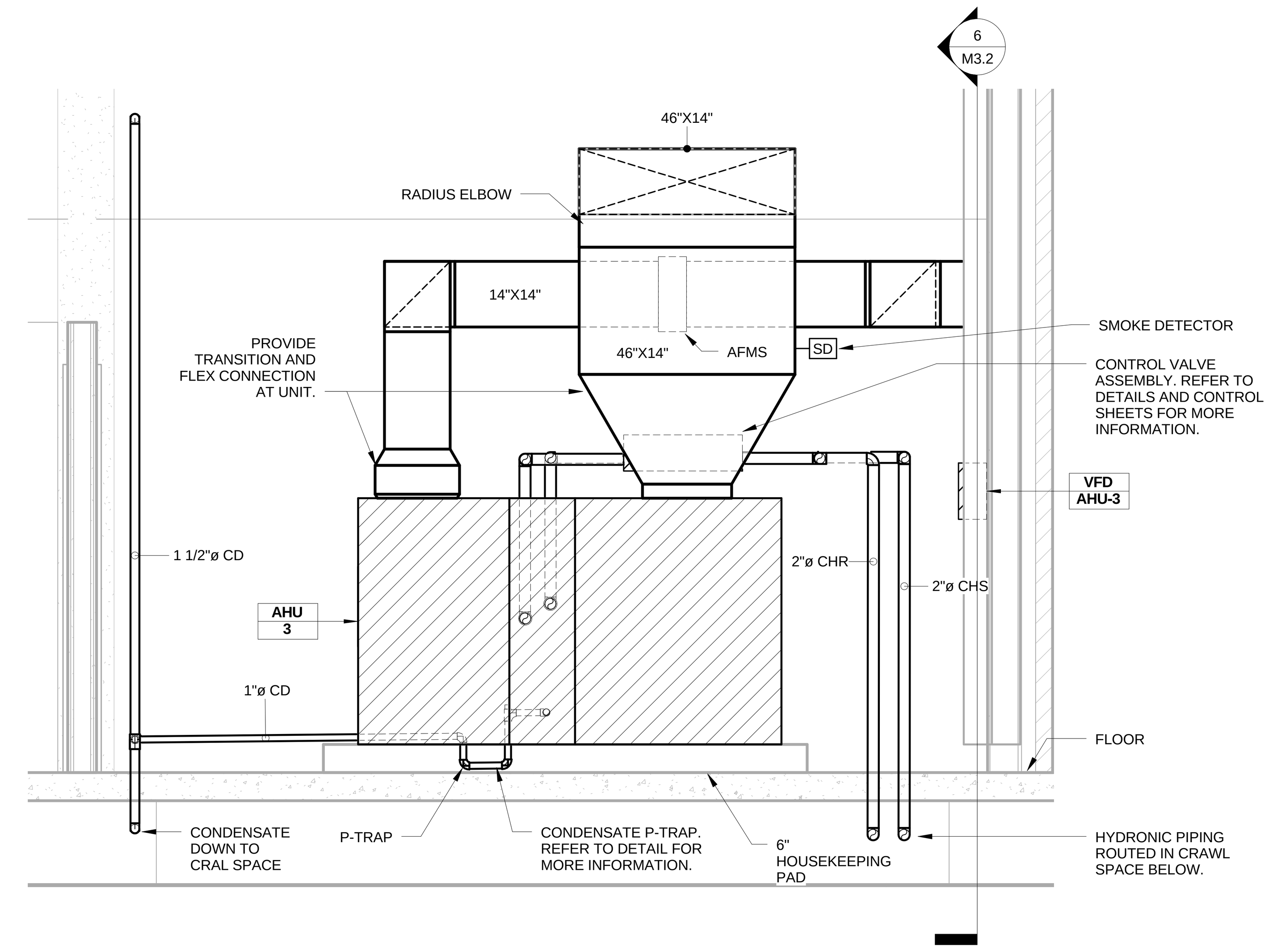
2 AHU-2 EAST ELEVATION
M3.2 1/2" = 1'-0"



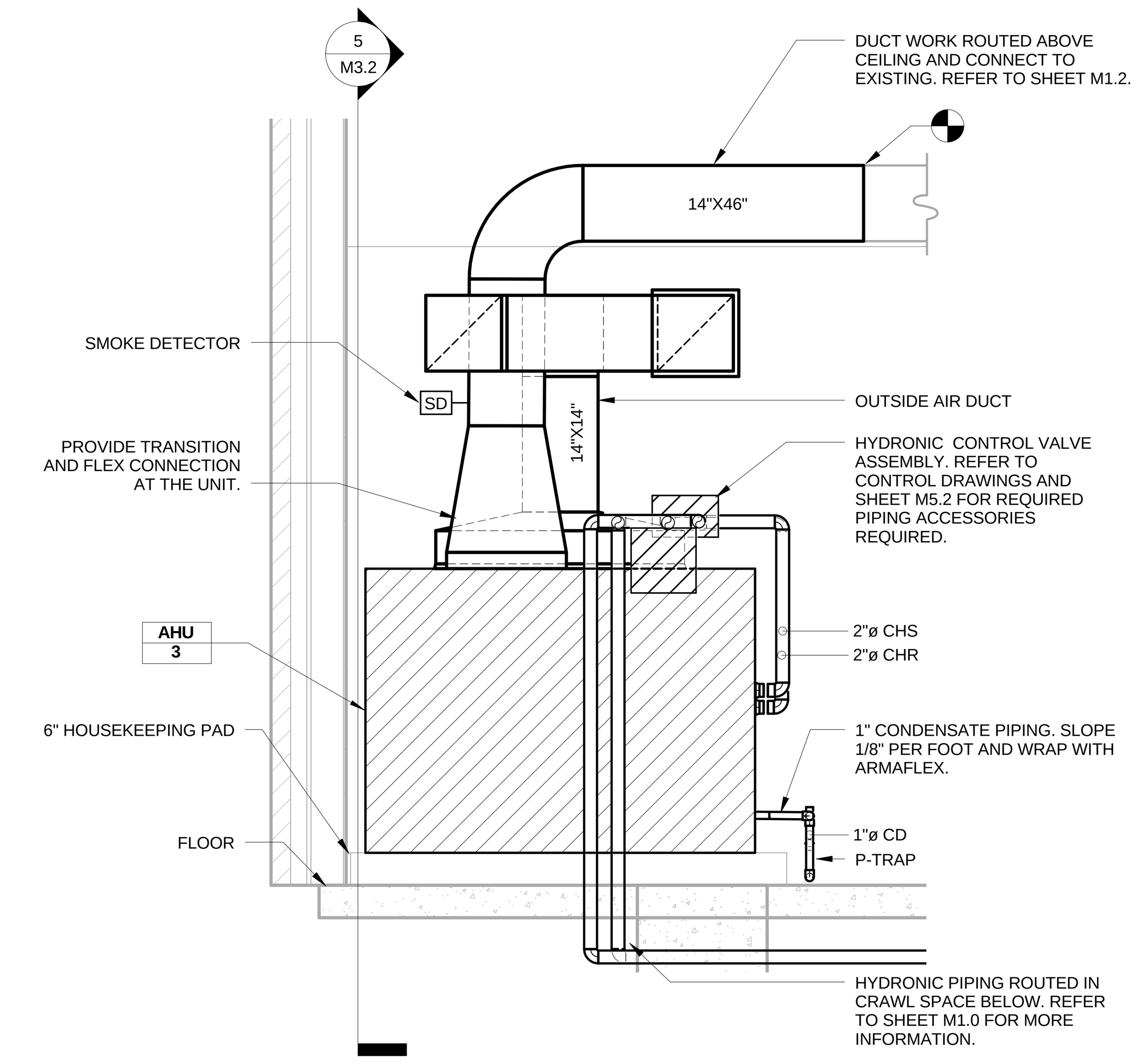
3 AHU-2 NORTH ELEVATION
M3.2 1/2" = 1'-0"



4 ENLARGED PLAN VIEW - AHU 3
M3.2 1/2" = 1'-0"



5 AHU-3 NORTH ELEVATION
M3.2 1/2" = 1'-0"



6 AHU-3 WEST ELEVATION
M3.2 1/2" = 1'-0"

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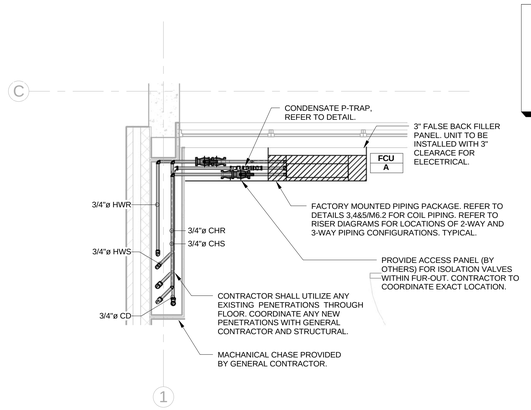
PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-851

MECHANICAL ENLARGED PLANS

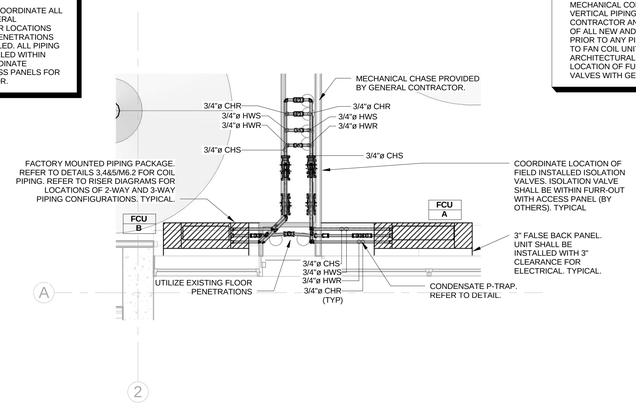
SHEET NUMBER
M3.2



GENERAL NOTE:

MECHANICAL CONTRACTOR SHALL COORDINATE ALL VERTICAL PIPING RISERS WITH GENERAL CONTRACTOR AND STRUCTURAL FOR LOCATIONS OF ALL NEW AND EXISTING FLOOR PENETRATIONS PRIOR TO ANY PIPING BEING INSTALLED. ALL PIPING TO FAN COIL UNITS SHALL BE INSTALLED WITHIN ARCHITECTURAL FURR-OUTS. COORDINATE LOCATION OF FURROUTS AND ACCESS PANELS FOR VALVES WITH GENERAL CONTRACTOR.

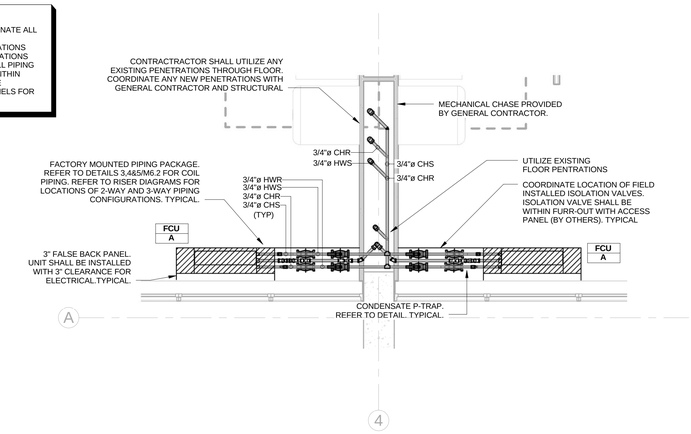
1 M3.3 TYPICAL PIPING TO AHU FROM RISERS - B,R,T
1/2" = 1'-0"



GENERAL NOTE:

MECHANICAL CONTRACTOR SHALL COORDINATE ALL VERTICAL PIPING RISERS WITH GENERAL CONTRACTOR AND STRUCTURAL FOR LOCATIONS OF ALL NEW AND EXISTING FLOOR PENETRATIONS PRIOR TO ANY PIPING BEING INSTALLED. ALL PIPING TO FAN COIL UNITS SHALL BE INSTALLED WITHIN ARCHITECTURAL FURR-OUTS. COORDINATE LOCATION OF FURROUTS AND ACCESS PANELS FOR VALVES WITH GENERAL CONTRACTOR.

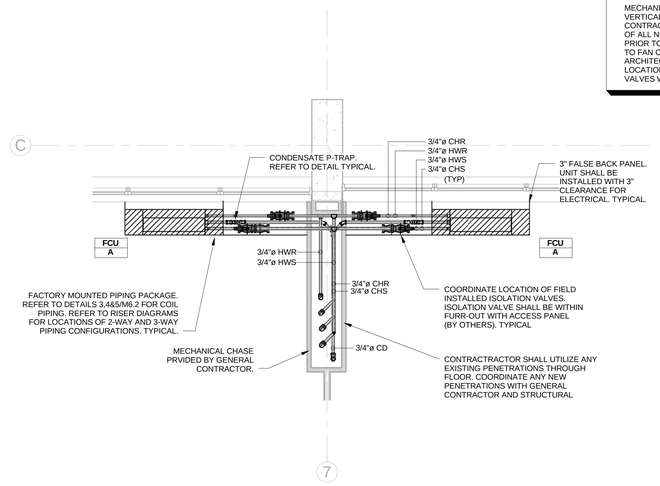
2 M3.3 TYPICAL PIPING TO AHU FROM RISERS - C,Q
1/2" = 1'-0"



3 M3.3 TYPICAL PIPING TO AHU FROM RISERS - E,G,I,K,O,U,W,Y,AA
1/2" = 1'-0"

GENERAL NOTE:

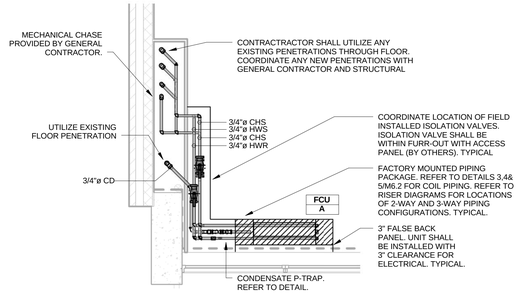
MECHANICAL CONTRACTOR SHALL COORDINATE ALL VERTICAL PIPING RISERS WITH GENERAL CONTRACTOR AND STRUCTURAL FOR LOCATIONS OF ALL NEW AND EXISTING FLOOR PENETRATIONS PRIOR TO ANY PIPING BEING INSTALLED. ALL PIPING TO FAN COIL UNITS SHALL BE INSTALLED WITHIN ARCHITECTURAL FURR-OUTS. COORDINATE LOCATION OF FURROUTS AND ACCESS PANELS FOR VALVES WITH GENERAL CONTRACTOR.



4 M3.3 TYPICAL PIPING TO AHU FROM RISERS - D,F,H,J,L,P,V,X,Z
1/2" = 1'-0"

GENERAL NOTE:

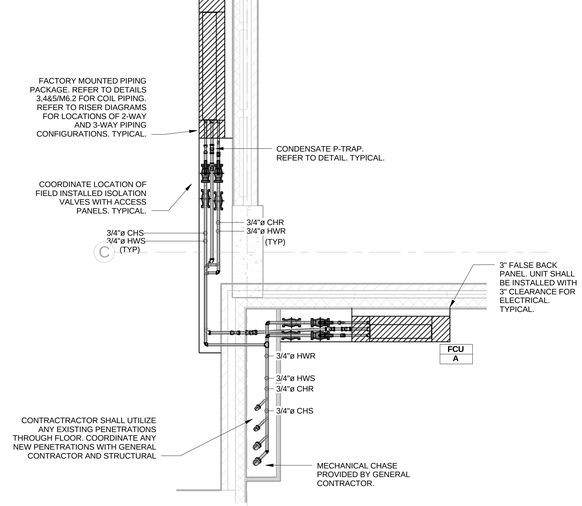
MECHANICAL CONTRACTOR SHALL COORDINATE ALL VERTICAL PIPING RISERS WITH GENERAL CONTRACTOR AND STRUCTURAL FOR LOCATIONS OF ALL NEW AND EXISTING FLOOR PENETRATIONS PRIOR TO ANY PIPING BEING INSTALLED. ALL PIPING TO FAN COIL UNITS SHALL BE INSTALLED WITHIN ARCHITECTURAL FURR-OUTS. COORDINATE LOCATION OF FURROUTS AND ACCESS PANELS FOR VALVES WITH GENERAL CONTRACTOR.



5 M3.3 TYPICAL PIPING TO AHU FROM RISER - A,S,BB
1/2" = 1'-0"

GENERAL NOTE:

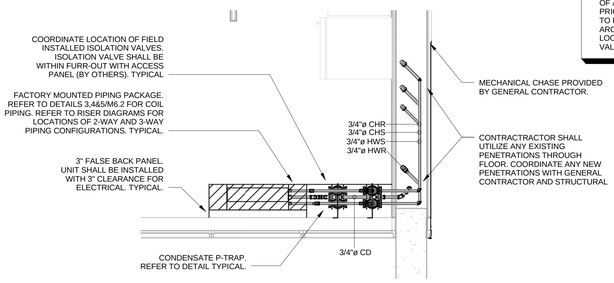
MECHANICAL CONTRACTOR SHALL COORDINATE ALL VERTICAL PIPING RISERS WITH GENERAL CONTRACTOR AND STRUCTURAL FOR LOCATIONS OF ALL NEW AND EXISTING FLOOR PENETRATIONS PRIOR TO ANY PIPING BEING INSTALLED. ALL PIPING TO FAN COIL UNITS SHALL BE INSTALLED WITHIN ARCHITECTURAL FURR-OUTS. COORDINATE LOCATION OF FURROUTS AND ACCESS PANELS FOR VALVES WITH GENERAL CONTRACTOR.



6 M3.3 TYTPICAL PIPING TO AHU FROM RISER - N
1/2" = 1'-0"

GENERAL NOTE:

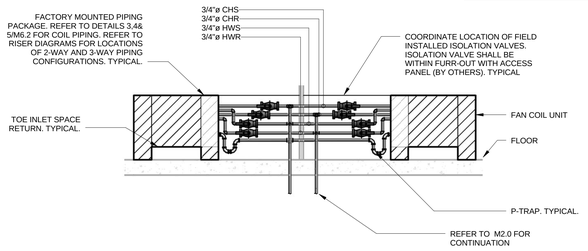
MECHANICAL CONTRACTOR SHALL COORDINATE ALL VERTICAL PIPING RISERS WITH GENERAL CONTRACTOR AND STRUCTURAL FOR LOCATIONS OF ALL NEW AND EXISTING FLOOR PENETRATIONS PRIOR TO ANY PIPING BEING INSTALLED. ALL PIPING TO FAN COIL UNITS SHALL BE INSTALLED WITHIN ARCHITECTURAL FURR-OUTS. COORDINATE LOCATION OF FURROUTS AND ACCESS PANELS FOR VALVES WITH GENERAL CONTRACTOR.



9 M3.3 TYPICAL PIPING TO AHU FROM RISER - M
1/2" = 1'-0"

GENERAL NOTE:

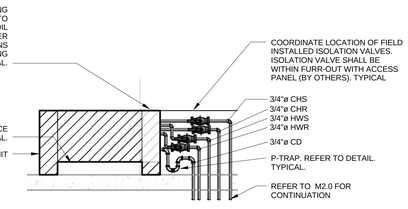
MECHANICAL CONTRACTOR SHALL COORDINATE ALL VERTICAL PIPING RISERS WITH GENERAL CONTRACTOR AND STRUCTURAL FOR LOCATIONS OF ALL NEW AND EXISTING FLOOR PENETRATIONS PRIOR TO ANY PIPING BEING INSTALLED. ALL PIPING TO FAN COIL UNITS SHALL BE INSTALLED WITHIN ARCHITECTURAL FURR-OUTS. COORDINATE LOCATION OF FURROUTS AND ACCESS PANELS FOR VALVES WITH GENERAL CONTRACTOR.



7 M3.3 1ST FLOOR RESIDENCE BEDROOM (2) FCU CONNECTION- ELEVATION
1/2" = 1'-0"

GENERAL NOTE:

MECHANICAL CONTRACTOR SHALL COORDINATE ALL VERTICAL PIPING RISERS WITH GENERAL CONTRACTOR AND STRUCTURAL FOR LOCATIONS OF ALL NEW AND EXISTING FLOOR PENETRATIONS PRIOR TO ANY PIPING BEING INSTALLED. ALL PIPING TO FAN COIL UNITS SHALL BE INSTALLED WITHIN ARCHITECTURAL FURR-OUTS. COORDINATE LOCATION OF FURROUTS AND ACCESS PANELS FOR VALVES WITH GENERAL CONTRACTOR.



8 M3.3 1ST FLOOR RESIDENCE FCU - ELEVATION - TYPICAL
1/2" = 1'-0"

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05/25/18

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TEXAS LICENSE NO. 10–881

MECHANICAL ENLARGED PLANS

SHEET NUMBER
M3.3

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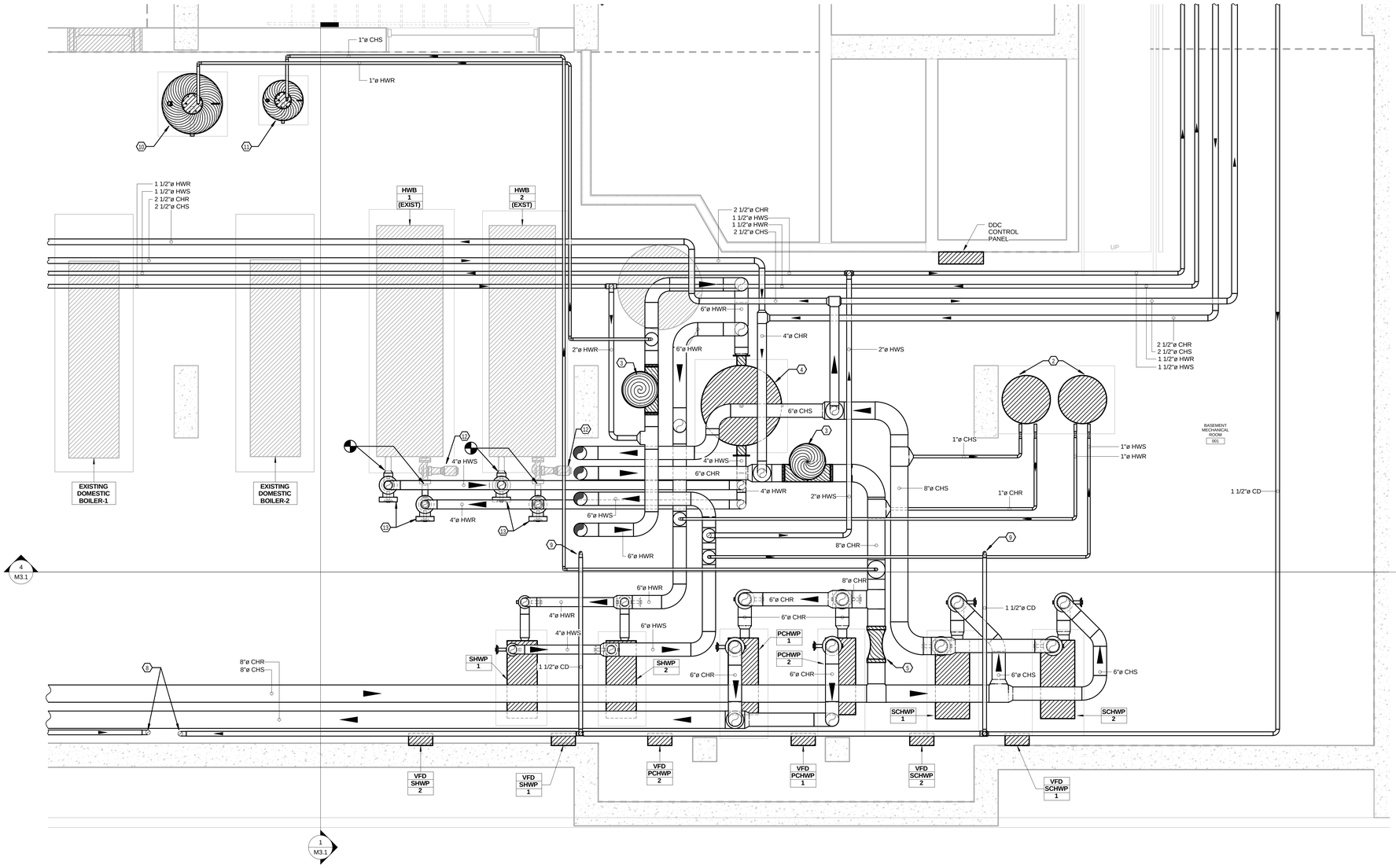

1 M3.4 ENLARGED BASEMENT PLAN - PIPING

1/2" = 1'-0"

HVAC NEW LEGEND:

- EXISTING MECHANICAL EQUIPMENT (WORK SHOWN IN HALF TONE LINES).
- NEW MECHANICAL WORK (WORK SHOWN IN SOLID DARK LINES).
- NEW CONNECTION TO EXISTING.

KEYED NOTES M3.4

1. NEW CHILLED AND HOT WATER PIPING UP TO AIR HANDLER ON FLOOR ABOVE. REUSE EXISTING FLOOR PENETRATIONS AND COORDINATE WITH GENERAL CONRACTOR AND STRUCTURAL FOR ADDITIONAL PENETRATIONS REQUIRED.
2. CHEMICAL SHOT FEEDERS FOR CHILLED WATER/HOT WATER LOOPS.
3. NEW AIR SEPARATOR. CONTRACTOR SHALL INSTALL AT HIGHEST POINT POSSIBLE WHILE MAINTAINING PROPER CLEARANCES.
4. NEW BUFFER TANK. PROVIDE LOCKINVAR MODEL BVU-300 WITH 300 GALLON CAPACITY.
5. PROVIDE AND INSTALL BI-DIRECTIONAL FLOW METER.
6. CONTINUE PIPING CONTINUES IN CRAWL SPACE AND UP TO AHU AND FAN COILS ON FLOOR ABOVE. REFER TO SHEET M1.0 FOR CONTINUATION.
7. CONTINUE CHILLED WATER PIPING IN CRAWL SPACE. REFER TO SHEET M1.3 FOR CONTINUATION.
8. CONTINUE MAIN CONDENSATE DRAIN LINE IN CRAWL SPACE. REFER TO SHEET M1.3 FOR CONTINUATION.
9. CONDENSATE DRAIN LINE DOWN FROM FLOOR ABOVE. CONTRACTOR SHALL ROUTE AS CLOSE TO CEILING AS POSSIBLE AND ROUTE TO MAIN CONDENSATE DRAIN LINE AS SHOWN. SLOPE 1/8" PER FOOT.
10. NEW HOT WATER EXPANSION TANK. REFER TO DETAIL 6/M4.3.
11. NEW CHILLED WATER EXPANSION TANK. REFER TO DETAIL 6/M4.3.
12. EXISTING BOILER PUMPS.
13. PROVIDE BUTTERFLY VALVE AND CHECK VALVE IN THE VERTICAL.

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PIPING ENLARGED BASEMENT PLAN

SHEET NUMBER
M3.4

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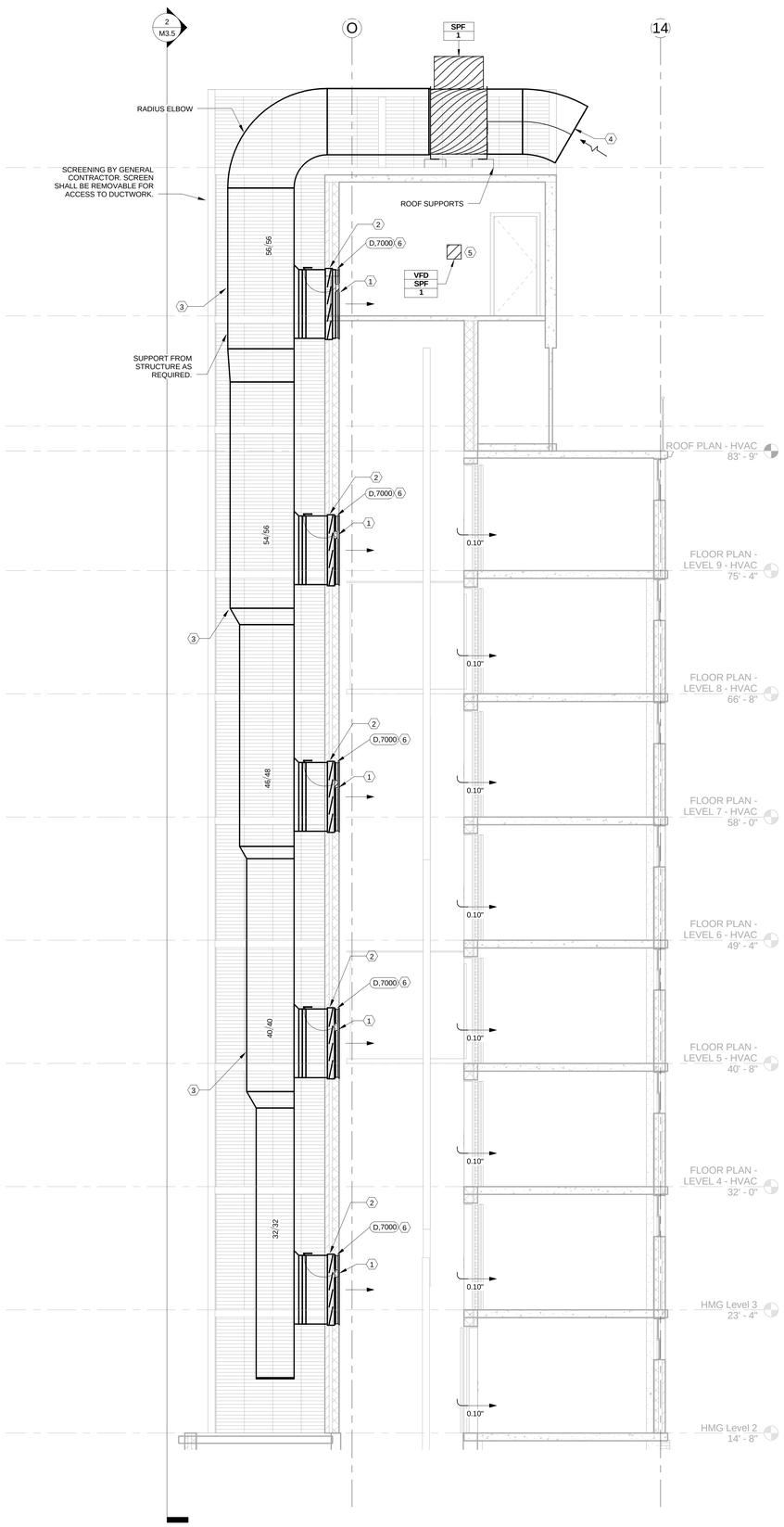
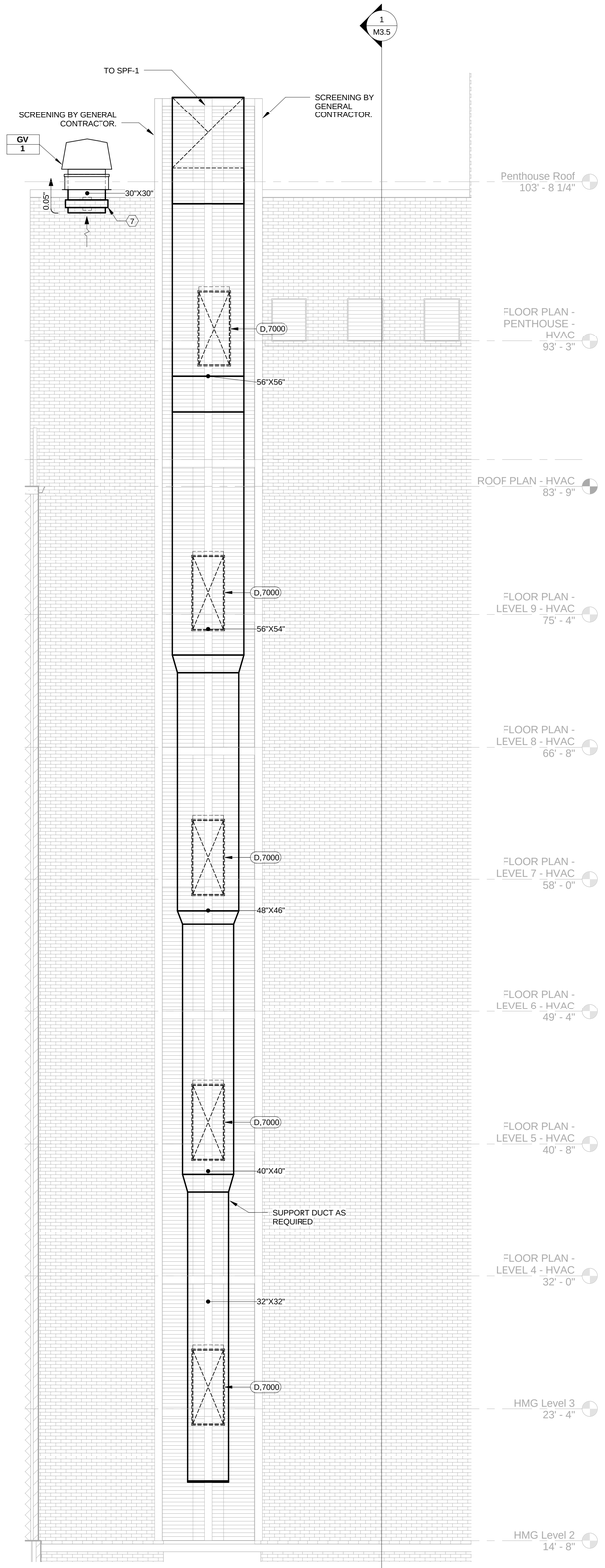


1 M3.5 STAIR PRESSURIZATION 1
1/4" = 1'-0"

NOTE:

STAIRWELL PRESSURIZATION REQUIREMENTS TO BE PROVIDED PER 2015 IBC, SECTION 909 WITH LOAD AMENDMENTS.

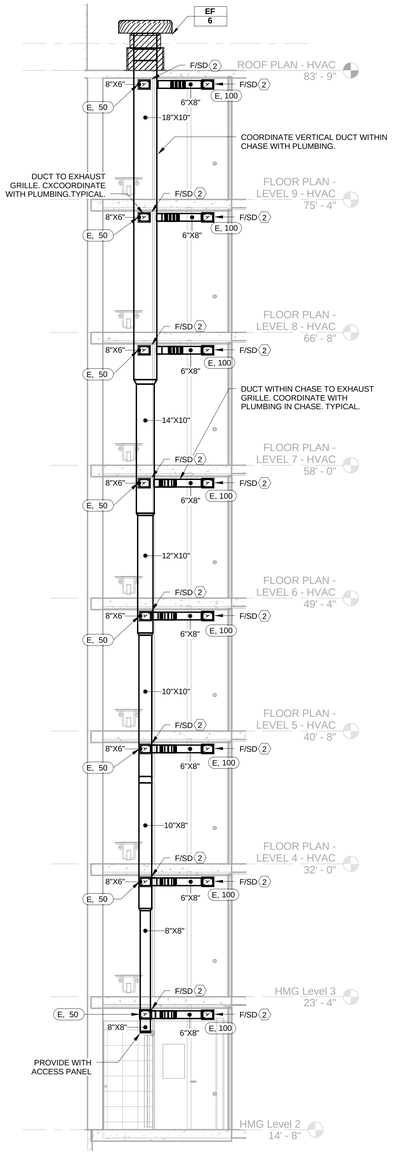
1. STAIRWELL PRESSURIZATION CALCULATIONS BASE UPON THREE (3) DOORS OPEN AT TOP OF THE BUILDING; OR THREE (3) DOORS OPEN IN THE MIDDLE OF THE BUILDING OR THRU (3) DOORS OPEN AT THE BOTTOM OF THE BUILDING. IN ADDITION, ANY GROUND LEVEL EXTERIOR STAIRWELL DOOR SHALL ALSO BE OPEN. THE WORSE CASE IS USED IN SIZING THE PRESSURIZATION FANS.
2. STAIRWELL PRESSURIZATION FAN TO HAVE MINIMUM TWO (2) BELTS PER FAN SCHEDULE AND FANS TO BE CONTROLLED BY VFD (REFER TO SCHEDULE).
3. STAIRWELL PRESSURIZATION TO HAVE MULTIPLE INJECTION POINTS AS NOTED ON THE RISER.
4. MINIMUM PRESSURE DIFFERENCES WITHIN THE STAIR VESTIBULE WITH THE DOORS CLOSED SHALL BE 0.05" W.C. RELATIVE TO CORRIDOR (ADJACENT SPACE), AND 0.05" W.C. NEGATIVE PRESSURE RELATIVE TO THE STAIR TOWER.
5. SECTION 909.20.3.3 REQUIRES A 2500 CFM BAROMETRIC RELIEF DAMPER/ HOOD CAPABLE OF DISCHARGING 2500 CFM OF AIR AT THE DESIGN PRESSURE DIFFERENCE OF 0.05" W.C. RELATIVE TO STAIR VESTIBULE (SHOWN ON STAIRWELL RISERS). THE VENT SHALL BE SET TO ONLY OPEN WHEN ALL DOORS ARE CLOSED.
6. STACK EFFECT AND WIND EFFECT WERE CALCULATED SUCH THAT 0.3" W.C. WAS ADDED TO FAN S.P. FOR COMPENSATION.
7. PROVIDE EQUIPMENT DATA SHEETS FOR ALL EQUIPMENT FOR AFD APPROVAL DURING BUILDING PERMIT SUBMITTED STAGE.
8. SEQUENCE OF OPERATION: WHEN THE BUILDING FIRE ALARM SYSTEM IS IN ALARM, THE STAIRWELL PRESSURIZATION FANS SHALL START. THE BAROMETRIC RELIEF VENT SHALL FUNCTION AS NOTED IN NOTE 6 ABOVE.
   a. THE VFD FOR EACH STAIRWELL PRESSURIZATION FAN SHALL VARY THE SPEED OF THE FANS TO PROVIDE THE REQUIRED DIFFERENTIAL PRESSURES BETWEEN THE STAIRS AND ADJACENT SPACES, WHETHER THE STAIR DOORS ARE OPENED OR CLOSED. (REFER TO NOTES 4).
9. STAIRWELL PRESSURIZATION CALCULATIONS PERFORMED IN ACCORDANCE WITH ASHRAE PRINCIPLES OF SMOKE MANAGEMENT.
10. A UL LISTED FIRE FIGHTERS SMOKE CONTROL PANEL SHALL BE PROVIDE AND INSTALLED (COMPLETE) AS OUTLINED IN IBC 2015 LOCAL AMENDMENTS 909.16.A FULL SCALE DRAWING OF THE PANEL AND THE SYSTEM CONTROL SEQUENCE SHALL BE SUBMITTED TO AFD FOR REVIEW AND APPROVED PRIOR TO PANEL CONSTRUCTION REGARDLESS OF WHICH TRADE IS RESPONSIBLE FOR THE DESIGN.
11. SYSTEM TESTING REQUIREMENTS:
   a. ACCEPTANCE TESTING FOR THE ENTIRE SMOKE CONTROL SYSTEM WILL BE ACCORDING TO SECTION 909.18.8 OF THE IBC (LOCAL AMENDMENTS). SPECIAL INSPECTION AGENCY (SIA) IS REQUIRED TO PERFORM ALL INSPECTIONS AND ACCEPTANCE TESTING ON SMOKE MANAGEMENT SYSTEMS, AND MUST BE HIRED DIRECTLY BY THE BUILDING OWNER. THE SIA SHOULD BE HIRED EARLY.



2 M3.5 STAIR PRESSURIZATION 2
1/4" = 1'-0"

KEYED NOTES M3.5

1. PROVIDE BALANCING DAMPER WITH YOUNG REGULATOR MODEL 301./315 OR EQUAL. MOUNT REGULATOR IN STAIR WELL, 8'-0" ABOVE STAIR LANDING.
2. PROVIDE FIRE/SMOKE DAMPER AT WALL PENETRATION. TYPICAL.
3. SUPPORT DUCTWORK FROM STRUCTURE AS REQUIRED.
4. PROVIDE BIRD SCREEN AT SUPPLY FAN INLET.
5. MOUNT VFD ON WALL. COORDINATE WITH ELECTRICAL FOR COORDINATION OF PANELS.
6. MECHANICAL CONTRACTOR SHALL MOUNT AIR DEVICE WITHIN EXISTING WINDOW OPENING. COORDINATE WITH GENERAL CONTRACTOR FOR REMOVAL OF WINDOW. FIELD VERIFY ALL WINDOW OPENINGS PRIOR TO ORDERING AIR DEVICES.
7. MECHANICAL CONTRACTOR SHALL PROVED A 30"X30" DUCT AND BAROMETRIC DAMPER DOWN FRO GRAVITY VENTILATOR.



3 M3.5 RESTROOM EXHAUST RISER
1/4" = 1'-0"

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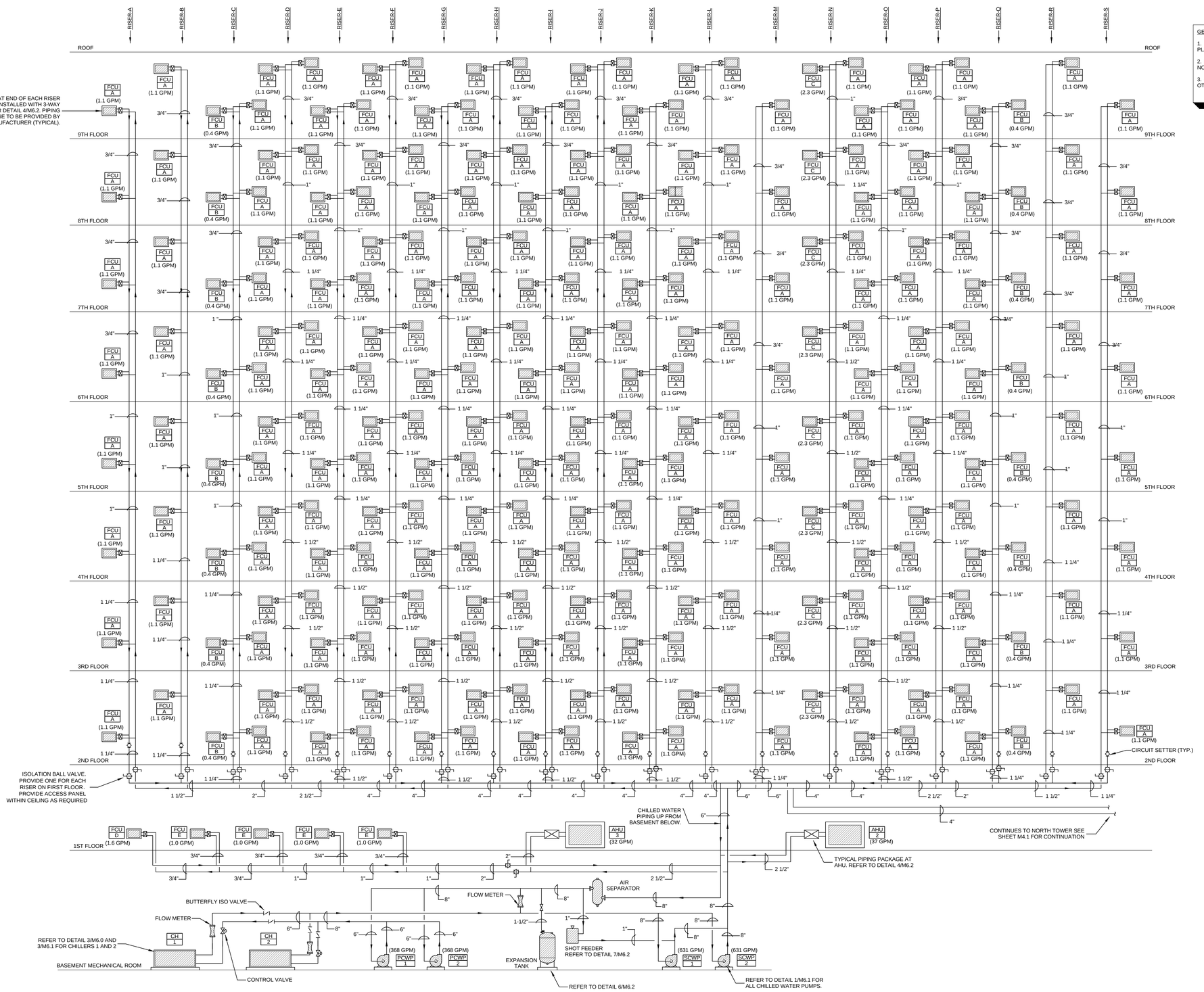
MECHANICAL DUCT ELEVATIONS

SHEET NUMBER
M3.5



1 M4.0 CHILLED WATER RISER DIAGRAM - EAST & WEST WING
NOT TO SCALE

GENERAL NOTES:

1. THIS IS ONLY A SCHEMATIC DIAGRAM. REFERENCE FLOOR PLANS FOR ACTUAL LAYOUT OF PIPING.

2. PROVIDE AND INSTALL 2-WAY VALVES UNLESS OTHERWISE NOTED ON DRAWINGS. SEE DETAIL 3/M4.3.

3. ALL FAN COIL AND VAV BRANCH PIPING SHALL BE 3/4" UNLESS OTHERWISE NOTED.

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CHILLED WATER RISER DIAGRAM

SHEET NUMBER
M4.0

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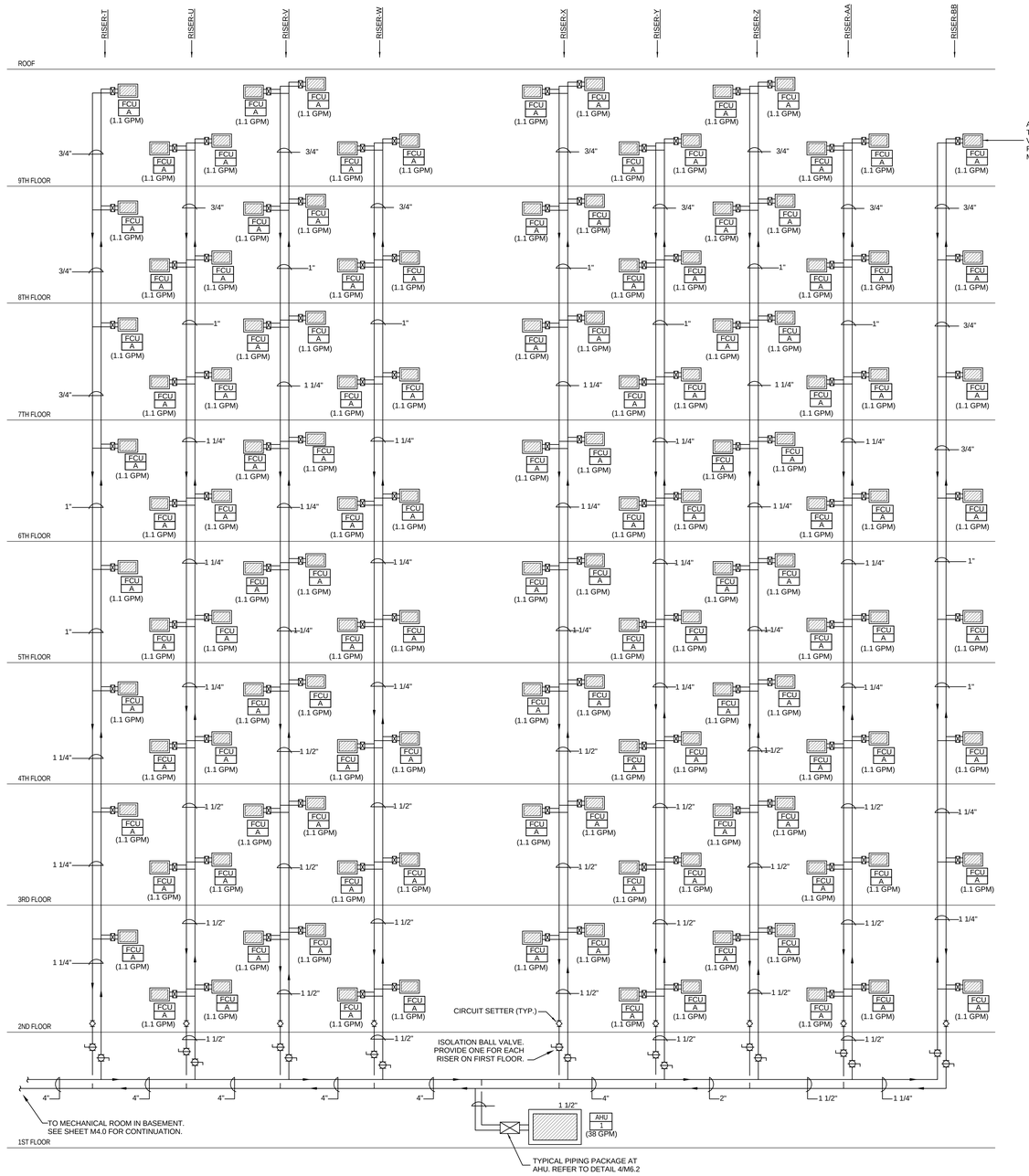

1 M4.1 CHILLED WATER RISER DIAGRAM - NORTH WING
NOT TO SCALE

GENERAL NOTES:

1. THIS IS ONLY A SCHEMATIC DIAGRAM. REFERENCE FLOOR PLANS FOR ACTUAL LAYOUT OF PIPING.

2. PROVIDE AND INSTALL 2-WAY VALVES UNLESS OTHERWISE NOTED ON DRAWINGS. SEE DETAIL 3/M4.3.

3. ALL FAN COIL AND VAV BRANCH PIPING SHALL BE 3/4" UNLESS OTHERWISE NOTED.

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CHILLED WATER RISER DIAGRAM

SHEET NUMBER
M4.1

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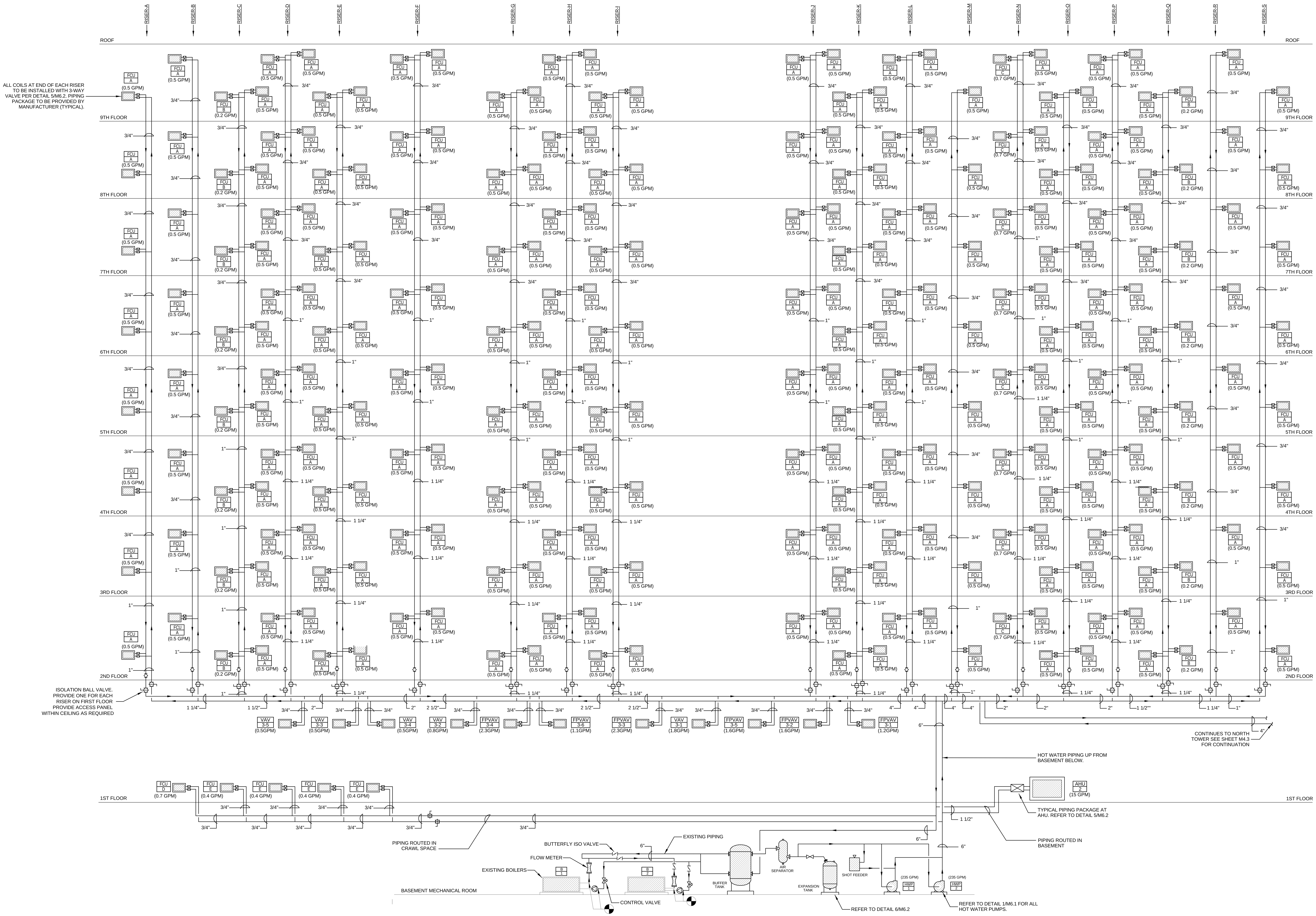
GENERAL NOTES:

1. THIS IS ONLY A SCHEMATIC DIAGRAM. REFERENCE FLOOR PLANS FOR ACTUAL LAYOUT OF PIPING.

2. PROVIDE AND INSTALL 2-WAY VALVES UNLESS OTHERWISE NOTED ON DRAWINGS. SEE DETAIL 3/M4.3.

3. ALL FAN COIL AND VAV BRANCH PIPING SHALL BE 3/4" UNLESS OTHERWISE NOTED.



RISER-A
RISER-B
RISER-C
RISER-D
RISER-E
RISER-F
RISER-G
RISER-H
RISER-I
RISER-J
RISER-K
RISER-L
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RISER-O
RISER-P
RISER-Q
RISER-R
RISER-S
ROOF
9TH FLOOR
8TH FLOOR
7TH FLOOR
6TH FLOOR
5TH FLOOR
4TH FLOOR
3RD FLOOR
2ND FLOOR
1ST FLOOR
ALL COILS AT END OF EACH RISER TO BE INSTALLED WITH 3-WAY VALVE PER DETAIL 5/M6.2, PIPING PACKAGE TO BE PROVIDED BY MANUFACTURER (TYPICAL).
ISOLATION BALL VALVE. PROVIDE ONE FOR EACH RISER ON FIRST FLOOR PROVIDE ACCESS PANEL WITHIN CEILING AS REQUIRED
CONTINUES TO NORTH TOWER SEE SHEET M4.3 FOR CONTINUATION
HOT WATER PIPING UP FROM BASEMENT BELOW.
TYPICAL PIPING PACKAGE AT AHU. REFER TO DETAIL 5/M6.2
PIPING ROUTED IN BASEMENT
PIPING ROUTED IN CRAWL SPACE
BUTTERFLY ISO VALVE
EXISTING PIPING
FLOW METER
EXISTING BOILERS
CONTROL VALVE
BUFFER TANK
AIR SEPARATOR
EXPANSION TANK
SHOT FEEDER
BASEMENT MECHANICAL ROOM
REFER TO DETAIL 6/M6.2
REFER TO DETAIL 1/M6.1 FOR ALL HOT WATER PUMPS.
AHU 2 (15 GPM)
HWP 1 (235 GPM)
HWP 2 (235 GPM)

1 M4.2 HOT WATER RISER DIAGRAM - EAST & WEST WING
3/32" = 1'-0"

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HOT WATER RISER DIAGRAM

SHEET NUMBER
M4.2

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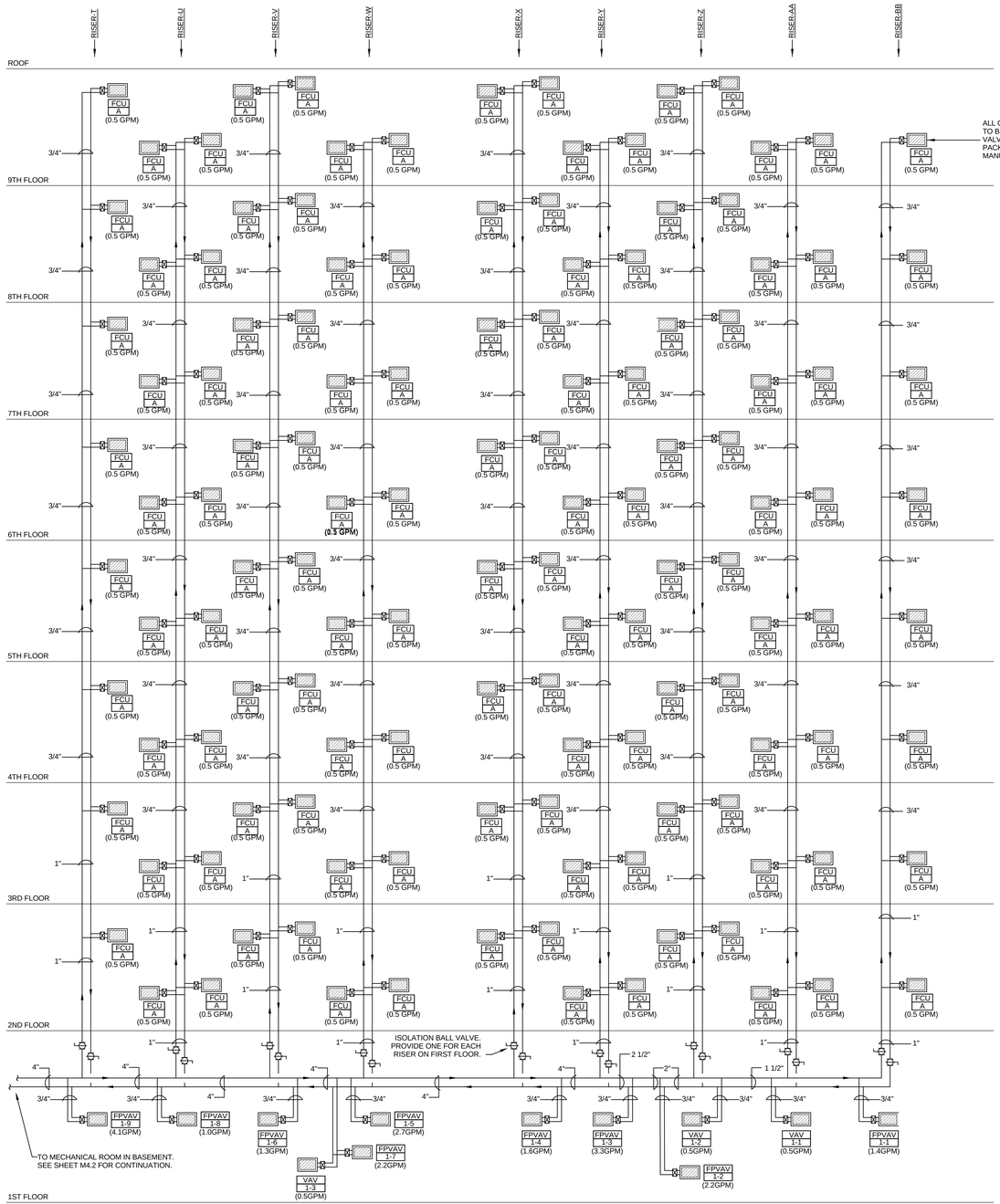

1 M4.3 HOT WATER RISER DIAGRAM - NORTH WING

3/32" = 1'-0"

GENERAL NOTES:

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2. PROVIDE AND INSTALL 2-WAY VALVES UNLESS OTHERWISE NOTED ON DRAWINGS. SEE DETAIL 3/M4.3.

3. ALL FAN COIL AND VAV BRANCH PIPING SHALL BE 3/4" UNLESS OTHERWISE NOTED.

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LICENSED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

HOT WATER RISER DIAGRAM

SHEET NUMBER
M4.3

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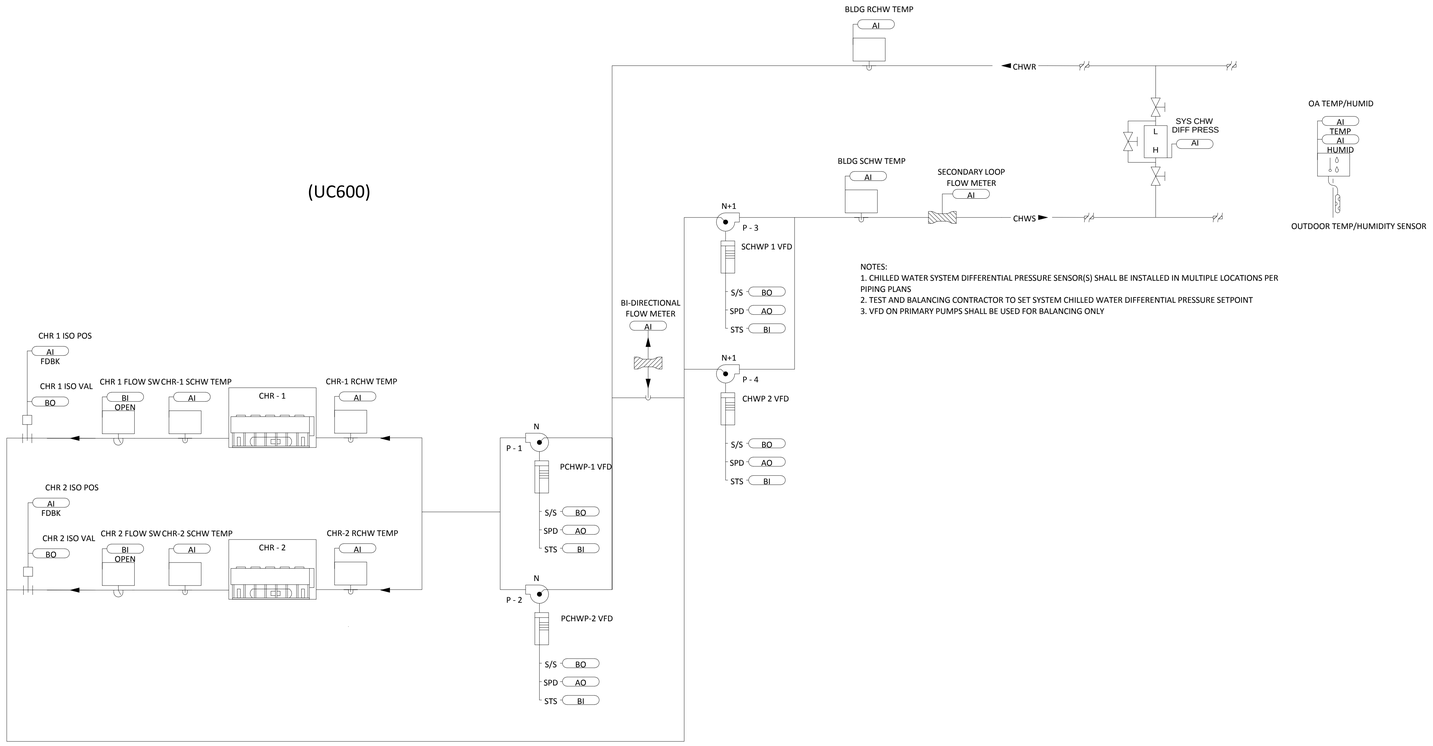
(UC600)



NOTES:
1. CHILLED WATER SYSTEM DIFFERENTIAL PRESSURE SENSOR(S) SHALL BE INSTALLED IN MULTIPLE LOCATIONS PER PIPING PLANS
2. TEST AND BALANCING CONTRACTOR TO SET SYSTEM CHILLED WATER DIFFERENTIAL PRESSURE SETPOINT
3. VFD ON PRIMARY PUMPS SHALL BE USED FOR BALANCING ONLY

SYSTEM GENERAL DESCRIPTION:
THE CHILLED WATER SYSTEM CONSISTS OF THE FOLLOWING:
TWO (2) CHILLERS, CONFIGURED AS: ONE (1) LEAD AND ONE (1) LAG
ONE (1) CHILLED WATER SUPPLY ISOLATION VALVE PER CHILLER
TWO (2) PRIMARY CHILLED WATER PUMPS, CONFIGURED AS: ONE (ONE) LEAD, ONE (1) LAG
TWO (2) SECONDARY CHILLED WATER PUMPS, CONFIGURED AS ONE (1) LEAD, ONE (1) LAG

THE CHILLED WATER SYSTEM SHALL BE ENABLED BY A HIGH LEVEL BAS CONTROLLER. THE HIGHER LEVEL BAS CONTROLLER SHALL SET THE BUILDING SCHEDULE OCCUPIED/UNOCCUPIED
MODES.
THE BAS CONTROLLER PROVIDES START/STOP AND LEAD/LAG/STANDBY CONTROL FOR THE PRIMARY CHILLED WATER PUMPS AND ALSO PROVIDES LEAD/LAG/STANDBY CONTROL OF THE SECONDARY CHILLED WATER PUMPS IN ORDER TO MAINTAIN THE SYSTEM CHILLED WATER SYSTEM DIFFERENTIAL PRESSURE SETPOINT (ADJ.).

CHILLED WATER SYSTEM ENABLE/DISABLE:
THE CHILLED WATER SYSTEM SHALL BE ENABLED VIA A POINT CONTROLLED BY A HIGHER LEVEL BAS. THE BAS CONTROLLER SHALL THEN START THE LEAD SYSTEM PUMP. WHEN RUN STATUS FOR THAT PUMP IS PROVEN, THE BAS CONTROLLER SHALL REPORT THAT STATUS TO THE HIGHER LEVEL BAS. THE HIGHER LEVEL BAS SHALL THEN BEGIN MAKING REQUESTS FOR CHILLERS TO RUN. THE PRIMARY CHILLED WATER PUMPS SHALL BE ENABLED WHEN SIGNALED AT THE VFD. WHEN ENABLED, THE BAS CONTROLLER SHALL START THE LEAD PRIMARY CHILLED WATER PUMP. AS ADDITIONAL CHILLERS MAKE CHILLED WATER PUMP REQUESTS, THE NEXT PRIMARY CHILLED WATER PUMP IN THE SEQUENCE SHALL START. WHEN THE CHILLED WATER SYSTEM IS DISABLED, THE SECONDARY CHILLED WATER PUMPS SHALL BE OFF AND THE PRIMARY PUMPS SHALL BE OFF UNLESS REQUESTED BY ONE OF THE
CHILLERS.

PRIMARY CHILLED WATER PUMP START/STOP:
THE BAS CONTROLLER SHALL START A CHILLED WATER PUMP THROUGH A CONTACT CLOSURE OF THE PUMPS VFD RUN-ENABLE CONTACTS.

PRIMARY CHILLED WATER PUMP STATUS:
THE BAS CONTROLLER SHALL DETECT CHILLED WATER PUMP RUN STATUS BY A CURRENT SWITCH.

PRIMARY CHILLED WATER PUMP LEAD/LAG:
THE CHILLED WATER PUMP LEAD/LAG SEQUENCE SHALL BE ROTATED ON A WEEKLY SCHEDULE. THE SEQUENCE SHALL BE BASED ON CALCULATED RUN TIME WITH THE PUMP HAVING THE LEAST RUN TIME AS LEAD, THE PUMP WITH THE NEXT LOWEST RUN TIME WILL BE THE SECOND IN THE SEQUENCE. FROM THE BAS, AN OPERATOR SHALL BE ABLE TO MANUALLY CHANGE THE LEAD/LAG SEQUENCE.

PRIMARY CHILLED WATER PUMP FAILURE:
IF THE LEAD START/STOP RELAY IS ENABLED AND THE CURRENT SWITCH STATUS IS OFF FOR MORE THAN 30 SECONDS (ADJ.), THE BAS CONTROLLER SHALL ANNUNCIATE A CHILLED WATER PUMP FAILURE ALARM TO THE BAS AND START THE NEXT PUMP IN THE SEQUENCE.

ONCE THE PROBLEM HAS BEEN CORRECTED, THE OPERATOR SHALL BE ABLE TO CLEAR THE ALARM FAILURE FROM THE BAS CONTROLLER USING TRACER TU, FROM A BAS OR BY MANUALLY OVERRIDING THE PUMP ON MOMENTARILY.
THIS SHALL RE-ENABLE THE LEAD/LAG SEQUENCE.

CHILLER ISOLATION VALVES:
CHILLER ISOLATION VALVES SHALL PREVENT THE FLOW OF WATER THROUGH NON-OPERATING CHILLERS. CHILLER CHILLED WATER PUMP OPERATION WILL BE COORDINATED WITH THE ISOLATION VALVE OPERATION. MODULATE VALVES AS REQUIRED TO MAINTAIN FLOW IN THE EVENT ONE CHILLER IS OFF AND ONE IS ON.

SECONDARY CHILLED WATER PUMP START/STOP:
THE BAS CONTROLLER SHALL START A SECONDARY CHILLED WATER PUMP THROUGH A CONTACT CLOSURE OF THE PUMPS VFD RUN-ENABLE CONTACTS.

SECONDARY CHILLED WATER PUMP STATUS:
THE BAS CONTROLLER SHALL DETECT SECONDARY CHILLED WATER PUMP RUN STATUS BY A VFD CURRENT SWITCH.

SECONDARY CHILLED WATER PUMP LEAD/LAG:
THE SECONDARY CHILLED WATER PUMP LEAD/LAG/STANDBY SEQUENCE SHALL BE BASED ON A WEEKLY SCHEDULE. FROM THE BAS WORKSTATION, AN OPERATOR SHALL BE ABLE TO MANUALLY CHANGE THE LEAD/LAG/STANDBY SEQUENCE.
IF THE CHILLED WATER SYSTEM DIFFERENTIAL PRESSURE FALLS
0.5 PSIG (ADJ.) BELOW SETPOINT AND THE LEAD PUMP IS AT 100% (ADJ.) FOR MORE THAN 5 MINUTES (ADJ.), THE NEXT PUMP IN THE SEQUENCE SHALL START. IF THE PUMP SPEED CONTROL OUTPUT IS BELOW 40% (ADJ.) FOR MORE THAN 5 MINUTES (ADJ.), THE LAST OPERATING PUMP IN THE SEQUENCE SHALL BE DISABLED.

SECONDARY CHILLED WATER PUMP FAILURE:
IF THE LEAD START/STOP RELAY IS ENABLED AND THE CURRENT SWITCH STATUS IS OFF FOR MORE THAN 30 SECONDS (ADJ.), THE BAS CONTROLLER SHALL ANNUNCIATE A SECONDARY CHILLED WATER PUMP FAILURE ALARM TO THE BAS AND START THE LAG PUMP. WHEN A SECONDARY CHILLED WATER PUMP FAILURE EXISTS, LEAD/LAG/ STANDBY AUTOMATION SHALL BE DISABLED AND THE CURRENTLY RUNNING PUMP BECOMES THE LEAD PUMP. ONCE THE PROBLEM HAS BEEN CORRECTED, THE OPERATOR SHALL BE ABLE TO CLEAR THE ALARM FAILURE FROM THE BAS CONTROLLER OR BAS WORKSTATION. THIS SHALL RE-ENABLE THE LEAD/LAG/STANDBY SEQUENCE.

SECONDARY CHILLED WATER PUMP SPEED:
THE BAS CONTROLLER SHALL MONITOR THE CHILLED WATER SYSTEM DIFFERENTIAL PRESSURE SENSOR. WHEN THE PUMP VARIABLE FREQUENCY DRIVE IS ENABLED, THE BAS CONTROLLER SHALL CONTROL THE ANALOG SPEED SIGNAL THAT IS SENT TO THE VARIABLE FREQUENCY DRIVES OF OPERATING PUMPS TO MAINTAIN A CHILLED WATER SYSTEM DIFFERENTIAL PRESSURE SETPOINT OF 15.0 PSIG (ADJ.).

SECONDARY CHILLED WATER AHU PUMP PRESSURE SETPOINT OPTIMIZATION:
THE BAS SHALL CONTINUALLY MONITOR THE CHILLED WATER CONTROL VALVE POSITION OF ALL AHUS IN THE CHILLED WATER SYSTEM. VALVE ACTUATOR AT AHU SHALL PROVIDE FEEDBACK TO
BAS.
AT CHILLED WATER SYSTEM STARTUP, THE CHILLED WATER SYSTEM PRESSURE SETPOINT SHALL BE 100% OF THE MAXIMUM PRESSURE SETPOINT. WHEN ALL CHILLED WATER VALVES ARE LESS THAN 85% OPEN, THE CHILLED WATER SYSTEM DIFFERENTIAL PRESSURE SETPOINT SHALL BE LOWERED BY 0.1 PSIG (ADJ.) OF THE CURRENT CHILLED WATER SYSTEM DIFFERENTIAL PRESSURE SETPOINT. THIS OCCURS EVERY 5 MINUTES UNTIL AT LEAST ONE VALVE IS MORE THAN 85% OPEN, OR IF THE SETPOINT IS EQUAL TO THE MINIMUM CHILLED WATER SYSTEM DIFFERENTIAL PRESSURE SETPOINT, OR IF THE PUMP VARIABLE FREQUENCY DRIVES ARE AT A MINIMUM SPEED SETTING (22 HZ).

WHEN ANY CHILLED WATER VALVE IS MORE THAN 95% OPEN, THE CHILLED WATER SYSTEM PRESSURE SETPOINT SHALL INCREASE BY 0.1 PSIG (ADJ.) OF THE CURRENT CHILLED WATER SYSTEM DIFFERENTIAL SETPOINT. THIS OCCURS EVERY 5 MINUTES UNTIL NO VALVE IS MORE THAN 95% OPEN, OR IF THE CHILLED WATER SYSTEM DIFFERENTIAL PRESSURE SETPOINT HAS RISEN TO THE SYSTEMS MAXIMUM SETTING, OR IF THE PUMP VARIABLE FREQUENCY DRIVES ARE AT THE MAXIMUM SETTING (60HZ).

NOTE: ALL POINTS TO BE ADJUSTABLE

CHILLED WATER SYSTEM UC600 - 1 FLOW - SYSTEM POINTS LIST

CONTROLLER: UC600	POINT TYPE							ALARMS								
SYSTEM POINT DESCRIPTION	GRAPHIC	HARDWARE INPUT	HARDWARE OUTPUT	SOFTWARE POINT	HARDWARE INTERLOCK	WIRELESS	NETWORK	DEFAULT VALUE	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SENSOR FAIL	COMMUNICATION FAIL	DIAGNOSTICS	NOTES
CHILLED WATER SETPOINT	X			X												
CHILLER 1 ENABLE/DISABLE	X		BO													
CHILLER 2 ENABLE/DISABLE	X		BO													
CHILLER 1 FAILURE	X	BI									X					
CHILLER 2 FAILURE	X	BI									X					
CHILLER 1 CHILLED WATER ISOLATION OPEN STATUS FEEDBACK	X	AI							X	X						NOTE 1
CHILLER 2 CHILLED WATER ISOLATION OPEN STATUS FEEDBACK	X	AI							X	X						NOTE 1
OUTDOOR AIR RELATIVE HUMIDITY LOCAL	X	AI											X		SENSOR FAILURE	NOTE 1, 2
OUTDOOR AIR TEMPERATURE LOCAL	X	AI											X		SENSOR FAILURE	NOTE 1, 2
BUILDING RETURN CHILLED WATER TEMPERATURE	X	AI							X	X						NOTE 1
BUILDING SUPPLY CHILLED WATER TEMPERATURE		AI														
CHILLER-1 RETURN CHILLED WATER TEMPERATURE		AI														
CHILLER-2 RETURN CHILLED WATER TEMPERATURE		AI														
CHILLER-1 SUPPLY CHILLED WATER TEMPERATURE		AI														
CHILLER-2 SUPPLY CHILLED WATER TEMPERATURE		AI														
SYSTEM CHILLED WATER DIFFERENTIAL PRESSURE SENSOR-1	X	AI							X	X						NOTE 1
SYSTEM CHILLED WATER DIFFERENTIAL PRESSURE SENSOR-2	X	AI							X	X						NOTE 1
KW		AI														
CAPACITY CONTROL		AO														
CHILLER 1 CHILLED WATER FLOW STATUS OPEN		BI														NOTE 1
CHILLER 2 CHILLED WATER FLOW STATUS OPEN		BI														NOTE 1
PRIMARY CHW PUMP-1 ENABLE/DISABLE		BI	BO													NOTE 1
PRIMARY CHW PUMP-2 ENABLE/DISABLE		BI	BO													NOTE 1
PRIMARY CHW PUMP-1 STATUS		AI	BO													NOTE 1
PRIMARY CHW PUMP-2 STATUS		AI														
PRIMARY CHW PUMP-1 SPEED		AI	AO													
PRIMARY CHW PUMP-2 SPEED		AI	AO													
SECONDARY CHW PUMP 1 ENABLE/DISABLE	X	BI									X				PUMP FAILURE	NOTE 1
SECONDARY CHW PUMP 2 ENABLE/DISABLE	X	BI									X				PUMP FAILURE	NOTE 1
SECONDARY CHW PUMP 1 STATUS		AI														
SECONDARY CHW PUMP 2 STATUS		AI														
SECONDARY CHW PUMP 1 VFD SPEED	X	AI	AO													NOTE 1
SECONDARY CHW PUMP 2 VFD SPEED	X	AI	AO													NOTE 1
BI-DIRECTIONAL FLOW METER	X	AI														
SECONDARY LOOP FLOW METER	X	AI														
CHILLER 1 EVAPORATOR ISOLATION VALVE OUTPUT	X		BO													
CHILLER 2 EVAPORATOR ISOLATION VALVE OUTPUT	X		BO													
SECONDARY CHILLED WATER PUMP 1 START STOP OUTPUT	X		BO													NOTE 1
SECONDARY CHILLED WATER PUMP 2 START STOP OUTPUT	X		BO													NOTE 1
CHILLER 1 FLOW	X			X												NOTE 3
CHILLER 2 FLOW	X			X												NOTE 3
CONTROLLER SPARE HARDWARE POINTS																
UNIVERSAL INPUT (S)		18														
ANALOG OUTPUT (S)			5													
BINARY OUTPUT (S)			6													
GENERAL NOTES																
	1. DISPLAYED AT THE BAS USER INTERFACE IF PRESENT															
	2. MAY BE A COMMUNICATED VALUE															
	3. CALCULATE CHILLER FLOW FROM DP ACROSS CHILLER															

1 M5.0 CHILLED WATER SYSTEM
1/8" = 1'-0"

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REVISIONS

ISSUE	DESCRIPTION	DATE
1	Revision 1	Date 1

05/25/18
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113121
LICENSED
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05/25/18

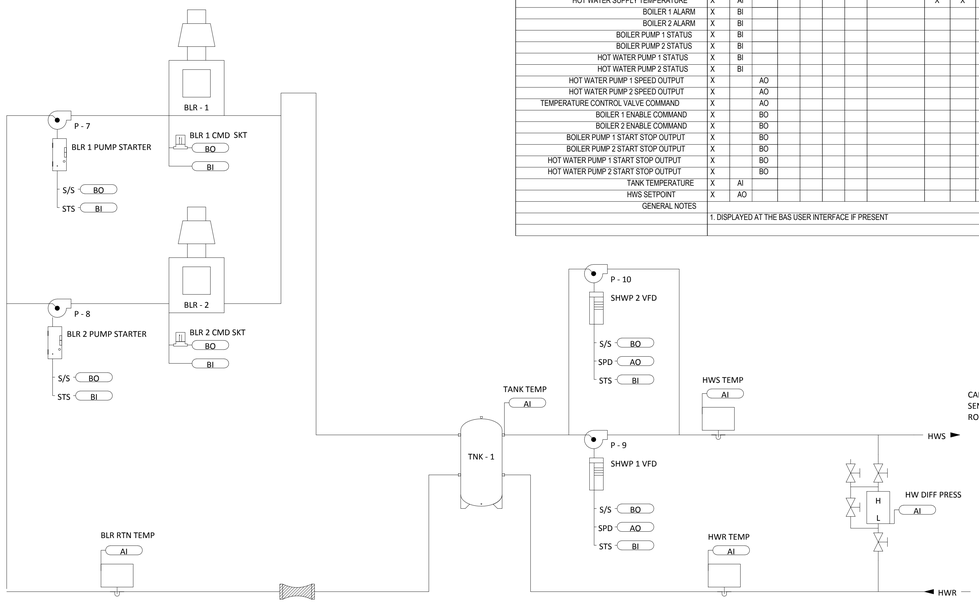
PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–861

MECHANICAL CONTROLS

SHEET NUMBER
M5.0

(UC600)

HW SYSTEM UC600 - 2 FLOW - SYSTEM POINTS LIST																	
CONTROLLER: UC600	POINT TYPE							ALARMS									
SYSTEM POINT DESCRIPTION	GRAPHIC	HARDWARE INPUT	HARWARE OUTPUT	SOFTWARE POINT	HARDWARE INTERLOCK	WIRELESS	NETWORK	DEFAULT VALUE	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SERSOR FAIL	COMMUNICATION FAIL	DIAGNOSTICS	NOTES
CO ALARM	X	BI							X				X		CO ALARM	
BOILER LOOP TEMPEARTURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	
HOT WATER DIFFERENTIAL PRESSURE	X	AI							X	X			X		SENSOR FAILURE	NOTE 1
HOT WATER RETURN TEMPERATURE	X	AI							X	X			X		SENSOR FAILURE	
HOT WATER SUPPLY TEMPERATURE	X	AI							X	X			X		SENSOR FAILURE	
BOILER 1 ALARM	X	BI									X				BOILER ALARM	
BOILER 2 ALARM	X	BI									X				BOILER ALARM	
BOILER PUMP 1 STATUS	X	BI									X	X				NOTE 1
BOILER PUMP 2 STATUS	X	BI									X	X				NOTE 1
HOT WATER PUMP 1 STATUS	X	BI									X					NOTE 1
HOT WATER PUMP 2 STATUS	X	BI									X					NOTE 1
HOT WATER PUMP 1 SPEED OUTPUT	X		AO													NOTE 1
HOT WATER PUMP 2 SPEED OUTPUT	X		AO													NOTE 1
TEMPERATURE CONTROL VALVE COMMAND	X		AO													
BOILER 1 ENABLE COMMAND	X		BO													NOTE 1
BOILER 2 ENABLE COMMAND	X		BO													
BOILER PUMP 1 START STOP OUTPUT	X		BO													NOTE 1
BOILER PUMP 2 START STOP OUTPUT	X		BO													
HOT WATER PUMP 1 START STOP OUTPUT	X		BO													NOTE 1
HOT WATER PUMP 2 START STOP OUTPUT	X		BO													NOTE 1
TANK TEMPERATURE	X	AI														
HWS SETPOINT	X	AO														NOTE 1
GENERAL NOTES	1. DISPLAYED AT THE BAS USER INTERFACE IF PRESENT															



NOTES
1. REFER TO PIPING DRAWINGS FOR ACTUAL PIPING LAYOUT
2. BOILERS AND PRIMARY PUMPS EXISTING EQUIPMENT AND TO REMAIN. CONTROLLERS AND CONTROL POINTS TO BE ADDED.

1 M5.1 HOT WATER SYSTEM
1/8" = 1'-0"

HEATING SYSTEM ENABLE/DISABLE:
THE HEATING SYSTEM SHALL BE ENABLED WHEN THE OUTSIDE AIR TEMPERATURE FALLS BELOW 60.0 DEG. F (ADJ.) OR ON A COMMAND FOR DEHUMIDIFICATION. WHEN ENABLED, THE BAS CONTROLLER SHALL START THE LEAD HOT WATER DISTRIBUTION PUMP, THE LEAD BOILER CIRCULATING PUMP, AND ENABLE THE LEAD BOILER. THE BOILER FACTORY CONTROL SHALL OPERATE THE BOILER TO MAINTAIN ITS LOCAL SUPPLY SETPOINT.

HEATING SHALL BE DISABLED WHEN THE OUTDOOR AIR TEMPERATURE IS ABOVE 65.0 DEG. F (ADJ.) AND THERE IS NO COMMAND FOR DEHUMIDIFICATION. WHEN HEATING IS DISABLED, THE HOT WATER PUMPS AND BOILERS SHALL BE COMMANDED TO OFF.

BOILER CONTROL:
THE BOILER LEAD/LAG SEQUENCE SHALL BE BASED ON A WEEKLY SCHEDULE. FROM THE BAS WORKSTATION, AN OPERATOR SHALL BE ABLE TO MANUALLY CHANGE THE LEAD/LAG SEQUENCE.

IF THE HOT WATER DISTRIBUTION SYSTEM SUPPLY TEMPERATURE FALLS MORE THAN 25.0 DEG. F (ADJ.) BELOW SETPOINT FOR A PERIOD LONGER THAN 15 MINUTES (ADJ.), OR IF AN ACTIVE BOILER SIGNALS A FAILURE ALARM, THE BAS CONTROLLER SHALL ENABLE THE LAG BOILER. IN ADDITION, THE BAS CONTROLLER SHALL SEND AN ALARM TO THE BAS WORKSTATION. WHEN A BOILER FAILURE EXISTS, LEAD/LAG AUTOMATION SHALL BE DISABLED AND THE CURRENTLY RUNNING BOILER SHALL BECOME THE LEAD BOILER. ONCE THE PROBLEM IS CORRECTED, THE OPERATOR SHALL BE ABLE TO CLEAR THE ALARM FAILURE FROM THE BAS CONTROLLER OR BAS WORKSTATION. THIS SHALL RE-ENABLE THE LEAD/LAG SEQUENCE.

ONCE THE LEAD BOILER IS ENABLED, THE ADD SEQUENCE OF ADDITIONAL BOILERS SHALL BE DISABLED FOR A PERIOD OF 30 MINUTES (ADJ.). ADDITIONAL BOILERS ARE ADDED IF THE HOT WATER DISTRIBUTION SYSTEM SUPPLY TEMPERATURE FALLS 5.0 DEG. F (ADJ.) BELOW THE HOT WATER SETPOINT FOR A PERIOD OF 10 MINUTES (ADJ.) OR MORE.

THE LAST BOILER ENABLED SHALL BE DISABLED WHEN THE HOT WATER TEMPERATURE RISES 5.0 DEG. F (ADJ.) ABOVE THE HOT WATER SETPOINT FOR A PERIOD OF 10 MINUTES (ADJ.) OR MORE. ADDITIONAL BOILERS SHALL BE DISABLED FOLLOWING THE SAME SUBTRACTION SEQUENCE IF THE HOT WATER TEMPERATURE REMAINS 5.0 DEG. F (ADJ.) ABOVE THE HOT WATER SETPOINT FOR A PERIOD OF 10 MINUTES (ADJ.) OR MORE.

HOT WATER TEMPERATURE VALVE CONTROL:
AFTER VERIFYING HOT WATER DISTRIBUTION LEAD PUMP RUN STATUS, THE HOT WATER TEMPERATURE CONTROL VALVE SHALL MODULATE TO MAINTAIN A HOT WATER SETPOINT ACCORDING TO THE HOT WATER RESET SCHEDULE.

HOT WATER RESET:
THE HOT WATER SUPPLY TEMPERATURE SETPOINT SHALL BE LINEARLY RESET FROM 160.0 DEG. F (ADJ.) TO 180.0 DEG. F (ADJ.) AS THE OUTSIDE AIR TEMPERATURE FALLS FROM 60.0 DEG. F (ADJ.) TO 0.0 DEG. F (ADJ.)

HOT WATER DISTRIBUTION PUMP START/STOP:
THE BAS CONTROLLER SHALL START A HOT WATER PUMP THROUGH A CONTACT CLOSURE OF THE PUMP'S VARIABLE FREQUENCY DRIVE (VFD) RUN-ENABLE CONTACTS.

HOT WATER DISTRIBUTION PUMP STATUS:
THE BAS CONTROLLER SHALL DETECT HOT WATER PUMP RUN STATUS BY A VFD CURRENT SWITCH.

HOT WATER DISTRIBUTION PUMP LEAD/LAG:
THE HOT WATER PUMP LEAD/LAG SEQUENCE SHALL BE BASED ON A WEEKLY SCHEDULE. FROM THE BAS CONTROLLER'S OPTIONAL TRACER™ TD7 COLOR TOUCH SCREEN DISPLAY OR A BAS WORKSTATION, AN OPERATOR SHALL BE ABLE TO MANUALLY CHANGE THE LEAD/LAG SEQUENCE.

IF THE LEAD PUMP SPEED FALLS BELOW 40% (ADJ.) FOR FIVE MINUTES (ADJ.) THE LAG PUMP SHALL BE DISABLED.

HOT WATER DISTRIBUTION PUMP FAILURE:
IF THE LEAD START/STOP RELAY IS ENABLED AND THE CURRENT SWITCH STATUS IS OFF FOR MORE THAN 30 SECONDS (ADJ.), THE BAS CONTROLLER SHALL ANNUNCIATE A HOT WATER PUMP FAILURE ALARM TO THE BAS WORKSTATION AND STARTS THE LAG PUMP. WHEN A PUMP FAILURE EXISTS, LEAD/LAG AUTOMATION SHALL BE DISABLED AND THE CURRENTLY RUNNING PUMP BECOMES THE LEAD PUMP. ONCE THE PROBLEM HAS BEEN CORRECTED, THE OPERATOR SHALL BE ABLE TO CLEAR THE ALARM FAILURE FROM THE BAS CONTROLLER OR BAS WORKSTATION. THIS ACTION SHALL RE-ENABLE THE LEAD/LAG SEQUENCE.

HOT WATER DISTRIBUTION PUMP SPEED:
THE BAS CONTROLLER SHALL MONITOR THE HOT WATER SYSTEM DIFFERENTIAL PRESSURE SENSOR. WHEN THE PUMP VFD IS ENABLED, THE BAS CONTROLLER SHALL CONTROL THE ANALOG SPEED SIGNAL SENT TO THE PUMP VFD TO MAINTAIN A HOT WATER DIFFERENTIAL PRESSURE SETPOINT OF 50.0 PSIG (ADJ.).

PUMP OPTIMIZATION:
THE BAS SHALL CONTINUALLY MONITOR THE HOT WATER CONTROL VALVE POSITION OF ALL AHU'S IN THE HOT WATER SYSTEM.

AT HOT WATER SYSTEM STARTUP, THE HOT WATER PRESSURE SETPOINT IS 100% OF THE MAXIMUM PRESSURE SETPOINT. WHEN ALL HOT WATER VALVES ARE LESS THAN 85% OPEN, THE HOT WATER DIFFERENTIAL PRESSURE SETPOINT SHALL BE LOWERED BY 0.1 PSIG (ADJ.) OF THE CURRENT HOT WATER DIFFERENTIAL PRESSURE SETPOINT. THIS OCCURS EVERY 5 MINUTES UNTIL AT LEAST ONE VALVE IS MORE THAN 85% OPEN, OR IF THE SETPOINT IS EQUAL TO THE MINIMUM HOT WATER DIFFERENTIAL PRESSURE SETPOINT, OR IF THE PUMP VFD'S ARE AT A MINIMUM SPEED SETTING (22 HZ).

WHEN ANY HOT WATER VALVE IS MORE THAN 95% OPEN, THE HOT WATER PRESSURE SETPOINT SHALL INCREASES BY 0.1 PSIG (ADJ.) OF THE CURRENT HOT WATER DIFFERENTIAL SETPOINT. THIS OCCURS EVERY 5 MINUTES UNTIL NO VALVE IS MORE THAN 95% OPEN, OR IF THE HOT WATER DIFFERENTIAL PRESSURE SETPOINT HAS RISEN TO THE SYSTEM'S MAXIMUM SETTING, OR IF THE PUMP VFD'S ARE AT THE MAXIMUM SETTING (60 HZ).

FREEZE PROTECTION:
WHEN THE OUTDOOR AIR TEMPERATURE FALLS BELOW 35.0 DEG. F (ADJ.), THE HOT WATER DISTRIBUTION PUMP SHALL OPERATE CONTINUOUSLY TO PROVIDE HOT WATER CIRCULATION TO ALL ASSOCIATED HOT WATER COILS. IF THE HOT WATER SUPPLY TEMPERATURE FALLS BELOW 160.0 DEG. F (ADJ.) DURING UNOCCUPIED PERIODS, THE BOILER SEQUENCE SHALL BE ENABLED TO SAFEGUARD AGAINST LOW WATER TEMPERATURE AND BOILER CONDENSATION.

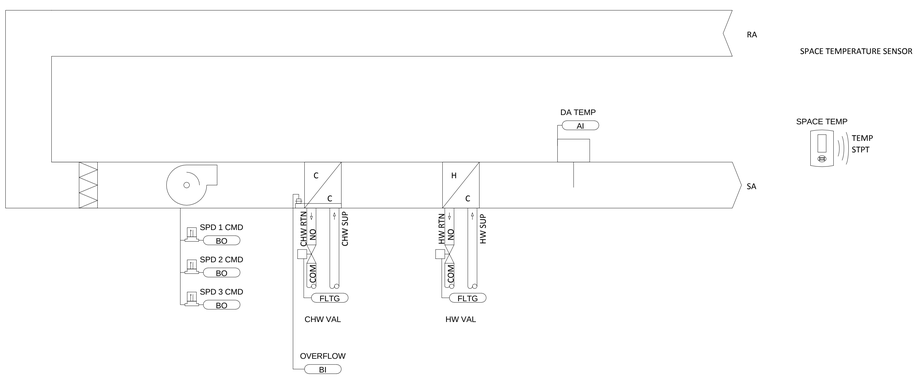
CO ALARM:
UPON DETECTION OF HIGH CO LEVELS AN ALARM SHALL BE SENT TO DDC AND BOILERS SHALL BE DISABLED

NOTE: ALL POINTS TO BE ADJUSTABLE

TYPICAL FOR 5 TYPES

FAN COIL UNIT (FCU-A, FCU-B, FCU-C, FCU-D, FCU-E)

REFER TO SCHEDULES



SEQUENCE OF OPERATIONS
FCU - A, FCU-B, FCU-C, FCU-D, AND FCU-E FLOW

BUILDING AUTOMATION SYSTEM INTERFACE:
THE BUILDING AUTOMATION SYSTEM (BAS) SHALL SEND THE CONTROLLER HEAT / COOL MODES. IF A BAS IS NOT PRESENT, OR COMMUNICATION IS LOST WITH THE BAS THE CONTROLLER SHALL OPERATE USING DEFAULT MODES AND SETPOINTS.

OCCUPIED MODE:
DURING OCCUPIED PERIODS THE SUPPLY FAN SHALL RUN CONTINUOUSLY. THE CHILLED WATER AND HOT WATER VALVE SHALL MODULATE TO MAINTAIN THE ACTIVE SPACE TEMPERATURE SETPOINT. USER SHALL HAVE ABILITY TO TURN SYSTEM ON/OFF. BAS SHALL HAVE ABILITY TO OVERRIDE LOCAL ON/OFF CONTROL.

SPACE TEMPERATURE CONTROL:
CASCADE ZONE CONTROL SHALL BE USED IN THE OCCUPIED MODES. IT MAINTAINS ZONE TEMPERATURE BY CONTROLLING THE DISCHARGE AIR TEMPERATURE TO CONTROL THE ZONE TEMPERATURE WHILE MINIMIZING THE FAN SPEED.

THE SPACE TEMPERATURE SHALL BE MAINTAINED BETWEEN THE OCCUPIED COOLING SETPOINT OF 75.0 DEG. F (ADJ.) AND AN ADJUSTABLE RANGE OF ±3 DEG. F

BAS SHALL BE ABLE TO OVERRIED LOCAL SETPOINT CONTROL.

CONDENSATE OVERFLOW MONITORING:
IF THE CONDENSATE LEVEL REACHES THE TRIP POINT, A CONDENSATE OVERFLOW DIAGNOSTIC SHALL BE ANNUNCIATED AT THE BAS. TO PREVENT THE CONDENSATE DRAIN PAN FROM OVERFLOWING AND CAUSING WATER DAMAGE TO THE BUILDING THE FAN SHALL BE DISABLED AND THE CHILLED WATER VALVE SHALL CLOSE.

FREEZE PROTECTION:
A HARDWIRED, LOW LIMIT TEMPERATURE SWITCH SHALL BE ELECTRICALLY INTERLOCKED WITH THE SAFETY CIRCUIT. IF THE LOW LIMIT TEMPERATURE SWITCH IS TRIPPED 38.0 DEG. F (ADJ.), THE SUPPLY FAN SHALL BE COMMANDED OFF, WATER VALVES SHALL OPEN TO 100%, OUTSIDE AIR DAMPER SHALL CLOSE, AND AN ALARM SHALL BE ANNUNCIATED AT THE BAS.

THE CONTROLLER SHALL AUTOMATICALLY ATTEMPT TO RESTART THE UNIT AFTER 30 MINUTES. IF THE UNIT RESTARTS SUCCESSFULLY WITH NO LOW TEMPERATURE CONDITION, THE DIAGNOSTIC IS CLEARED. IF A SECOND LOW TEMPERATURE CONDITION OCCURS WITHIN A 24 HOUR PERIOD THE UNIT SHALL BE LOCKED OUT UNTIL MANUALLY RESET.

NOTE: ALL POINTS SHALL BE ADJUSTABLE.

FCU-A, FCU-B, FCU-C, FCU-D, FCU-E UC400 - 1 FLOW - SYSTEM POINTS LIST																
CONTROLLER: UC400b TERMINAL UNIT	POINT TYPE							ALARMS								
SYSTEM POINT DESCRIPTION	GRAPHIC	HARDWARE INPUT	HARWARE OUTPUT	SOFTWARE POINT	HARDWARE INTERLOCK	WIRELESS	NETWORK	DEFAULT VALUE	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SERSOR FAIL	COMMUNICATION FAIL	DIAGNOSTICS	NOTES
DISCHARGE AIR TEMPERATURE LOCAL	X	AI							X	X			X			
SPACE TEMPERATURE LOCAL SETPOINT	X	AI				X										
SPACE TEMPERATURE LOCAL TEMPERATURE	X	AI				X										
CONDENSATE OVERFLOW DETECTION LOCAL	X	BI									X					
SUPPLY FAN OUTPUT 1	X		BO													
SUPPLY FAN OUTPUT 2	X		BO													
SUPPLY FAN OUTPUT 3	X		BO													
COOLING VALVE	X		FLTG													
HEATING VALVE	X		FLTG													
UNIT FAILURE ALARM	X			X												
OCCUPIED COOLING SETPOINT				X				74.0 deg. F								
OCCUPIED HEATING SETPOINT				X				70.0 deg. F								
OCCUPIED STANDBY COOLING SETPOINT				X				80.0 deg. F								
OCCUPIED STANDBY HEATING SETPOINT				X				65.0 deg. F								
UNOCCUPIED COOLING SETPOINT				X				85.0 deg. F								
UNOCCUPIED HEATING SETPOINT				X				60.0 deg. F								
OCCUPIED BYPASS TIMER				X				2 HRS								
DISCHARGE AIR TEMPERATURE CONTROL POINTS				X				45.0 deg. F-150.0 deg. F		38.0 deg. F						
BAS COMMUNICATION STATE	X			X										X		
MAINTENANCE REQUIRED				X				600 HRS							MAINTENANCE REQUIRED	
CONTROLLER SPARE HARDWARE POINTS																
ANALOG INPUT(S)		6														
BINARY INPUT(S)		4														
UNIVERSAL INPUT(S)		2														
BINARY OUTPUT(S)			4													
GENERAL NOTES																

2 M5.1 TYPICAL FCU CONTROL
1/8" = 1'-0"

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VICTORIA PLAZA MODERNIZATION-PHASE 1
411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
ISSUE	DESCRIPTION	DATE
1	Revision 1	Date 1

05/25/18

PERMIT SET

STATE OF TEXAS
MEHDI J. MIRMOMENI
113121
LICENSED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

MECHANICAL CONTROLS

SHEET NUMBER
M5.1

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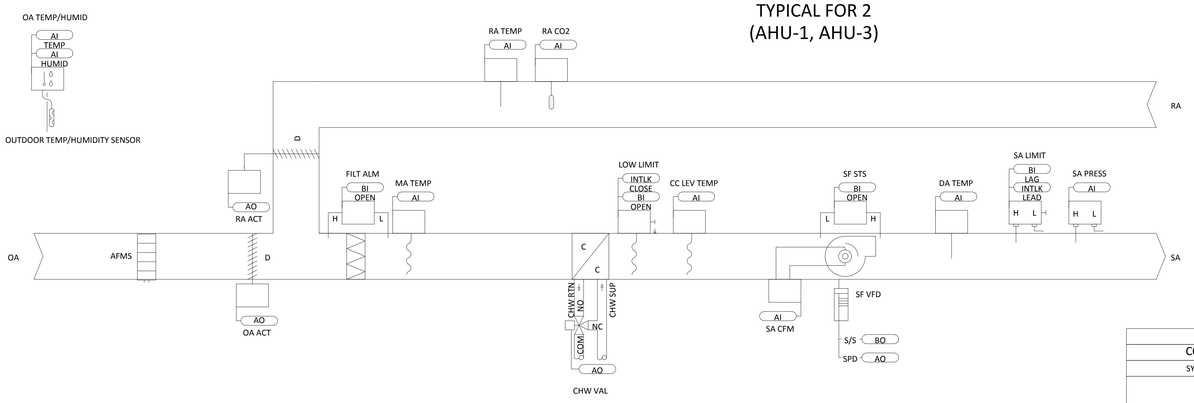
TYPICAL FOR 2
(AHU-1, AHU-3)



BUILDING AUTOMATION SYSTEM INTERFACE:
THE BUILDING AUTOMATION SYSTEM (BAS) SHALL SEND THE CONTROLLER OCCUPIED BYPASS, PRE-COOL, OCCUPIED/UNOCCUPIED AND HEAT/COOL MODES. THE BAS SHALL ALSO SEND THE DISCHARGE AIR TEMPERATURE SETPOINT AND THE DUCT STATIC PRESSURE SETPOINT. IF A BAS IS NOT PRESENT, OR COMMUNICATION IS LOST WITH THE BAS THE CONTROLLER SHALL OPERATE USING DEFAULT MODES AND SETPOINTS.
OCCUPIED:
DURING OCCUPIED PERIODS, THE SUPPLY FAN SHALL RUN CONTINUOUSLY AND THE OUTSIDE AIR DAMPER SHALL OPEN TO MAINTAIN MINIMUM VENTILATION REQUIREMENTS. THE CHILLED WATER VALVE SHALL MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT. IF THE DISCHARGE AIR TEMPERATURE SENSOR FAILS THE CHILLED WATER VALVE SHALL CLOSE AND AN ALARM SHALL BE ANNUNCIATED AT THE BAS.
UNOCCUPIED:
WHEN THE SPACE TEMPERATURE IS ABOVE THE UNOCCUPIED COOLING SETPOINT OF 85.0 DEG. F (ADJ.) THE SUPPLY FAN SHALL START, THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED AND THE CHILLED WATER VALVE SHALL OPEN. WHEN THE SPACE TEMPERATURE FALLS BELOW THE UNOCCUPIED COOLING SETPOINT OF 85.0 DEG. F (ADJ.) MINUS THE UNOCCUPIED DIFFERENTIAL OF 4.0 DEG. F (ADJ.) THE SUPPLY FAN SHALL STOP, THE CHILLED WATER VALVE SHALL CLOSE AND THE OUTSIDE AIR DAMPER SHALL CLOSE.
OPTIMAL START:
THE BAS SHALL MONITOR THE SCHEDULED OCCUPIED TIME, OCCUPIED SPACE SETPOINTS AND SPACE TEMPERATURE TO CALCULATE WHEN THE OPTIMAL START OCCURS.
PRE-COOL MODE:
DURING OPTIMAL START, IF THE AVERAGE SPACE TEMPERATURE IS ABOVE THE OCCUPIED COOLING SETPOINT, PRE-COOL MODE SHALL BE ACTIVATED. WHEN PRE-COOL IS INITIATED THE UNIT SHALL ENABLE THE FAN AND COOLING. THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED. WHEN THE SPACE TEMPERATURE REACHES OCCUPIED COOLING SETPOINT (ADJ.), THE UNIT SHALL TRANSITION TO THE OCCUPIED MODE.
OPTIMAL STOP:
THE BAS SHALL MONITOR THE SCHEDULED UNOCCUPIED TIME, OCCUPIED SETPOINTS AND SPACE TEMPERATURE TO CALCULATE WHEN THE OPTIMAL STOP OCCURS. WHEN THE OPTIMAL STOP MODE IS ACTIVE THE UNIT CONTROLLER SHALL MAINTAIN THE SPACE TEMPERATURE TO THE SPACE TEMPERATURE OFFSET SETPOINT. OUTSIDE AIR DAMPER SHALL REMAIN ENABLED TO PROVIDE MINIMUM VENTILATION.
OCCUPIED BYPASS:
THE BAS SHALL MONITOR THE STATUS OF THE "ON" AND "CANCEL" BUTTONS OF THE SPACE TEMPERATURE SENSORS. WHEN AN OCCUPIED BYPASS REQUEST IS RECEIVED FROM A SPACE SENSOR, THE UNIT SHALL TRANSITION FROM ITS CURRENT OCCUPANCY MODE TO OCCUPIED BYPASS MODE AND THE UNIT SHALL MAINTAIN THE SPACE TEMPERATURE TO THE OCCUPIED SETPOINTS (ADJ.).

SUPPLY FAN:
THE FAN SHALL BE OFF IN THE UNOCCUPIED MODE. WHEN THE UNIT CONTROLLER IS IN THE OCCUPIED MODE, THE SUPPLY FAN SHALL OPERATE CONTINUOUSLY AND ITS SPEED SHALL BE MODULATED TO MAINTAIN THE DUCT STATIC PRESSURE SETPOINT. THE DUCT STATIC PRESSURE SETPOINT SHALL BE SENT BY THE BAS AND IS RESET BETWEEN THE MINIMUM AND MAXIMUM STATIC PRESSURE LIMITS TO MAINTAIN THE CRITICAL ZONE VAV AIR DAMPER IN A POSITION BETWEEN 65% AND 75% OPEN.

IF THE SUPPLY FAN FAILS TO PROVE STATUS FOR 30 SECONDS (ADJ.), THE FAN SHALL BE COMMANDED OFF, THE OUTSIDE AIR DAMPER SHALL CLOSE, CHILLED WATER VALVE SHALL CLOSE AND AN ALARM SHALL BE ANNUNCIATED AT THE BAS. A MANUAL RESET SHALL BE REQUIRED TO RESTART THE FAN. A HARDWIRED, HIGH STATIC PRESSURE CUT-OFF SWITCH SHALL BE ELECTRICALLY INTERLOCKED WITH THE VARIABLE SPEED DRIVE. IF THE HIGH STATIC PRESSURE CUT-OFF SWITCH IS TRIPPED THE FAN SHALL STOP, THE OUTSIDE AIR DAMPER SHALL CLOSE, CHILLED WATER VALVE SHALL CLOSE AND AN ALARM SHALL BE ANNUNCIATED AT THE BAS. A MANUAL RESET OF THE HIGH STATIC PRESSURE CUT-OFF SWITCH SHALL BE REQUIRED TO RESTART THE FAN.

FREEZE PROTECTION:
A HARDWIRED, LOW LIMIT TEMPERATURE SWITCH SHALL BE ELECTRICALLY INTERLOCKED WITH THE VARIABLE SPEED DRIVE. IF THE LOW LIMIT TEMPERATURE SWITCH IS TRIPPED 38.0 DEG. F (ADJ.), THE OUTSIDE AIR DAMPER SHALL CLOSE, ALL VALVES SHALL OPEN TO 100% (ADJUST PER CLIMATE) AND AN ALARM SHALL BE ANNUNCIATED AT THE BAS. A MANUAL RESET OF THE LOW LIMIT TEMPERATURE SWITCH SHALL BE REQUIRED TO RESTART THE FAN.

FILTER STATUS:
A DIFFERENTIAL PRESSURE SWITCH SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FILTER WHEN THE FAN IS RUNNING. IF THE SWITCH CLOSES DURING NORMAL OPERATION A DIRTY FILTER ALARM SHALL BE ANNUNCIATED AT THE BAS.

NOTE: ALL POINTS TO BE ADJUSTABLE.

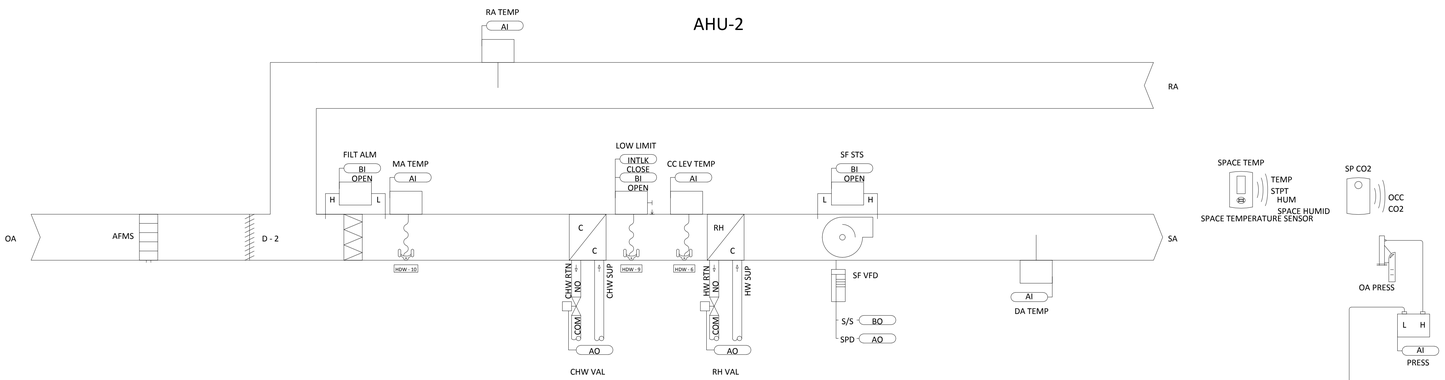
ECONOMIZER (AHU-3):
WHEN THE RETURN AIR RELATIVE HUMIDITY IS AT 55% OR LOWER AND THE OUTSIDE AIR TEMPERATURE IS BETWEEN 58°F AND 50°F (ADJ.), THE UNIT SHALL ENTER THE ECONOMIZER MODE. THE CHILLED WATER VALVE SHALL BE CLOSED AND THE OUTSIDE AIR DAMPER AND THE RETURN AIR DAMPER SHALL MODULATE TO MAINTAIN AN AIR TEMPERATURE OF 55°F (ADJ.) OFF THE UNIT DISCHARGE OR EQUAL TO THE DISCHARGE TEMPERATURE SET POINT. THE REVERSE SHALL HOLD TRUE. PROVIDE PID LOOP TO CONTROL BOTH OUTSIDE AIR AND RETURN AIR DAMPERS.

AHU - 1 & 3 UC600 - 3 FLOW - SYSTEM POINTS LIST

CONTROLLER: UC600	POINT TYPE						ALARMS								
SYSTEM POINT DESCRIPTION	GRAPHIC	HARDWARE INPUT	HARWARE OUTPUT	SOFTWARE POINT	HARDWARE INTERLOCK	WIRELESS	NETWORK	DEFAULT VALUE	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SERSOR FAIL	COMMUNICATION FAIL	DIAGNOSTICS	NOTES
COOLING COIL LEAVING TEMPERATURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	
DISCHARGE AIR TEMPERATURE	X	AI							X	X			X		SENSOR FAILURE	
DUCT STATIC PRESSURE LOCAL	X	AI														
MIXED AIR TEMPERATURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	
RETURN AIR CO2 LOCAL	X	AI							X			X			CO2 SENSOR FAILURE	
RETURN AIR TEMPERATURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	
SUPPLY FAN AIR FLOW LOCAL	X	AI														
DIRTY FILTER ALARM OPEN	X	BI										X			DIRTY FILTER	
HIGH STATIC ALARM	X	BI			X						X	X			DUCT STATIC PRESSURE HIGH LIMIT	NOTE 1, 2
MIXED AIR LOW TEMPERATURE CUTOUT ALARM OPEN	X	BI			X						X	X			LOW TEMP DETECT	NOTE 3
SUPPLY FAN STATUS OPEN	X	BI												X	STATUS FAILURE	
COOLING OUTPUT COMMAND	X		AO													
OUTDOOR AIR DAMPER COMMAND	X		AO													
SUPPLY FAN SPEED COMMAND	X		AO													
SUPPLY FAN START STOP COMMAND	X		BO													
OA DAMPER	X		AO													
RA DAMPER	X		AO													
CONTROLLER SPARE HARDWARE POINTS																
UNIVERSAL INPUT(S)		4														
ANALOG OUTPUT(S)			1													
BINARY OUTPUT(S)			3													
GENERAL NOTES																
	1. DISPLAYED AT THE BAS USER INTERFACE IF PRESENT															
	2. DEVICE IS HARDWIRE INTERLOCKED TO VFD, MANUAL RESET MAY BE REQUIRED															
	3. DEVICE IS HARDWIRE INTERLOCKED, MANUAL RESET MAY BE REQUIRED															

1 M5.2 AHU-1 & 3
1/8" = 1'-0"

AHU-2



BUILDING AUTOMATION SYSTEM INTERFACE:
THE BUILDING AUTOMATION SYSTEM (BAS) SHALL SEND THE CONTROLLER OCCUPIED BYPASS, MORNING WARM-UP/PRE-COOL, OCCUPIED/UNOCCUPIED AND HEAT/COOL MODES. IF A BAS IS NOT PRESENT, OR COMMUNICATION IS LOST WITH THE BAS THE CONTROLLER SHALL OPERATE USING DEFAULT MODES AND SETPOINTS .
OPTIMAL START:
THE BAS SHALL MONITOR THE SCHEDULED OCCUPIED TIME, OCCUPIED SPACE SETPOINTS AND SPACE TEMPERATURE TO CALCULATE WHEN THE OPTIMAL START OCCURS.
OCCUPIED BYPASS:
THE BAS SHALL MONITOR THE STATUS OF THE "ON" AND "CANCEL" BUTTONS OF THE SPACE TEMPERATURE SENSOR. WHEN AN OCCUPIED BYPASS REQUEST IS RECEIVED FROM A SPACE SENSOR, THE UNIT SHALL TRANSITION FROM ITS CURRENT OCCUPANCY MODE TO OCCUPIED BYPASS MODE AND THE UNIT SHALL MAINTAIN THE SPACE TEMPERATURE TO THE OCCUPIED SETPOINTS (ADJ.).
HEAT/COOL MODE:
WHEN THE SPACE TEMPERATURE RISES ABOVE THE OCCUPIED COOLING SETPOINT THE MODE SHALL TRANSITION TO COOLING. WHEN THE SPACE TEMPERATURE FALLS BELOW THE OCCUPIED HEATING SETPOINT THE MODE SHALL TRANSITION TO HEATING. WHEN THE SPACE TEMPERATURE IS ABOVE THE OCCUPIED COOLING SETPOINT OR BELOW THE OCCUPIED HEATING SETPOINT THE MODE SHALL REMAIN IN ITS LAST STATE. IF THE SPACE TEMPERATURE SENSOR FAILS THE MODE SHALL REMAIN IN ITS LAST STATE AND AN ALARM SHALL BE ANNUNCIATED AT THE BAS. IF THE LOCAL AND COMMUNICATED SETPOINTS FAIL THE CONTROLLER SHALL DISABLE THE SUPPLY FAN AND AN ALARM SHALL BE ANNUNCIATED AT THE BAS.

SUPPLY AIR TEMPERATURE RESET CONTROL:
ON A RISE IN SPACE TEMPERATURE (+2.0 DEG. F ADJ. OR GREATER) ABOVE THE SPACE COOLING SETPOINT (74.0 DEG. F ADJ.); THE SUPPLY FAN SPEED SHALL MODULATE FROM MINIMUM (50% ADJ.) TO MAXIMUM (OR DESIGN) AIR FLOW TO MAINTAIN SPACE COOLING TEMPERATURE SETPOINT WHILE KEEPING THE DISCHARGE AIR TEMPERATURE SETPOINT AT MINIMUM (55.0 DEG. F ADJ.).

AS SPACE TEMPERATURE DECREASES BELOW 76.0 DEG. F (SPACE COOLING SETPOINT 74.0 DEG. F + 2.0 DEG. F); THE FAN SPEED SHALL BE LOCKED AT MINIMUM AIR FLOW AND THE DISCHARGE AIR TEMPERATURE SETPOINT REMAINS AT MINIMUM.

WHEN SPACE TEMPERATURE DECREASES TO 75.0 DEG. F (COOLING SETPOINT OF 74.0 DEG. F ADJ. + 1.0 DEG. F) OR BELOW FOR A PERIOD OF TIME (DEFAULT 1 MIN. ADJ.); THE FAN SPEED SHALL REMAIN AT MINIMUM, THE DISCHARGE AIR TEMPERATURE SETPOINT REMAINS AT MINIMUM, AND CONTROL ENTERS INTO DISCHARGE AIR TEMPERATURE SETPOINT RESET MODE.

AS SPACE TEMPERATURE CONTINUES TO DROP BELOW 75.0 DEG. F (SPACE TEMPERATURE COOLING SETPOINT + 1.0 DEG. F); THE FAN SPEED SHALL REMAIN AT MINIMUM AND THE DISCHARGE AIR TEMPERATURE SETPOINT SHALL BE RESET FROM MINIMUM (55.0 DEG. F ADJ.) TO MAXIMUM (65.0 DEG. F ADJ.) AS SPACE TEMPERATURE DROPS FROM 75.0 DEG. F TO 74.0 DEG. F TO MAINTAIN THE SPACE COOLING TEMPERATURE SETPOINT.

ON A CONTINUED DROP OF SPACE TEMPERATURE BELOW THE SPACE COOLING TEMPERATURE SETPOINT (74.0 DEG. F ADJ.) THROUGH (71.0 DEG. F ADJ.) THE SPACE TEMPERATURE CONTROL SHALL BE WITHIN ITS DEADBAND; THE FAN SPEED REMAINS AT MINIMUM AND DISCHARGE AIR SETPOINT OF (65.0 DEG. F ADJ.) FOR COOLING. AS SPACE TEMPERATURE DECREASES TO THE HEATING SETPOINT (71.0 DEG. F ADJ.) THE CONTROL SHALL SWITCH TO THE HEATING DISCHARGE AIR TEMPERATURE RESET. IN THE HEATING MODE, THE MODULATING HEAT WILL BE ENABLED; THE SUPPLY FAN SHALL REMAIN AT MINIMUM AIR FLOW AND THE DISCHARGE AIR TEMPERATURE SETPOINT SHALL BE RESET FROM 70.0 DEG. F TO 90.0 DEG. F AS THE SPACE TEMPERATURE DROPS FROM 71.0 DEG. F TO 70.0 DEG. F.

AS SPACE TEMPERATURE CONTINUES TO DECREASE TO HEATING SETPOINT (71.0 DEG. F ADJ.) - 1.0 DEG. F; THE DISCHARGE AIR TEMPERATURE SETPOINT SHALL REMAIN AT MAXIMUM (90.0 DEG. F ADJ.), THE FAN SHALL BE MODULATED FROM MINIMUM TO MAXIMUM AIR FLOW TO MAINTAIN THE SPACE TEMPERATURE HEATING SETPOINT.

WHEN THE SPACE TEMPERATURE INCREASES THE REVERSE CONTROL SHALL BE IMPLEMENTED.

OCCUPIED HUMIDITY CONTROL:
IF THE SPACE RELATIVE HUMIDITY IS GREATER THAN 50% (ADJ.), THE CHILLED WATER VALVE SHALL MODULATE TO MAINTAIN SPACE RELATIVE HUMIDITY SETPOINT OF 50% (ADJ.) AND THE REHEAT VALVE SHALL MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT. MODE SHALL TERMINATE WHEN THE SPACE RELATIVE HUMIDITY FALLS BELOW THE RELATIVE HUMIDITY SETPOINT OF 50% (ADJ.) MINUS 3% (ADJ.). IF THE SPACE RELATIVE HUMIDITY SENSOR FAILS THE DEHUMIDIFICATION SEQUENCE SHALL BE TERMINATED AND AN ALARM SHALL BE ANNUNCIATED AT THE BAS.
SUPPLY FAN:
THE SUPPLY FAN SHALL BE ENABLED WHILE IN THE OCCUPIED MODE AND CYCLED ON DURING THE UNOCCUPIED MODE. THE UNIT CONTROLLER SHALL VARY THE SUPPLY FAN SPEED TO OPTIMIZE MINIMUM FAN SPEED IN ALL COOLING AND HEATING MODES. A DIFFERENTIAL PRESSURE SWITCH SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FAN. IF THE SWITCH DOES NOT OPEN WITHIN 30 SECONDS AFTER A REQUEST FOR FAN OPERATION A FAN FAILURE ALARM SHALL BE ANNUNCIATED, THE UNIT SHALL STOP, REQUIRING A MANUAL RESET.

FREEZE PROTECTION:
A HARDWIRED, LOW LIMIT TEMPERATURE SWITCH SHALL BE ELECTRICALLY INTERLOCKED WITH THE VARIABLE SPEED DRIVE. IF THE LOW LIMIT TEMPERATURE SWITCH IS TRIPPED 38.0 DEG. F (ADJ.), THE OUTSIDE AIR DAMPER SHALL CLOSE, ALL VALVES SHALL OPEN TO 100% (ADJUST PER CLIMATE) AND AN ALARM SHALL BE ANNUNCIATED AT THE BAS. A MANUAL RESET OF THE LOW LIMIT TEMPERATURE SWITCH SHALL BE REQUIRED TO RESTART THE FAN.

FILTER STATUS:
A DIFFERENTIAL PRESSURE SWITCH SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FILTER WHEN THE FAN IS RUNNING. IF THE SWITCH CLOSES DURING NORMAL OPERATION A DIRTY FILTER ALARM SHALL BE ANNUNCIATED AT THE BAS.

NOTE: ALL POINTS TO BE ADJUSTABLE.

AHU - 2 UC600 - 4 FLOW - SYSTEM POINTS LIST

CONTROLLER: UC600	POINT TYPE						ALARMS								
SYSTEM POINT DESCRIPTION	GRAPHIC	HARDWARE INPUT	HARWARE OUTPUT	SOFTWARE POINT	HARDWARE INTERLOCK	WIRELESS	NETWORK	DEFAULT VALUE	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SERSOR FAIL	COMMUNICATION FAIL	DIAGNOSTICS	NOTES
COOLING COIL LEAVING TEMPERATURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	NOTE 1
DISCHARGE AIR TEMPERATURE	X	AI							X	X			X		SENSOR FAILURE	
MIXED AIR TEMPERATURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	
OCCUPANCY INPUT	X	AI				X										NOTE 1
RETURN AIR TEMPERATURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	
SPACE CO2 CONCENTRATION LOCAL	X	AI				X			X	X						NOTE 1
SPACE HUMIDITY LOCAL	X	AI				X										NOTE 1
SPACE STATIC PRESSURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	
SPACE TEMPERATURE LOCAL	X	AI				X			X	X			X	X		NOTE 1
SPACE TEMPERATURE SETPOINT LOCAL	X	AI				X										NOTE 1, 2
DIRTY FILTER ALARM OPEN	X	BI										X			DIRTY FILTER	
MIXED AIR LOW TEMPERATURE CUTOUT ALARM OPEN	X	BI			X						X	X			LOW TEMP DETECT	NOTE 3
SUPPLY FAN STATUS OPEN	X	BI												X	STATUS FAILURE	
COOLING OUTPUT COMMAND	X		AO													
HEATING OUTPUT COMMAND	X		AO													
SUPPLY FAN SPEED COMMAND	X		AO													
SUPPLY FAN START STOP COMMAND	X		BO													
OUTSIDE AIR FLOW MONITORING STATION	X	AI														
OUTSIDE AIR TEMPERATURE LOCAL	X	AI							X	X			X		SENSOR FAILURE	
CONTROLLER SPARE HARDWARE POINTS																
ANALOG INPUT(S)		1														
UNIVERSAL INPUT(S)		13														
ANALOG OUTPUT(S)			6													
BINARY OUTPUT(S)			3													
GENERAL NOTES																
	1. DISPLAYED AT THE BAS USER INTERFACE IF PRESENT															
	2. OPTIONAL FEATURE (SETPOINT)															
	3. DEVICE IS HARDWIRE INTERLOCKED, MANUAL RESET MAY BE REQUIRED															

2 M5.2 AHU-2
N.T.S.

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REVISIONS

ISSUE	DESCRIPTION	DATE

05/25/18
PERMIT SET

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

MECHANICAL CONTROLS

SHEET NUMBER
M5.2

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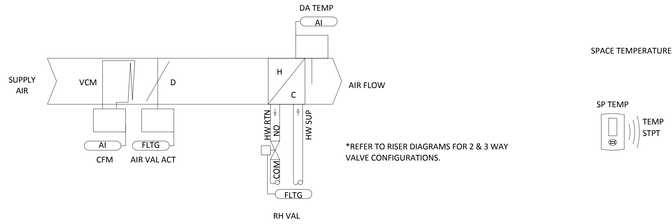
TYPICAL FOR 8
HOT WATER REHEAT VAV



*REFER TO RISER DIAGRAMS FOR 2 & 3 WAY VALVE CONFIGURATIONS.

BUILDING AUTOMATION SYSTEM INTERFACE:
THE BUILDING AUTOMATION SYSTEM (BAS) SHALL SEND THE CONTROLLER OCCUPIED AND UNOCCUPIED COMMANDS. THE BAS MAY ALSO SEND A HEAT/COOL MODE, PRIORITY SHUTDOWN COMMANDS, SPACE TEMPERATURE AND/OR SPACE TEMPERATURE SETPOINT. IF COMMUNICATION IS LOST WITH THE BAS, THE VAV CONTROLLER SHALL OPERATE USING ITS LOCAL SETPOINTS.

OCCUPANCY MODE:
THE OCCUPANCY MODE SHALL BE COMMUNICATED OR HARDWIRED TO THE CONTROLLER VIA A BINARY INPUT. VALID OCCUPANCY MODES FOR THE UNIT SHALL BE:

OCCUPIED:
NORMAL OPERATING MODE FOR OCCUPIED SPACES OR DAYTIME OPERATION. WHEN THE UNIT IS IN THE OCCUPIED MODE THE VAV SHALL MAINTAIN THE SPACE TEMPERATURE AT THE ACTIVE OCCUPIED HEATING OR COOLING SETPOINT. APPLICABLE VENTILATION AND AIRFLOW SETPOINTS SHALL BE ENFORCED. THE OCCUPIED MODE SHALL BE THE DEFAULT MODE OF THE VAV.

UNOCCUPIED:
NORMAL OPERATING MODE FOR UNOCCUPIED SPACES OR NIGHTTIME OPERATION . WHEN THE UNIT IS IN UNOCCUPIED MODE THE VAV CONTROLLER SHALL MAINTAIN THE SPACE TEMPERATURE AT THE STORED UNOCCUPIED HEATING OR COOLING SETPOINT REGARDLESS OF THE PRESENCE OF A HARDWIRED OR COMMUNICATED SETPOINT. WHEN THE SPACE TEMPERATURE EXCEEDS THE ACTIVE UNOCCUPIED SETPOINT THE VAV SHALL MODULATE FULLY CLOSED.

OCCUPIED BYPASS:
MODE USED TO TEMPORARILY PLACE THE UNIT INTO THE OCCUPIED OPERATION. TENANTS SHALL BE ABLE TO OVERRIDE THE UNOCCUPIED MODE FROM THE SPACE SENSOR. THE OVERRIDE SHALL LAST FOR A MAXIMUM OF 4 HOURS (ADJ.). THE TENANTS SHALL BE ABLE TO CANCEL THE OVERRIDE FROM THE SPACE SENSOR AT ANY TIME. DURING THE OVERRIDE THE UNIT SHALL OPERATE IN OCCUPIED MODE.

HEAT/COOL MODE:
THE HEAT/COOL MODE SHALL BE SET BY A COMMUNICATED VALUE OR AUTOMATICALLY BY THE VAV. IN STANDALONE OR AUTO MODE THE VAV SHALL COMPARE THE PRIMARY AIR TEMPERATURE WITH THE CONFIGURED AUTO CHANGEOVER SETPOINT TO DETERMINE IF THE AIR IS "HOT" OR "COLD". HEATING MODE IT IMPLIES THE PRIMARY AIR TEMPERATURE IS HOT. COOLING MODE IT IMPLIES THE PRIMARY AIR TEMPERATURE IS COLD.

HEAT/COOL SETPOINT:
THE SPACE TEMPERATURE SETPOINT SHALL BE DETERMINED EITHER BY A LOCAL (E.G., THUMBWHEEL) SETPOINT, THE VAV DEFAULT SETPOINT OR A COMMUNICATED VALUE. THE VAV SHALL USE THE LOCALLY STORED DEFAULT SETPOINTS WHEN NEITHER A LOCAL SETPOINT NOR COMMUNICATED SETPOINT IS PRESENT. IF BOTH A LOCAL SETPOINT AND COMMUNICATED SETPOINT EXIST, THE VAV SHALL USE THE COMMUNICATED VALUE.

COOLING MODE:
WHEN THE UNIT IS IN COOLING MODE, THE VAV CONTROLLER SHALL MAINTAIN THE SPACE TEMPERATURE AT THE ACTIVE COOLING SETPOINT BY MODULATING THE AIRFLOW BETWEEN THE ACTIVE COOLING MINIMUM AIRFLOW SETPOINT TO THE MAXIMUM COOLING AIRFLOW SETPOINT. BASED ON THE VAV CONTROLLER OCCUPANCY MODE, THE ACTIVE COOLING SETPOINT SHALL BE ONE OF THE FOLLOWING:

SETPOINT	DEFAULT VALUE
OCCUPIED COOLING SETPOINT	74.0 DEG. F
UNOCCUPIED COOLING SETPOINT	85.0 DEG. F
OCCUPIED STANDBY COOLING SETPOINT	78.0 DEG. F
OCCUPIED MIN COOLING AIRFLOW SETPOINT	SEE VAV SCHEDULE
OCCUPIED MAX COOLING AIRFLOW SETPOINT	SEE VAV SCHEDULE

THE VAV SHALL USE THE MEASURED SPACE TEMPERATURE AND THE ACTIVE COOLING SETPOINT TO DETERMINE THE REQUESTED COOLING CAPACITY OF THE UNIT. THE OUTPUTS WILL BE CONTROLLED BASED ON THE UNIT CONFIGURATION AND THE REQUESTED COOLING CAPACITY.

HEATING MODE:
WHEN THE UNIT IS IN HEATING MODE, THE VAV CONTROLLER SHALL MAINTAIN THE SPACE TEMPERATURE AT THE ACTIVE HEATING SETPOINT BY MODULATING THE AIRFLOW BETWEEN THE ACTIVE HEATING MINIMUM AIRFLOW SETPOINT TO THE MAXIMUM HEATING AIRFLOW SETPOINT. BASED ON THE VAV CONTROLLER OCCUPANCY MODE, THE ACTIVE HEATING SETPOINT SHALL BE ONE OF THE FOLLOWING:

SETPOINT	DEFAULT VALUE
OCCUPIED HEATING SETPOINT	71.0 DEG. F
UNOCCUPIED HEATING SETPOINT	60.0 DEG. F
OCCUPIED STANDBY HEATING SETPOINT	67.0 DEG. F
OCCUPIED MIN HEATING AIRFLOW SETPOINT	SEE VAV SCHEDULE
OCCUPIED MAX HEATING AIRFLOW SETPOINT	SEE VAV SCHEDULE

THE VAV CONTROLLER SHALL USE THE MEASURED SPACE TEMPERATURE AND THE ACTIVE HEATING SETPOINT TO DETERMINE THE REQUESTED HEATING CAPACITY. THE UNIT. THE OUTPUTS WILL BE CONTROLLED BASED ON THE UNIT CONFIGURATION AND THE REQUESTED HEATING CAPACITY.

REHEAT CONTROL:
REHEAT WILL ONLY BE ALLOWED WHEN THE PRIMARY AIR TEMPERATURE IS 5.0 DEG. F BELOW THE CONFIGURED REHEAT ENABLE SETPOINT OF 70.0 DEG. F (ADJ.). THE REHEAT SHALL BE ENABLED WHEN THE SPACE TEMPERATURE DROPS BELOW THE ACTIVE HEATING SETPOINT AND THE MINIMUM AIRFLOW REQUIREMENTS ARE MET. DURING REHEAT THE VAV SHALL OPERATE AT ITS MINIMUM HEATING AIRFLOW SETPOINT AND ENERGIZE THE HEAT AS FOLLOWS:

PROPORTIONAL HOT WATER REHEAT:
IF THE SPACE TEMPERATURE IS BELOW THE HEATING SETPOINT THE HOT WATER REHEAT VALVE SHALL MODULATE AS REQUIRED TO MAINTAIN THE ACTIVE HEATING SETPOINT.

VENTILATION CONTROL (CO2):
WHEN THE UNIT IS IN UNOCCUPIED MODE, THE VENTILATION AIRFLOW SETPOINT WILL BE ZERO. WHEN THE UNIT IS IN OCCUPIED MODE, THE VENTILATION AIRFLOW SETPOINT WILL EQUAL THE DESIGN OUTDOOR AIRFLOW (SEE VAV SCHEDULE).

CO2 SENSOR
WHEN THE UNIT IS IN OCCUPIED MODE, THE VENTILATION AIRFLOW SETPOINT WILL BE CONTINUOUSLY CALCULATED USING THE MEASURED CO2 CONCENTRATION IN THE SPACE.

THE CURRENT VENTILATION AIRFLOW SETPOINT SHALL BE COMMUNICATED TO THE BAS FOR CONTROL OF THE SYSTEM OUTDOOR-AIR INTAKE.

SPACE SENSOR FAILURE:
IF THERE IS A FAULT WITH THE OPERATION OF THE ZONE SENSOR AN ALARM SHALL BE ANNUNCIATED AT THE BAS. SPACE SENSOR FAILURE SHALL CAUSE THE VAV TO DRIVE THE DAMPER TO MINIMUM AIR FLOW IF THE VAV IS IN THE OCCUPIED MODE, OR DRIVE IT CLOSED IF THE VAV IS IN THE UNOCCUPIED MODE.

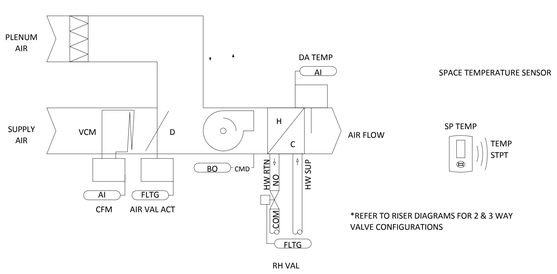
NOTE: ALL POINTS TO BE ADJUSTABLE.

V V 2 ~ 3 UC210 - 1 FLOW - SYSTEM POINTS LIST

CONTROLLER: UC210 VAV	POINT TYPE							ALARMS							
SYSTEM POINT DESCRIPTION	GRAPHIC	HARDWARE INPUT	HARDWARE OUTPUT	SOFTWARE POINT	HARDWARE INTERLOCK	WIRELESS	NETWORK	DEFAULT VALUE	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SERSOR FAIL	COMMUNICATION FAIL	DIAGNOSTICS	NOTES
DISCHARGE AIR TEMPERATURE	X	AI							X	X			X			
SPACE TEMPERATURE LOCAL	X	AI				X										NOTE 1
SPACE TEMPERATURE SETPOINT LOCAL	X	AI				X										NOTE 1, 2
SUPPLY V AIRFLOW	X	AI														NOTE 1
AIR VALVE DRIVE COMMAND	X		FLTG													
HEATING VALVE COMMAND	X		FLTG													
OCCUPIED HEATING SETPOINT				X				71.0 deg. F	X	X						
OCCUPIED STANDBY HEATING SETPOINT				X				67.0 deg. F	X	X						
UNOCCUPIED HEATING SETPOINT				X				60.0 deg. F								
MINIMUM HEATING AIRFLOW SETPOINT				X												NOTE 3
MAXIMUM HEATING AIRFLOW SETPOINT				X												NOTE 3
CONTROLLER SPARE HARDWARE POINTS																
ANALOG INPUT (S)		2														
BINARY INPUT (S)		1														
UNIVERSAL INPUT (S)		2														
ANALOG OUTPUT (S)			2													
BINARY OUTPUT (S)			1													
GENERAL NOTES																
	1. DISPLAYED AT THE BAS USER INTERFACE IF PRESENT															
	2. OPTIONAL FEATURE															
	3. SEE VAV SCHEDULE FOR VALUES															

1 M5.3 SDVAV WITH HOT WATER REHEAT
1/8" = 1'-0"

TYPICAL FOR 15
FAN POWERED BOX



*REFER TO RISER DIAGRAMS FOR 2 & 3 WAY VALVE CONFIGURATIONS

VV 3 ~ 4 UC400 - 6 FLOW - SYSTEM POINTS LIST

CONTROLLER: UC400 VAV	POINT TYPE							ALARMS							
SYSTEM POINT DESCRIPTION	GRAPHIC	HARDWARE INPUT	HARDWARE OUTPUT	SOFTWARE POINT	HARDWARE INTERLOCK	WIRELESS	NETWORK	DEFAULT VALUE	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	BINARY	LATCH DIAGNOSTIC	SERSOR FAIL	COMMUNICATION FAIL	DIAGNOSTICS	NOTES
DISCHARGE AIR TEMPERATURE	X	AI							X	X			X			
SPACE TEMPERATURE LOCAL	X	AI				X										NOTE 1
SPACE TEMPERATURE SETPOINT LOCAL	X	AI				X										NOTE 1, 2
SUPPLY AIRFLOW	X	AI														NOTE 1
FAN OUTPUT	X		BO													
AIR VALVE DRIVE COMMAND	X		FLTG													NOTE 1
HEATING VALVE COMMAND	X		FLTG													
OCCUPIED HEATING SETPOINT				X				71.0 deg. F	X	X						
OCCUPIED STANDBY HEATING SETPOINT				X				67.0 deg. F	X	X						
UNOCCUPIED HEATING SETPOINT				X				60.0 deg. F								
MINIMUM HEATING AIRFLOW SETPOINT				X												NOTE 3
MAXIMUM HEATING AIRFLOW SETPOINT				X												NOTE 3
CONTROLLER SPARE HARDWARE POINTS																
ANALOG INPUT (S)		5														
BINARY INPUT (S)		3														
UNIVERSAL INPUT (S)		2														
ANALOG OUTPUT (S)			2													
BINARY OUTPUT (S)			4													
GENERAL NOTES																
	1. DISPLAYED AT THE BAS USER INTERFACE IF PRESENT															
	2. OPTIONAL FEATURE															
	3. SEE VAV SCHEDULE FOR VALUES															

BUILDING AUTOMATION SYSTEM INTERFACE:
THE BUILDING AUTOMATION SYSTEM (BAS) SHALL SEND THE CONTROLLER OCCUPIED AND UNOCCUPIED COMMANDS. THE BAS MAY ALSO SEND A HEAT/COOL MODE, PRIORITY SHUTDOWN COMMANDS, SPACE TEMPERATURE AND/OR SPACE TEMPERATURE SETPOINT. IF COMMUNICATION IS LOST WITH THE BAS, THE VAV CONTROLLER SHALL OPERATE USING ITS LOCAL SETPOINTS.

OCCUPANCY MODE:
THE OCCUPANCY MODE SHALL BE COMMUNICATED OR HARDWIRED TO THE CONTROLLER VIA A BINARY INPUT. VALID OCCUPANCY MODES FOR THE UNIT SHALL BE:

OCCUPIED:
NORMAL OPERATING MODE FOR OCCUPIED SPACES OR DAYTIME OPERATION WHEN THE UNIT IS IN THE OCCUPIED MODE THE VAV SHALL MAINTAIN THE SPACE TEMPERATURE AT THE ACTIVE OCCUPIED HEATING OR COOLING SETPOINT. APPLICABLE VENTILATION AND AIRFLOW SETPOINTS SHALL BE ENFORCED. THE OCCUPIED MODE SHALL BE THE DEFAULT MODE OF THE VAV.

UNOCCUPIED:
NORMAL OPERATING MODE FOR UNOCCUPIED SPACES OR NIGHTTIME OPERATION . WHEN THE UNIT IS IN UNOCCUPIED MODE THE VAV CONTROLLER SHALL MAINTAIN THE SPACE TEMPERATURE AT THE STORED UNOCCUPIED HEATING OR COOLING SETPOINT REGARDLESS OF THE PRESENCE OF A HARDWIRED OR COMMUNICATED SETPOINT. WHEN THE SPACE TEMPERATURE EXCEEDS THE ACTIVE UNOCCUPIED SETPOINT THE VAV SHALL MODULATE FULLY CLOSED.

OCCUPIED BYPASS:
MODE USED TO TEMPORARILY PLACE THE UNIT INTO THE OCCUPIED OPERATION . TENANTS SHALL BE ABLE TO OVERRIDE THE UNOCCUPIED MODE FROM THE SPACE SENSOR. THE OVERRIDE SHALL LAST FOR A MAXIMUM OF 4 HOURS (ADJ.). THE TENANTS SHALL BE ABLE TO CANCEL THE OVERRIDE FROM THE SPACE SENSOR AT ANY TIME. DURING THE OVERRIDE THE UNIT SHALL OPERATE IN OCCUPIED MODE.

HEAT/COOL MODE:
THE HEAT/COOL MODE SHALL BE SET BY A COMMUNICATED VALUE OR AUTOMATICALLY BY THE VAV. IN STANDALONE OR AUTO MODE THE VAV SHALL COMPARE THE PRIMARY AIR TEMPERATURE WITH THE CONFIGURED AUTO CHANGEOVER SETPOINT TO DETERMINE IF THE AIR IS "HOT" OR "COLD". HEATING MODE IT IMPLIES THE PRIMARY AIR TEMPERATURE IS HOT. COOLING MODE IT IMPLIES THE PRIMARY AIR TEMPERATURE IS COLD.

HEAT/COOL SETPOINT:
THE SPACE TEMPERATURE SETPOINT SHALL BE DETERMINED EITHER BY A LOCAL (E.G., THUMBWHEEL) SETPOINT, THE VAV DEFAULT SETPOINT OR A COMMUNICATED VALUE. THE VAV SHALL USE THE LOCALLY STORED DEFAULT SETPOINTS WHEN NEITHER A LOCAL SETPOINT NOR COMMUNICATED SETPOINT IS PRESENT. IF BOTH A LOCAL SETPOINT AND COMMUNICATED SETPOINT EXIST, THE VAV SHALL USE THE COMMUNICATED VALUE.

REHEAT CONTROL:
REHEAT WILL ONLY BE ALLOWED WHEN THE PRIMARY AIR TEMPERATURE IS 5.0 DEG. F BELOW THE CONFIGURED REHEAT ENABLE SETPOINT OF 70.0 DEG. F (ADJ.). THE REHEAT SHALL BE ENABLED WHEN THE SPACE TEMPERATURE DROPS BELOW THE ACTIVE HEATING SETPOINT AND THE MINIMUM AIRFLOW REQUIREMENTS ARE MET. DURING REHEAT THE VAV SHALL OPERATE AT ITS MINIMUM HEATING AIRFLOW SETPOINT AND ENERGIZE THE HEAT AS FOLLOWS:

PROPORTIONAL HOT WATER REHEAT:
IF THE SPACE TEMPERATURE IS BELOW THE HEATING SETPOINT THE HOT WATER REHEAT VALVE SHALL MODULATE AS REQUIRED TO MAINTAIN THE ACTIVE HEATING SETPOINT.

HEATING MODE:
WHEN THE UNIT IS IN HEATING MODE, THE VAV CONTROLLER SHALL MAINTAIN THE SPACE TEMPERATURE AT THE ACTIVE HEATING SETPOINT BY MODULATING THE AIRFLOW BETWEEN THE ACTIVE HEATING MINIMUM AIRFLOW SETPOINT TO THE MAXIMUM HEATING AIRFLOW SETPOINT. BASED ON THE VAV CONTROLLER OCCUPANCY MODE, THE ACTIVE HEATING SETPOINT SHALL BE ONE OF THE FOLLOWING:

SETPOINT	DEFAULT VALUE
OCCUPIED HEATING SETPOINT	71.0 DEG. F
UNOCCUPIED HEATING SETPOINT	60.0 DEG. F
OCCUPIED STANDBY HEATING SETPOINT	67.0 DEG. F
OCCUPIED MIN HEATING AIRFLOW SETPOINT	SEE VAV SCHEDULE
OCCUPIED MAX HEATING AIRFLOW SETPOINT	SEE VAV SCHEDULE

THE VAV CONTROLLER SHALL USE THE MEASURED SPACE TEMPERATURE AND THE ACTIVE HEATING SETPOINT TO DETERMINE THE REQUESTED HEATING CAPACITY OF THE UNIT. THE OUTPUTS WILL BE CONTROLLED BASED ON THE UNIT CONFIGURATION AND THE REQUESTED HEATING CAPACITY.

CONTINUOUS FAN CONTROL:
THE VAV FAN SHALL OPERATE CONTINUOUSLY IN ALL OCCUPIED MODES. DURING THE UNOCCUPIED MODE, THE PRIMARY AIR VALVE SHALL MODULATE FULLY CLOSED. THE TERMINAL FAN SHALL CYCLE AS NEEDED TO MAINTAIN A REDUCED SPACE TEMPERATURE.

COOLING MODE:
WHEN THE UNIT IS IN COOLING MODE, THE VAV CONTROLLER SHALL MAINTAIN THE SPACE TEMPERATURE AT THE ACTIVE COOLING SETPOINT BY MODULATING THE AIRFLOW BETWEEN THE ACTIVE COOLING MINIMUM AIRFLOW SETPOINT TO THE MAXIMUM COOLING AIRFLOW SETPOINT. BASED ON THE VAV CONTROLLER OCCUPANCY MODE, THE ACTIVE COOLING SETPOINT SHALL BE ONE OF THE FOLLOWING:

SETPOINT	DEFAULT VALUE
OCCUPIED COOLING SETPOINT	74.0 DEG. F
UNOCCUPIED COOLING SETPOINT	85.0 DEG. F
OCCUPIED STANDBY COOLING SETPOINT	78.0 DEG. F
OCCUPIED MIN COOLING AIRFLOW SETPOINT	SEE VAV SCHEDULE
OCCUPIED MAX COOLING AIRFLOW SETPOINT	SEE VAV SCHEDULE

THE VAV SHALL USE THE MEASURED SPACE TEMPERATURE AND THE ACTIVE COOLING SETPOINT TO DETERMINE THE REQUESTED COOLING CAPACITY OF THE UNIT. THE OUTPUTS WILL BE CONTROLLED BASED ON THE UNIT CONFIGURATION AND THE REQUESTED COOLING CAPACITY.

SPACE SENSOR FAILURE:
IF THERE IS A FAULT WITH THE OPERATION OF THE ZONE SENSOR AN ALARM SHALL BE ANNUNCIATED AT THE BAS. SPACE SENSOR FAILURE SHALL CAUSE THE VAV TO DRIVE THE DAMPER TO MINIMUM AIR FLOW IF THE VAV IS IN THE OCCUPIED MODE, OR DRIVE IT CLOSED IF THE VAV IS IN THE UNOCCUPIED MODE. THE SERIES FAN SHALL BE ENABLED AND THE REHEAT WILL BE DISABLED.

NOTE: ALL POINTS TO BE ADJUSTABLE.

2 M5.3 FAPVAV WITH HOT WATER REHEAT
1/8" = 1'-0"

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REVISIONS

ISSUE	DESCRIPTION	DATE

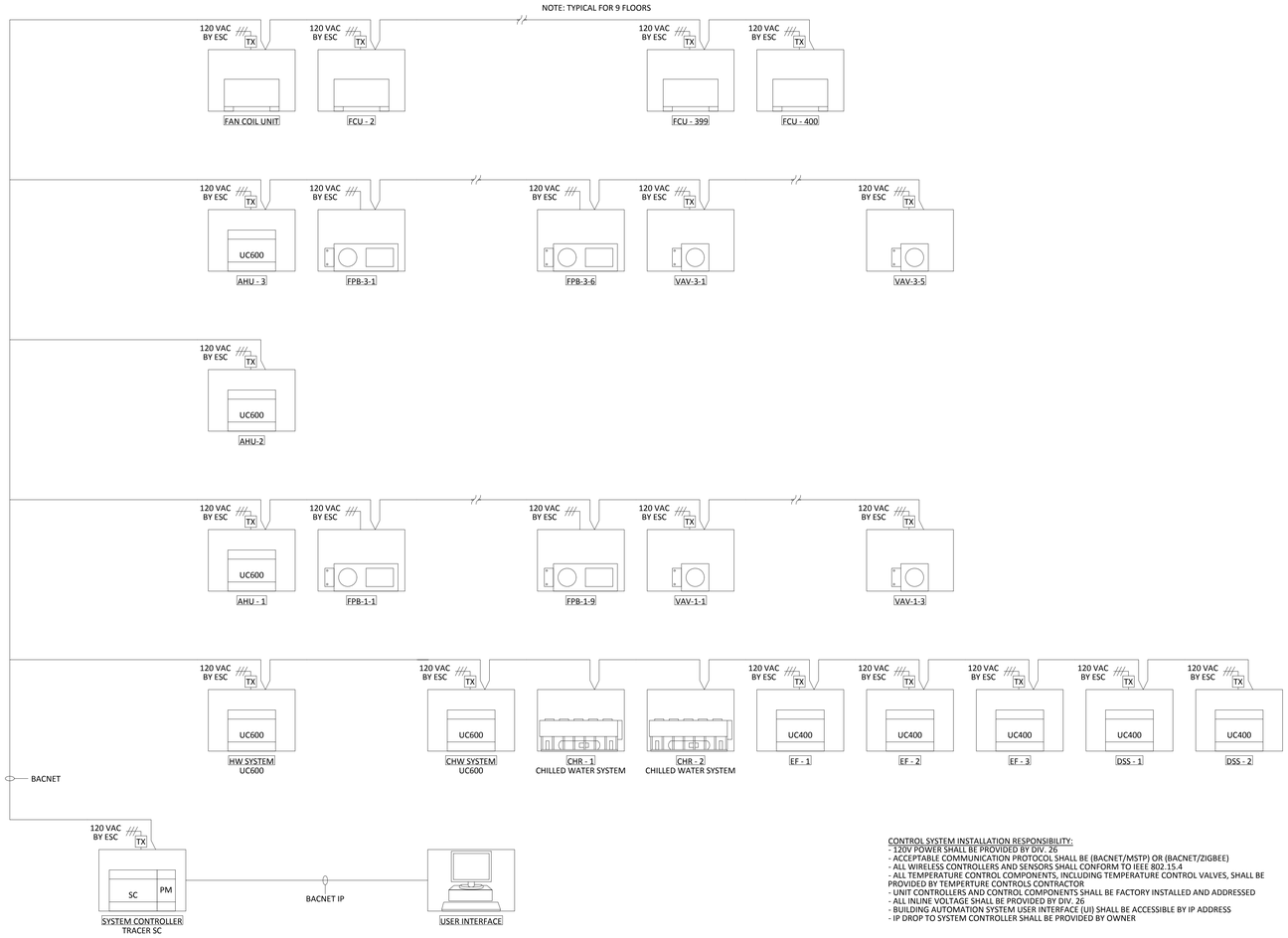
05/25/18
PERMIT SET

STATE OF TEXAS
MEHDI J. MIRMOMENI
113121
LICENSED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

MECHANICAL CONTROLS

SHEET NUMBER
M5.3



1 M5.4 CONTROLS RISER
1/8" = 1'-0"

CONTROL SYSTEM INSTALLATION RESPONSIBILITY:
- 120V POWER SHALL BE PROVIDED BY DIV. 26
- ACCEPTABLE COMMUNICATION PROTOCOL SHALL BE (BACNET/MSTP) OR (BACNET/ZIGBEE)
- ALL WIRELESS CONTROLLERS AND SENSORS SHALL CONFORM TO IEEE 802.15.4
- ALL TEMPERATURE CONTROL COMPONENTS, INCLUDING TEMPERATURE CONTROL VALVES, SHALL BE PROVIDED BY TEMPERTURE CONTROLS CONTRACTOR
- UNIT CONTROLLERS AND CONTROL COMPONENTS SHALL BE FACTORY INSTALLED AND ADDRESSED
- ALL INLINE VOLTAGE SHALL BE PROVIDED BY DIV. 26
- BUILDING AUTOMATION SYSTEM USER INTERFACE (UI) SHALL BE ACCESSIBLE BY IP ADDRESS
- IP DROP TO SYSTEM CONTROLLER SHALL BE PROVIDED BY OWNER

SEQUENCE OF OPERATION

SYSTEM OPERATING MODES: THE BUILDING AUTOMATION SYSTEM (BAS) SHALL INCLUDE A USER-ADJUSTABLE TIME-OF-DAY SCHEDULE TO DEFINE WHEN THE VARIOUS AREAS OF THE FACILITY ARE EXPECTED TO BE OCCUPIED VERSUS UNOCCUPIED. THEN, BASED ON CURRENT ZONE CONDITIONS, THE BAS DETERMINES THE CURRENT SYSTEM OPERATING MODE.

OCCUPIED HEAT/COOL
DURING THE OCCUPIED MODE, EACH VAV TERMINAL UNIT VARIES PRIMARY AIRFLOW, CYCLES A TERMINAL FAN (IF EQUIPPED), AND/OR MODULATES (OR STAGES) A LOCAL OR REMOTE HEAT SOURCE (IF EQUIPPED) TO MAINTAIN ZONE TEMPERATURE AT THE OCCUPIED SETPOINT (COOLING OR HEATING). MEANWHILE, THE AIR-HANDLING UNIT (AHU) MODULATES THE SUPPLY FAN AND RETURN FAN (IF EQUIPPED) TO DELIVER THE REQUIRED AIRFLOW TO THE ZONES, POSITIONS THE OUTDOOR-AIR DAMPER TO BRING IN REQUIRED AMOUNT OF VENTILATION, MODULATES THE CENTRAL RELIEF DAMPER (OR RELIEF FAN) TO MAINTAIN BUILDING PRESSURE AT THE DESIRED SETPOINT, AND MODULATES THE CHILLED-WATER VALVE, MODULATES (OR STAGES) THE SOURCE OF HEAT, AND/OR ENABLES THE AIRSIDE ECONOMIZER TO DISCHARGE AIR AT THE DESIRED SETPOINT.

UNOCCUPIED HEAT/COOL
DURING THE UNOCCUPIED MODE, EACH VAV TERMINAL UNIT VARIES PRIMARY AIRFLOW, CYCLES A TERMINAL FAN (IF EQUIPPED), AND/OR MODULATES (OR STAGES) A LOCAL OR REMOTE HEAT SOURCE (IF EQUIPPED) TO MAINTAIN ZONE TEMPERATURE AT THE UNOCCUPIED SETPOINT (COOLING OR HEATING). MEANWHILE, THE AHU SHUTS OFF, UNLESS A ZONE REQUIRES UNOCCUPIED COOLING OR HEATING. IF NEEDED TO OPERATE, THE AHU MODULATES THE SUPPLY FAN AND RETURN FAN (IF EQUIPPED) TO DELIVER THE REQUIRED AIRFLOW TO THE ZONES, CLOSES THE OUTDOOR-AIR DAMPER, CLOSES THE CENTRAL RELIEF DAMPER (OR SHUTS OFF THE CENTRAL RELIEF FAN), AND MODULATES THE CHILLED-WATER VALVE OR MODULATES (OR STAGES) THE SOURCE OF HEAT TO DISCHARGE AIR AT THE DESIRED SETPOINT.

MORNING WARM-UP/PRE-COOL
DURING THE MORNING WARM-UP/PRE-COOL MODE, EACH VAV TERMINAL UNIT VARIES PRIMARY AIRFLOW, CYCLES A TERMINAL FAN (IF EQUIPPED), AND/OR MODULATES (OR STAGES) A LOCAL OR REMOTE HEAT SOURCE (IF EQUIPPED) TO RAISE/LOWER THE ZONE TEMPERATURE TO THE OCCUPIED SETPOINT (HEATING OR COOLING), AND THEN CLOSES. MEANWHILE, THE AHU MODULATES THE SUPPLY FAN AND RETURN FAN (IF EQUIPPED) TO DELIVER THE REQUIRED AIRFLOW TO THE ZONES, CLOSES THE OUTDOOR-AIR DAMPER, CLOSES THE CENTRAL RELIEF DAMPER (OR SHUTS OFF THE CENTRAL RELIEF FAN), AND MODULATES THE CHILLED-WATER VALVE OR MODULATES (OR STAGES) THE SOURCE OF HEAT TO DISCHARGE AIR AT THE DESIRED SETPOINT.
FOR A COLD
-AIR VAV SYSTEM, IF THE RETURN AIR DEW POINT TEMPERATURE IS HIGHER THAN 55°F (ADJ) DURING MORNING PRE-COOL MODE, THE DISCHARGE-AIR TEMPERATURE SETPOINT WILL BE RESET EVERY 10 MINUTES SO THAT IT IS ONLY 2°F (ADJ) BELOW THE CURRENT RETURN AIR DEW POINT TEMPERATURE.

OPTIMIZED SYSTEM
-LEVEL CONTROL SEQUENCES: THE BAS SHALL PERFORM THE FOLLOWING OPTIMIZED SYSTEM-LEVEL CONTROL STRATEGIES:

OPTIMAL START
THE BAS SHALL INITIATE OPTIMAL START MODE SUCH THAT THE AHU IS STARTED AND VAV BOXES ARE ENABLED TO ALLOW THE ZONE TEMPERATURE TO REACH THE OCCUPIED HEATING OR COOLING SETPOINT PRIOR TO SCHEDULED OCCUPANCY. THE SYSTEM SHALL WAIT AS LONG AS POSSIBLE BEFORE STARTING, SO THAT THE TEMPERATURE IN EACH ZONE REACHES THE OCCUPIED SETPOINT JUST IN TIME FOR SCHEDULED OCCUPANCY.

OPTIMAL STOP
THE BAS SHALL INITIATE OPTIMAL STOP MODE SUCH THAT COOLING OR HEATING IS DISABLED SO THAT THE ZONE TEMPERATURE DOES NOT DRIFT BEYOND THE OCCUPIED STANDBY SETPOINT BY THE END OF THE SCHEDULED OCCUPANCY PERIOD. THE AHU SUPPLY FAN SHALL CONTINUE OPERATING, AND VENTILATION CONTROL SHALL CONTINUE, THROUGH THE END OF THE SCHEDULED OCCUPANCY PERIOD.

UNOCCUPIED ECONOMIZING (NIGHT PURGE)
BETWEEN 4:00 AM (ADJ.) AND 6:00 AM (ADJ), THE BAS SHALL INITIATE UNOCCUPIED ECONOMIZING MODE IF THE CURRENT ZONE TEMPERATURE IS AT LEAST 1°F WARMER THAN THE OCCUPIED COOLING SETPOINT AND THE OUTDOOR DRY-BULB TEMPERATURE IS MORE THAN 15°F (ADJ) COOLER THAN THE CURRENT ZONE TEMPERATURE. WHEN INITIATED, THE AHU IS STARTED (OA DAMPER FULLY OPEN, CHILLED-WATER VALVE CLOSED) AND VAV BOXES ARE ENABLED TO ALLOW THE ZONE TEMPERATURE TO COOL TO THE OCCUPIED COOLING SETPOINT.

OPTIMIZED CONTROL OF SUPPLY DUCT STATIC PRESSURE (FAN-PRESSURE OPTIMIZATION)
AT A FREQUENCY OF ONCE EVERY 10 MINUTES, THE BAS SHALL MONITOR THE DAMPER POSITION OF ALL VAV TERMINAL UNITS. THE BAS SHALL CALCULATE A NEW SUPPLY FAN DUCT STATIC PRESSURE SETPOINT BASED ON THE POSITION OF THE FURTHEST-OPEN VAV DAMPER, AND SEND THIS NEWLY-CALCULATED SETPOINT TO THE AHU CONTROLLER. WHEN ANY VAV DAMPER IS MORE THAN 75% (ADJ) OPEN, THE SUPPLY FAN DUCT STATIC PRESSURE SETPOINT SHALL BE RESET UPWARD BY 5% UNTIL NO DAMPER IS MORE THAN 75% (ADJ) OPEN OR THE STATIC PRESSURE SETPOINT HAS RESET TO THE MAXIMUM SETTING. WHEN ALL VAV DAMPERS ARE LESS THAN 65% (ADJ) OPEN, THE SUPPLY FAN DUCT STATIC PRESSURE SETPOINT SHALL BE RESET DOWNWARD BY 5% UNTIL AT LEAST ONE DAMPER IS MORE THAN 65% (ADJ) OPEN OR THE STATIC PRESSURE SETPOINT HAS RESET TO THE MINIMUM SETTING.

OPTIMIZED CONTROL OF SUPPLY AIR TEMPERATURE (SAT RESET)
AT A FREQUENCY OF ONCE EVERY 10 MINUTES, THE BAS SHALL MONITOR THE OUTDOOR DRY-BULB TEMPERATURE, AS WELL AS THE ZONE TEMPERATURE AND DAMPER POSITION OF ALL VAV TERMINAL UNITS. THE BAS SHALL CALCULATE A NEW SAT SETPOINT BASED ON CURRENT OUTDOOR AIR (OA) TEMPERATURE, AND SEND THIS NEWLY-CALCULATED SAT SETPOINT TO THE AHU CONTROLLER. WHEN THE OA TEMPERATURE IS WARMER THAN 65°F (ADJ), THE SAT SETPOINT SHALL BE 55°F (ADJ). WHEN THE OA TEMPERATURE IS COLDER THAN 55°F (ADJ), THE SAT SETPOINT SHALL BE 60°F (ADJ). WHEN THE OA TEMPERATURE IS BETWEEN 55°F (ADJ) AND 65°F (ADJ), THE SAT SETPOINT SHALL BE RESET PROPORTIONALLY BETWEEN 55°F (ADJ) AND 60°F (ADJ). IF AT LEAST TWO (ADJ) ZONES HAVE BOTH 1) A VAV DAMPER THAT IS MORE THAN 75% OPEN, AND 2) A CURRENT ZONE TEMPERATURE THAT IS HIGHER THAN THE CURRENT COOLING SETPOINT, THEN THE SAT SETPOINT SHALL RETURN TO 55°F (ADJ) IF THE OUTDOOR DEW POINT IS HIGHER THAN 60°F (ADJ), THIS SAT RESET SEQUENCE SHALL BE SUSPENDED AND THE SAT SETPOINT SHALL BE RESET TO 55°F (ADJ) UNTIL OUTDOOR DEW POINT DROPS BELOW 57°F (ADJ).

OPTIMIZED CONTROL OF VENTILATION (VENTILATION OPTIMIZATION)
THE ACTUAL OUTDOOR AIRFLOW SHALL BE SENSED AT THE OUTDOOR AIR INTAKE OF THE AHU, AND CONTROLLED TO AN AIRFLOW SETPOINT DETERMINED ACCORDING TO ASHRAE STANDARD 62.1. WHEN THE BAS TIME-OF-DAY SCHEDULE INDICATES THAT A ZONE IS UNOCCUPIED, THE REQUIRED OUTDOOR AIRFLOW FOR THAT ZONE SHALL BE ZERO. WHEN THE SCHEDULE INDICATES THAT A ZONE IS OCCUPIED, THE REQUIRED OUTDOOR AIRFLOW FOR THAT ZONE SHALL EQUAL THE DESIGN OUTDOOR AIRFLOW, UNLESS THE ZONE IS EQUIPPED WITH OCCUPANCY SENSOR AND/OR A CARBON DIOXIDE (CO2) SENSOR, OR USES A TIME-OF-DAY VENTILATION SCHEDULE, TO REDUCE THE REQUIRED OUTDOOR AIRFLOW DURING PERIODS OF PARTIAL OCCUPANCY. THE REQUIRED OUTDOOR-AIR FRACTION (CURRENT REQUIRED OUTDOOR AIRFLOW DIVIDED BY THE CURRENT PRIMARY AIRFLOW) SHALL BE CONTINUOUSLY CALCULATED FOR EACH ZONE (VAV TERMINAL UNIT). AT A FREQUENCY OF ONCE EVERY 10 MINUTES, THE BAS SHALL GATHER THIS DATA FROM ALL VAV TERMINAL UNITS, CALCULATE THE MINIMUM REQUIRED OUTDOOR AIRFLOW FOR THE SYSTEM ACCORDING TO ASHRAE 62.1, AND SEND THIS NEWLY-CALCULATED OUTDOOR AIRFLOW SETPOINT TO THE AHU CONTROLLER.

VARIABLE PRIMARY - PARALLEL CHILLERS

THE CHILLED WATER PLANT WILL BE ENABLED IN RESPONSE TO A NEED FOR CHILLED WATER FROM ANY SYSTEM LOAD (E.G. THE CHILLED WATER COIL OUTPUT ON ANY AHU EXCEEDS 50% FOR 5 MINUTES (ADJ)).

STARTUP – SOFT START
SYSTEM SOFT START - THE CHILLER PLANT CONTROL SYSTEM WILL INITIATE A "SOFT START" MODE WHENEVER THE SYSTEM CHILLED WATER TEMPERATURE EXCEEDS THE SPECIFIED CHILLED WATER SYSTEM SETPOINT BY 20°F (ADJ) AT SYSTEM START-UP. THE CHILLER PLANT CONTROL APPLICATION WILL ADD COOLING CAPACITY DURING SOFT START MODE ONLY IF RETURN WATER TEMPERATURE IS NOT DECLINING AT A RATE OF AT LEAST 0.5°F (ADJ) PER MINUTE. THIS PREVENTS THE UNNECESSARY OPERATION OF CHILLERS AND LIMITS SYSTEM ELECTRICAL DEMAND DURING CHILLED WATER LOOP PULL DOWN.

CHILLER SEQUENCING
WHEN THE CHILLED WATER SYSTEM IS ENABLED THE CHILLER PLANT CONTROL SYSTEM WILL SEND AN ENABLE SIGNAL TO THE LEAD CHILLER AND CHILLED WATER PUMPING CONTROL. THE CHILLER PLANT CONTROL SYSTEM WILL INITIATE THE START OF THE NEXT CHILLER IN THE SEQUENCE WHENEVER THE CHILLED WATER LOAD, AS DETERMINED BY THE SYSTEM SUPPLY WATER TEMPERATURE, IS NOT MET FOR 20 (ADJ) MINUTES. THE CHILLER PLANT CONTROL SYSTEM WILL UNLOAD OPERATING CHILLERS TO 60% RLA (ADJ) PRIOR TO STARTING A LAG CHILLER.

THE CHILLER PLANT CONTROL SYSTEM WILL INITIATE THE SHUTDOWN OF THE NEXT CHILLER IN THE SEQUENCE WHENEVER EXCESS CHILLED WATER CAPACITY EXISTS, AS DETERMINED BY PERCENT RUN LOAD AMPS OR PERCENT KW, FOR 20 (ADJ) MINUTES.

SETPOINT CONTROL
THE CHILLER PLANT CONTROL SYSTEM WILL CONTROL INDIVIDUAL CHILLER SETPOINTS TO MAINTAIN THE SYSTEM SUPPLY WATER TEMPERATURE SETPOINT.

FAILURE RECOVERY
UPON SENSING A CHILLER FAILURE THE CHILLER PLANT CONTROL SYSTEM WILL SHUT DOWN THE FAILED CHILLER IMMEDIATELY AND INITIATE THE START OF THE NEXT CHILLER IN THE ROTATION SEQUENCE.

IN THE EVENT OF A POWER LOSS, THE CHILLER PLANT CONTROL APPLICATION WILL COMPARE THE NUMBER OF CHILLERS RUNNING TO THE NUMBER OF CHILLERS RUNNING PRIOR TO THE POWER LOSS. THE APPLICATION WILL ADD CHILLERS ONE AT A TIME, SKIPPING NORMAL DELAY TIMERS, UNTIL THE CHILLERS RUNNING EQUALS THE NUMBER OF CHILLERS RUNNING PRIOR TO THE POWER LOSS.

ROTATION
CHILLER ROTATION WILL BE INITIATED BASED ON AN OPERATOR EDITABLE DAY OF WEEK/TIME, FIXED NUMBER OF DAYS, NUMBER OF RUN HOURS, OR BY THE CYCLING OF A BINARY INPUT. CHILLER CYCLING CAUSED BY NORMAL SYSTEM LOAD FLUCTUATIONS WILL CAUSE THE CHILLERS TO CHANGE ROTATION SEQUENCE OR AT THE OPERATOR'S OPTION CHILLERS MAY BE FORCED INTO THE NEW ROTATION SEQUENCE AT THE TIME OF SEQUENCE CHANGE.

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LOCATION:
SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION-PHASE 1
411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS

ISSUE	DESCRIPTION	DATE

05/25/18
PERMIT SET

STATE OF TEXAS
MEHDI J. MIRMOMENI
113121
LICENSED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10-581

MECHANICAL CONTROLS

SHEET NUMBER
M5.4

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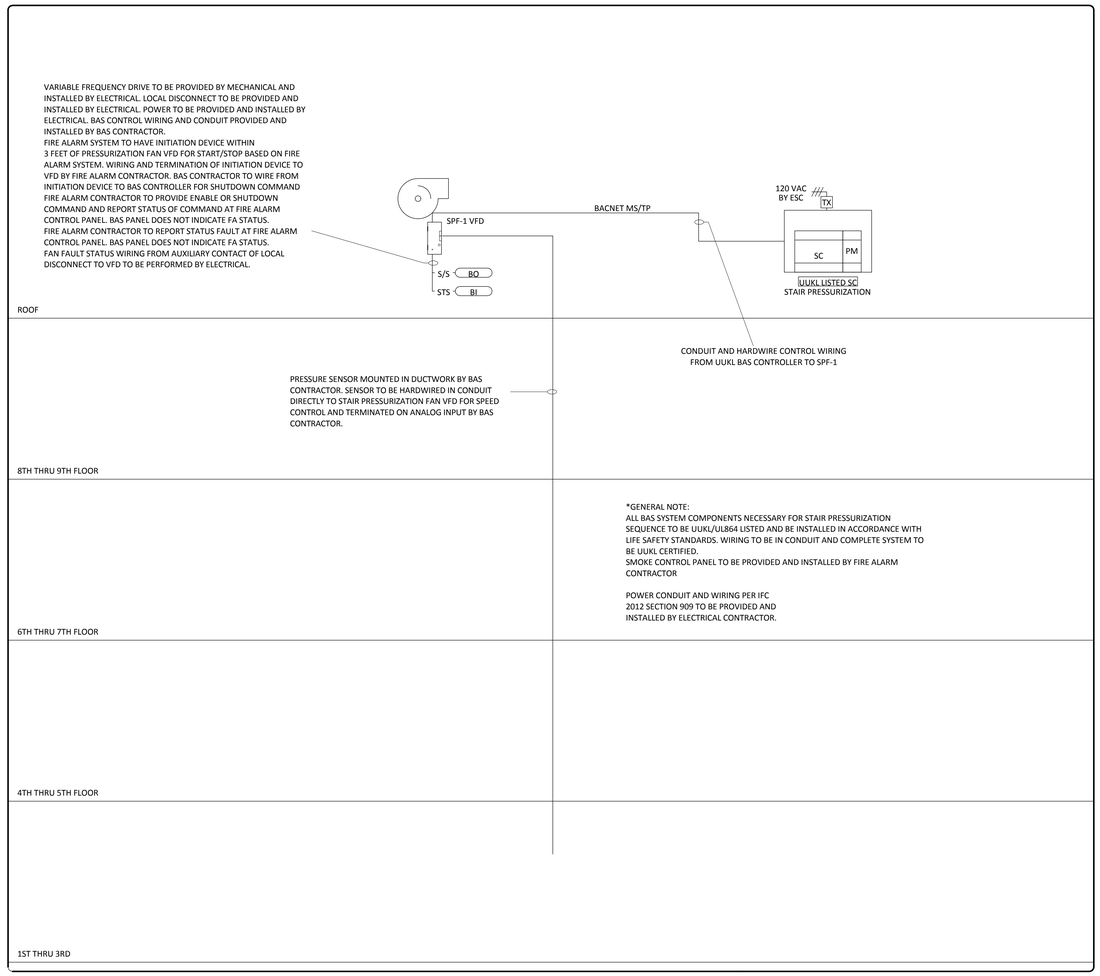

1 M5.5 STAIR PRESSURIZATION RISER
N.T.S.

MEP RESPONSIBILITY MATRIX

SYSTEM DESCRIPTION	FURNISHED BY	INSTALLED BY		
EXPOSED CEILINGS/MECHANICAL ROOMS AND INACCESIBLE CEILINGS				
CONDUIT FOR FIRE ALARM WIRING	E	E		
CONDUIT FOR BAS WIRING	BAS	BAS		
AIR TERMINAL UNITS [ATUS]				
AIR TERMINAL UNITS (VAVS)	M	M		
120 VOLT SINGLE POINT POWER FEED TO AIR TERMINAL DEVICE	E	E		
24V TRANSFORMER UNIT MOUNTED POWER FOR BAS CONTROLLER POWER	EQ. MANUFACTURER	EQ. MANUFACTURER		
ANY DEVICE THAT IS REQUIRED TO BE SHUTDOWN PER AHJ - FIRE ALARM DEVICE TO BE PLACED WITHIN 3 FEET OF THE DEVICE BEING SHUTDWON AND BAS TO WIRE FROM FA RELAY TO BAS CONTROLLER FOR SHUTDOWN COMMAND	FA/BAS	FA/BAS		
CHILLED WATER AIR HANDLING UNITS [CHW AHUS]				
SUPPLY AIR SMOKE DETECTORS (SUPPLIED, WIRED BY FA, INSTALLED BY M)	FA	FA		
MOTORIZED CONTROL DAMPERS	EQ. MANUFACTURER	EQ. MANUFACTURER		
120 VOLT POWER TO DAMPER AND VALVE ACUTATORS (COORDINATE POWER REQUIREMENTS WITH BAS & EQ. MANUFACTURER)	E	E		
24 VOLT POWER & CONTROL COMMAND TO DAMPER AND VALVE ACUTATORS (COORDINATE POWER REQUIREMENTS WITH E & EQ. MANUFACTURER)	BAS	BAS		
DAMPER ACTAUTOR	BAS	BAS		
HIGH VOLTAGE POWER AND CONDUIT TO UNIT	E	E		
CONTROL POINTS, CONDUIT, AND WIRING	BAS	BAS		
LOCAL DISCONNECT	E	E		
VARIABLE FREQUENCY DRIVES (INC. STAIR PRESSURIZATION & CHW AHUS)				
VARIABLE FREQUENCY DRIVES	M	E		
LOCAL DISCONNECT (MAINTENANCE)	E	E		
POWER TO VFD	E	E		
BAS CONTROL WIRING AND CONDUIT	BAS	BAS		
FA SHUTDOWN OR ENABLE- FIRE ALARM DEVICE TO BE PLACED WITHIN 3 FEET OF THE VFD BEING SHUTDWON/ENABLED AND BAS TO WIRE FROM FA RELAY TO BAS CONTROLLER FOR COMMAND	FA/BAS	FA/BAS		* FA TO PROVIDE ENABLE OR SHUTDOWN COMMAND AND REPORT STATUS OF COMMAND AT FA CONTROL PANEL/ BAS PANEL DOES NOT INDICATE FA STATUS
FAULT STATUS OF VFD - FIRE MONITORING DEVICE TO BE LOCATED WITHIN 3 FT OF VFD BAS CONTRACTOR TO WIRE FROM VFD FAULT CONTACT TO FA MONITORING DEVICE	FA/BAS	FA/BAS		* FA TO REPORT STATUS OF FAULT AT FA CONTROL PANEL/ BAS PANEL DOES NOT INDICATE FA STATUS
FAN FAULT STATUS - WIRING FROM AUXILIARY CONTACT OF LOCAL DISCONENCT TO VFD TO BE PERFORMED BY ELECTRICAL SUB-CONTRACTOR	E	E		
FIRE & COMBINATION FIRE/SMOKE DAMPERS				
FIRE AND COMBINATION FIRE/SMOKE DAMPERS (FUSIBLE LINK AND MOTORIZED)	M	M		
CONDUIT AND 120VAC POWER	E	E		
MONITORING STATUS FOR SMOKE CONTROL DAMPERS ONLY WIRING	FA	FA		
CONTROL SIGNAL (RELAY TO BREAK 120VAC POWER)	FA	FA/E		
MODULATING CONTROL DAMPERS NON FIRE-RATED				
DAMPERS & ACUTATORS [DUCT MOUNTED]	BAS	M		
CONDUIT	BAS	BAS		
120 VOLT POWER TO DAMPER AND VALVE ACUTATORS (COORDINATE POWER REQUIREMENTS WITH BAS & EQ. MANUFACTURER)	E	E		
24 VOLT POWER & CONTROL COMMAND TO DAMPER AND VALVE ACUTATORS (COORDINATE POWER REQUIREMENTS WITH E & EQ. MANUFACTURER)	BAS	BAS		
CONTROL WIRING	BAS	BAS		
DATA				
CONDUIT FOR TELECOMMUNICATIONS CABLING	E	E		
DATA WIRING	TEL	TEL		
BAS IP INTERNETOWRK	BAS	BAS		
FA NETWORK	FA	FA		
STAIRWELL FANS SMOKE CONTROL - PER IFC 2015 AND COSA AMENDMENTS				
CONDUIT, WIRING AND POWER PER IFC 2015 SECTION 909	E	E		
SMOKE CONTROL PANEL	FA	FA		
FULL CONDUIT AND BOXES FOR ALL ASSOCIATED DEVICES TO FANS AND DAMPERS	E	E		
STATUS MONITORING OF FANS AND ASSOCIATED DAMPERS PER IFC 2015 SECTION 909	FA/E	FA/E		
M - MECHANICAL SUB-CONTRACTOR				
E - ELECTRICAL SUB-CONTRACTOR				
FA - FIRE ALARM SUB-CONTRACTOR				
BAS - BUILDING AUTOMATION SUB-CONTRACTOR				
TEL - STRUCTURED CABLING/DATA SUB-CONTRACTOR				

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TEXAS LICENSE NO. 10-881

MECHANICAL CONTROLS

SHEET NUMBER
M5.5

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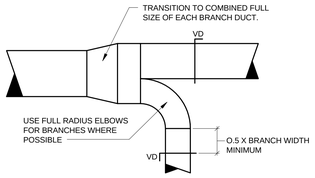
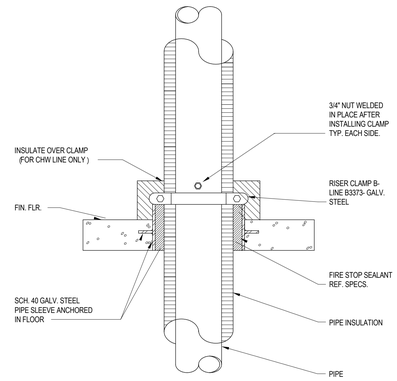


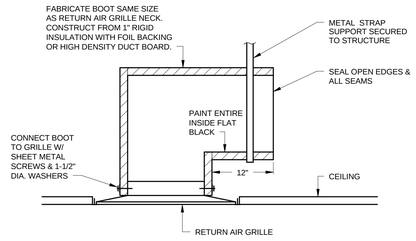
NOTES:
1. STANDARD HORIZONTAL DUCT SPLIT SHOWN; TOP & BOTTOM SPLIT SIMILAR.

2. USE DUCT SPLITS FOR ANY BRANCH SERVING 2 OR MORE AIR DEVICES.

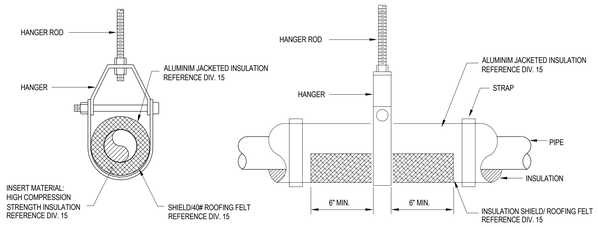
1 M6.0 RECTANGULAR DUCT SPLIT
NOT TO SCALE



2 M6.0 PIPE RISER SUPPORT DETAIL
NOT TO SCALE

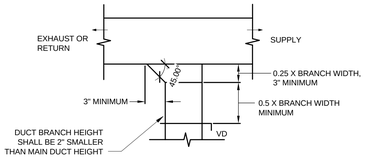


3 M6.0 RETURN AIR BOOT DETAIL
NOT TO SCALE

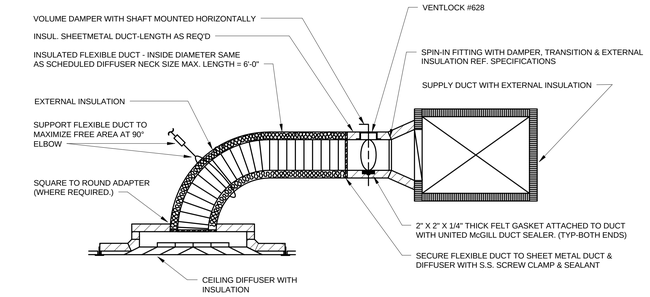


MAXIMUM PIPE/TUBING SUPPORT SPACING, FEET																	
NOM. SIZE	THRU 3/4"	1	1-1/4	1-1/2	2	2-1/2	3	4	5	6	8	10	12	14	16	18	20	24
PIPE	7 FT	7	7	9	10	11	12	14	16	17	19	22	23	25	27	28	30	32
TUBING	5 FT	6	7	8	8	9	10	12	13	14	16	-	-	-	-	-	-	-
NOTE: FOR TRAPEZE HANGER TAKE SPACING OF SMALLEST SIZE ON TRAPEZE.																		

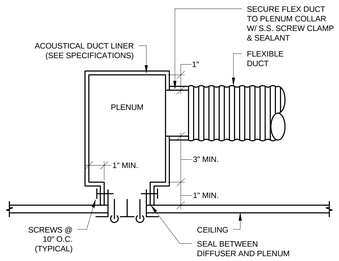
4 M6.0 TYPICAL PIPE HANGER
NOT TO SCALE



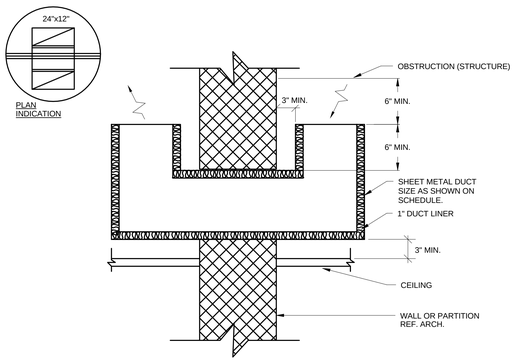
5 M6.0 RECTANGULAR BRANCH DUCT TAKEOFF
NOT TO SCALE



6 M6.0 DIFFUSER CONNECTION DETAIL
NOT TO SCALE



7 M6.0 LINEAR DIFFUSER PLENUM
NOT TO SCALE



8 M6.0 RETURN AIR SOUND ATTENUATOR DETAIL
NOT TO SCALE

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PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10-581

MECHANICAL DETAILS

SHEET NUMBER
M6.0

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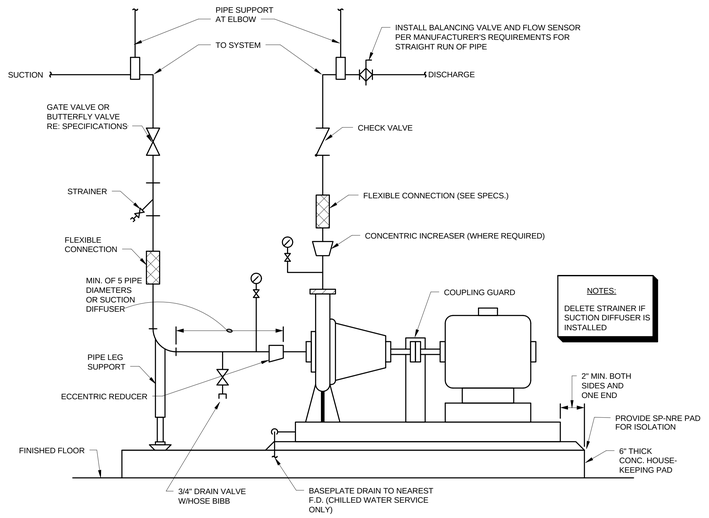
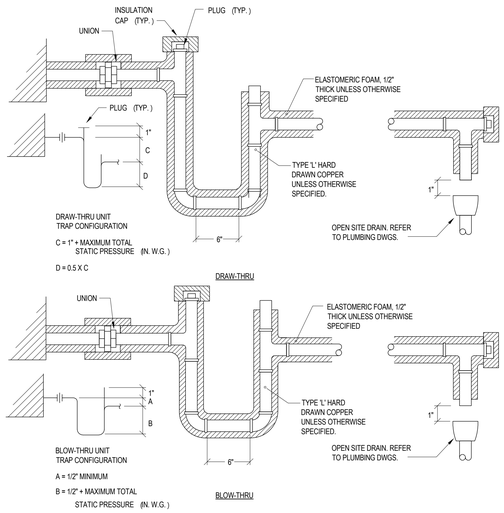
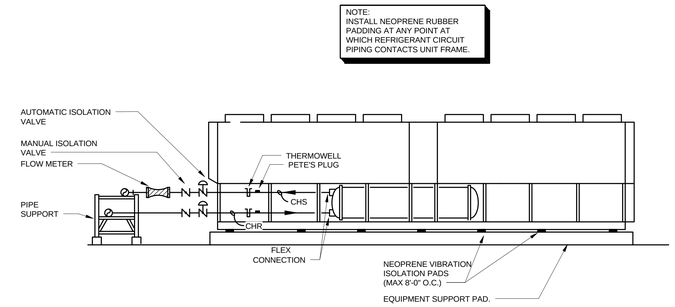


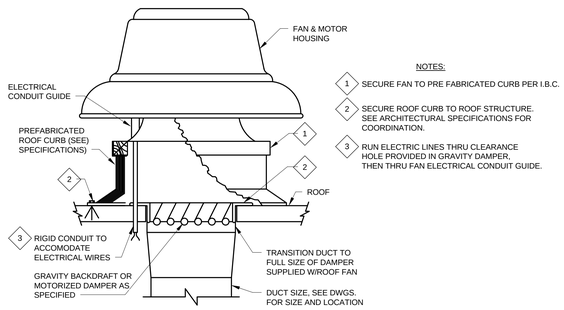
1 M6.1 END SUCTION PUMP W/ VIBRATION ISOLATION
NOT TO SCALE



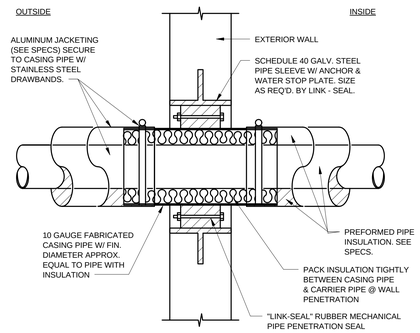
2 M6.1 CONDENSATE DRAIN TRAP DETAIL
NOT TO SCALE



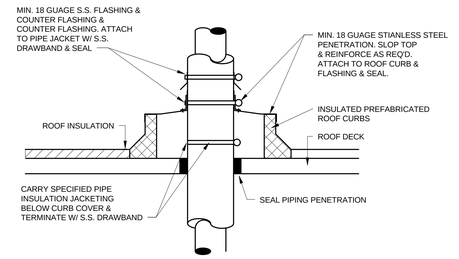
3 M6.1 AIR COOLED, AT-GRADE CHILLER DETAIL
NOT TO SCALE



4 M6.1 ROOF EXHAUST FAN DETAIL
NOT TO SCALE



5 M6.1 INSULATED PIPE THROUGH EXTERIOR WALL
NOT TO SCALE



6 M6.1 INSULATED PIPE THROUGH ROOF DETAIL
NOT TO SCALE

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GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

MECHANICAL DETAILS

SHEET NUMBER
M6.1

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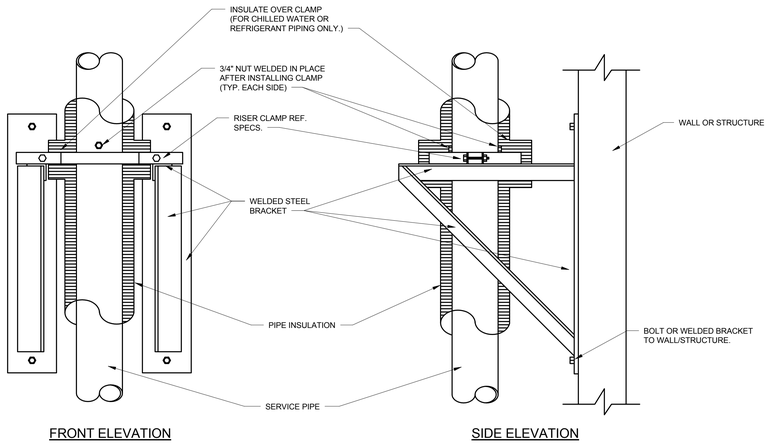
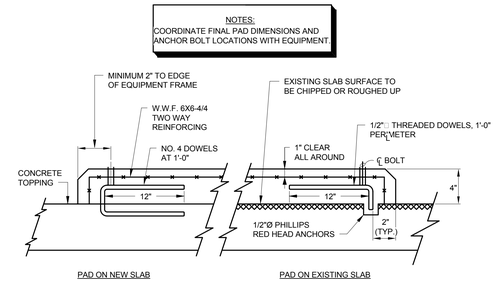
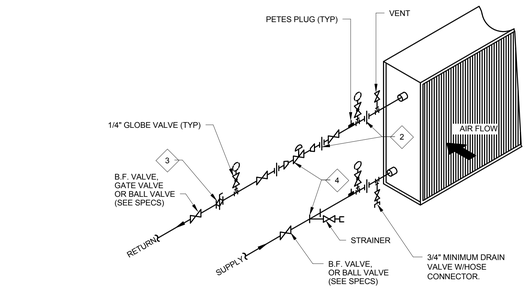


1 WALL OR STRUCTURE SUPPORTED PIPE RISER DETAIL
M6.2 NOT TO SCALE

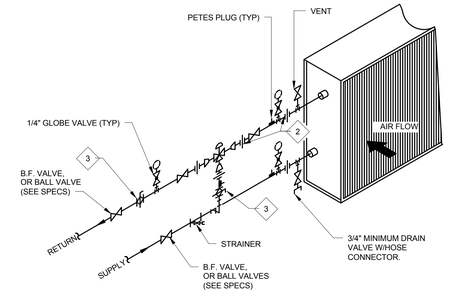


2 HOUSEKEEPING PAD
M6.2 NOT TO SCALE



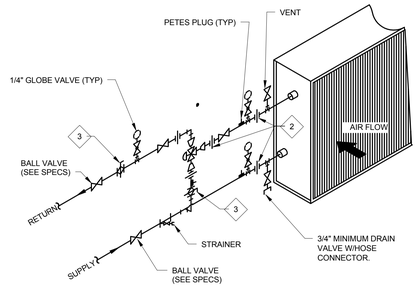
1. NOT USED.
2. PROVIDE PIPE UNIONS OR FLANGES AS REQUIRED BY PIPE SIZE & SPECIFICATIONS (TYP.).
3. CIRCUIT SETTER.
4. MOUNT CONTROL VALVE, PIPING AND ACCESSORIES IN A MANNER TO NOT INTERFERE WITH COIL PULL AREAS AND UNIT ACCESS.

3 WATER COIL CONNECTION WITH 2-WAY CONTROL VALVE
M6.2 NOT TO SCALE



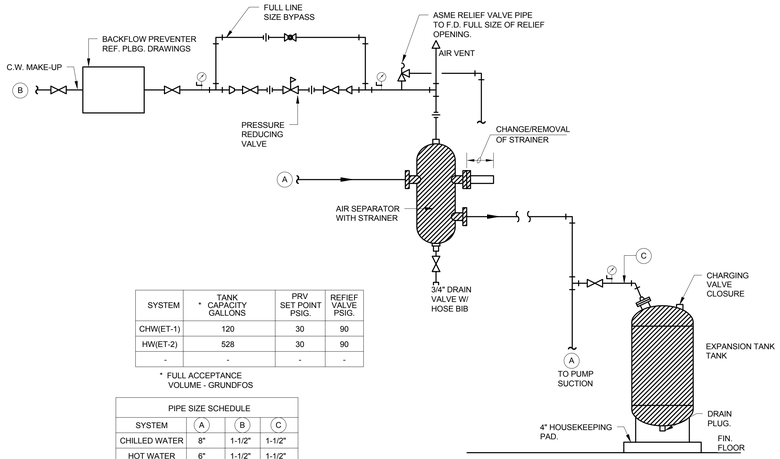
1. NOT USED
2. PROVIDE PIPE UNIONS OR FLANGES AS REQUIRED BY PIPE SIZE & SPECIFICATIONS (TYP.).
3. CIRCUIT SETTER
4. MOUNT CONTROL VALVE, PIPING AND ACCESSORIES IN A MANNER TO NOT INTERFERE WITH COIL PULL AREAS AND UNIT ACCESS.

4 CHILLED WATER COIL CONNECTION WITH 3-WAY CONTROL VALVE
M6.2 NOT TO SCALE



1. NOT USED
2. PROVIDE PIPE UNIONS OR FLANGES AS REQUIRED BY PIPE SIZE & SPECIFICATIONS (TYP.).
3. CIRCUIT SETTER
4. MOUNT CONTROL VALVE, PIPING AND ACCESSORIES IN A MANNER TO NOT INTERFERE WITH COIL PULL AREAS AND UNIT ACCESS.

5 HEATING WATER COIL CONNECTION WAITH 3 WAY CONTROL VALVE
M6.2 NOT TO SCALE

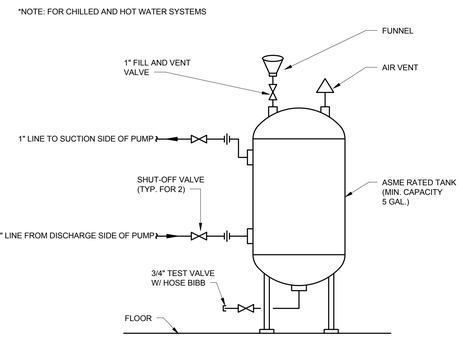


SYSTEM	* TANK CAPACITY GALLONS	PRV SET POINT PSIG.	REFIEF VALVE PSIG.
CHW(ET-1)	120	30	90
HW(ET-2)	528	30	90
-	-	-	-

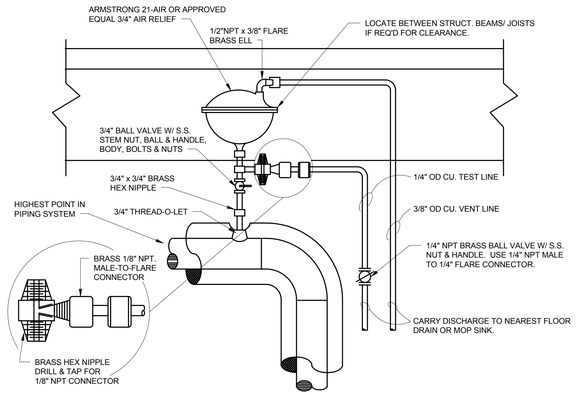
* FULL ACCEPTANCE VOLUME - GRUNDFOS

PIPE SIZE SCHEDULE			
SYSTEM	(A)	(B)	(C)
CHILLED WATER	8"	1-1/2"	1-1/2"
HOT WATER	6"	1-1/2"	1-1/2"

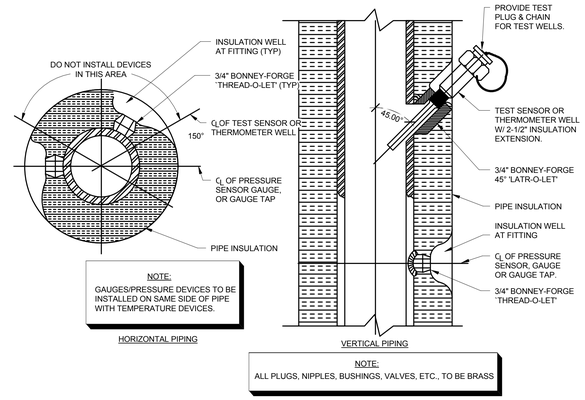
6 SYSTEM MAKE-UP/EXPANSION TANK DETAIL
M6.2 NOT TO SCALE



7 CHEMICAL BYPASS (POT) FEEDER DETAIL
M6.2 NOT TO SCALE



8 AUTOMATIC AIR VENT
M6.2 NOT TO SCALE



NOTE:
GAUGES/PRESSURE DEVICES TO BE INSTALLED ON SAME SIDE OF PIPE WITH TEMPERATURE DEVICES.

HORIZONTAL PIPING

VERTICAL PIPING

NOTE:
ALL PLUGS, NIPPLES, BUSHINGS, VALVES, ETC., TO BE BRASS

9 TEST PLUG DETAIL
M6.2 NOT TO SCALE

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TEXAS LICENSE NO. 10-181

MECHANICAL DETAILS

SHEET NUMBER
M6.2

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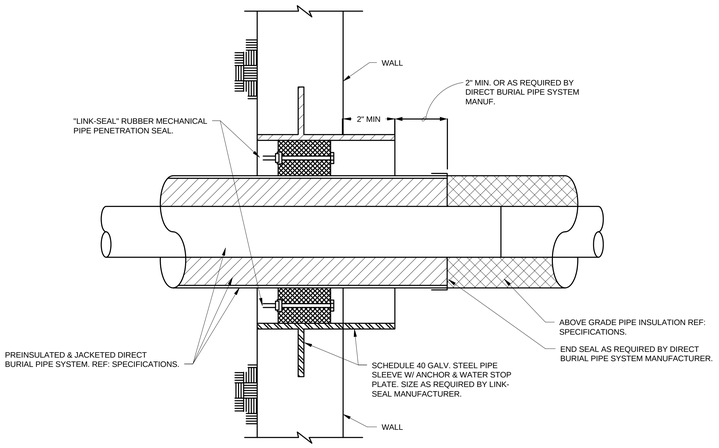
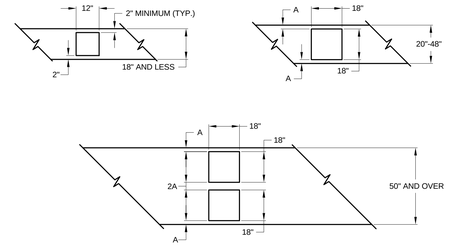
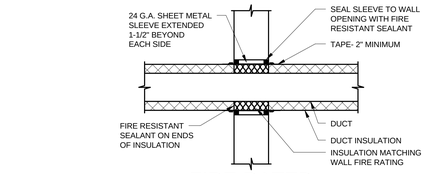


1 M6.3 INSULATED PIPE THRU WALL BELOW GRADE DETAIL
NOT TO SCALE



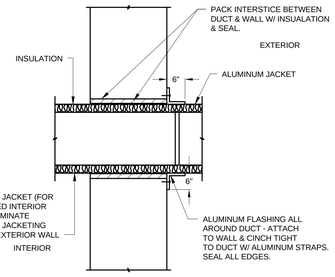
NOTE:
1. PROVIDE DUCT ACCESS DOORS AS PER SPECIFICATION AT CONTROL DEVICES, (AUTOMATIC DAMPERS, THERMOSTATS, ETC.), FIRE DAMPERS, SMOKE DAMPERS, REHEAT COILS, HUMIDIFIERS, AIR FLOW SENSORS, AIR BOXES, AND WHERE REQUIRED FOR SERVICE ACCESS, AND AS SHOWN ON DRAWINGS.
2. LOCATE ACCESS DOORS IN DUCTWORK TO FACILITATE ACCESS TO DEVICES REQUIRING SERVICE AND INSPECTION.

2 M6.3 DUCT ACCESS DOOR DETAILS
NOT TO SCALE

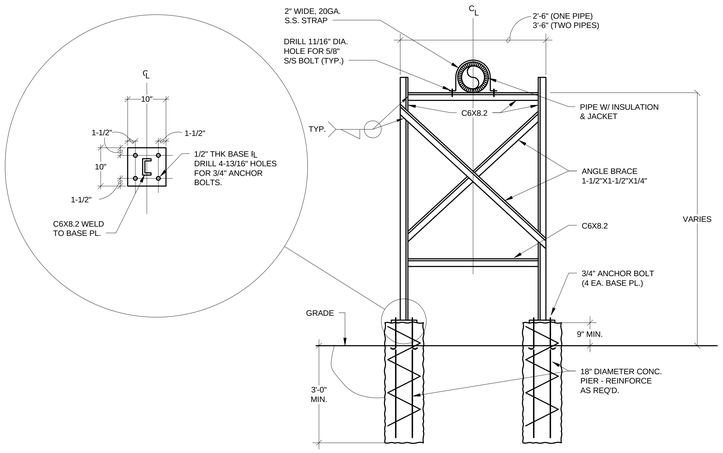


NOTE:
THIS DETAIL APPLIES ONLY FOR INSULATED DUCTS NOT REQUIRING FIRE DAMPERS.

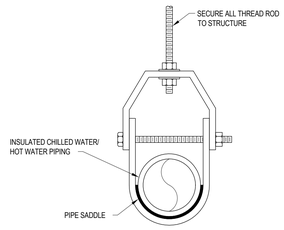
3 M6.3 DUCT PENETRATION THRU INTERIOR WALL
NOT TO SCALE



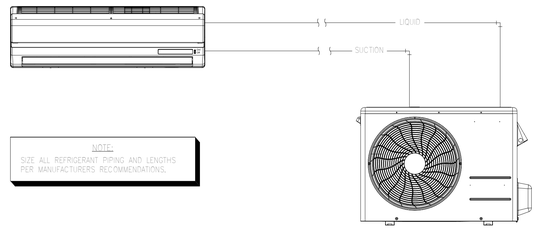
4 M6.3 DUCT THROUGH EXTERIOR WALL
NOT TO SCALE



5 M6.3 PIPE SUPPORT DETAIL
1/8" = 1'-0"



6 M6.3 PIPING HANGER
NOT TO SCALE



7 M6.3 MINI-SPLIT PIPING SCHEMATIC REFRIGERANT
NOT TO SCALE

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05/25/18
PERMIT SET

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LICENSED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

MECHANICAL DETAILS

SHEET NUMBER
M6.3

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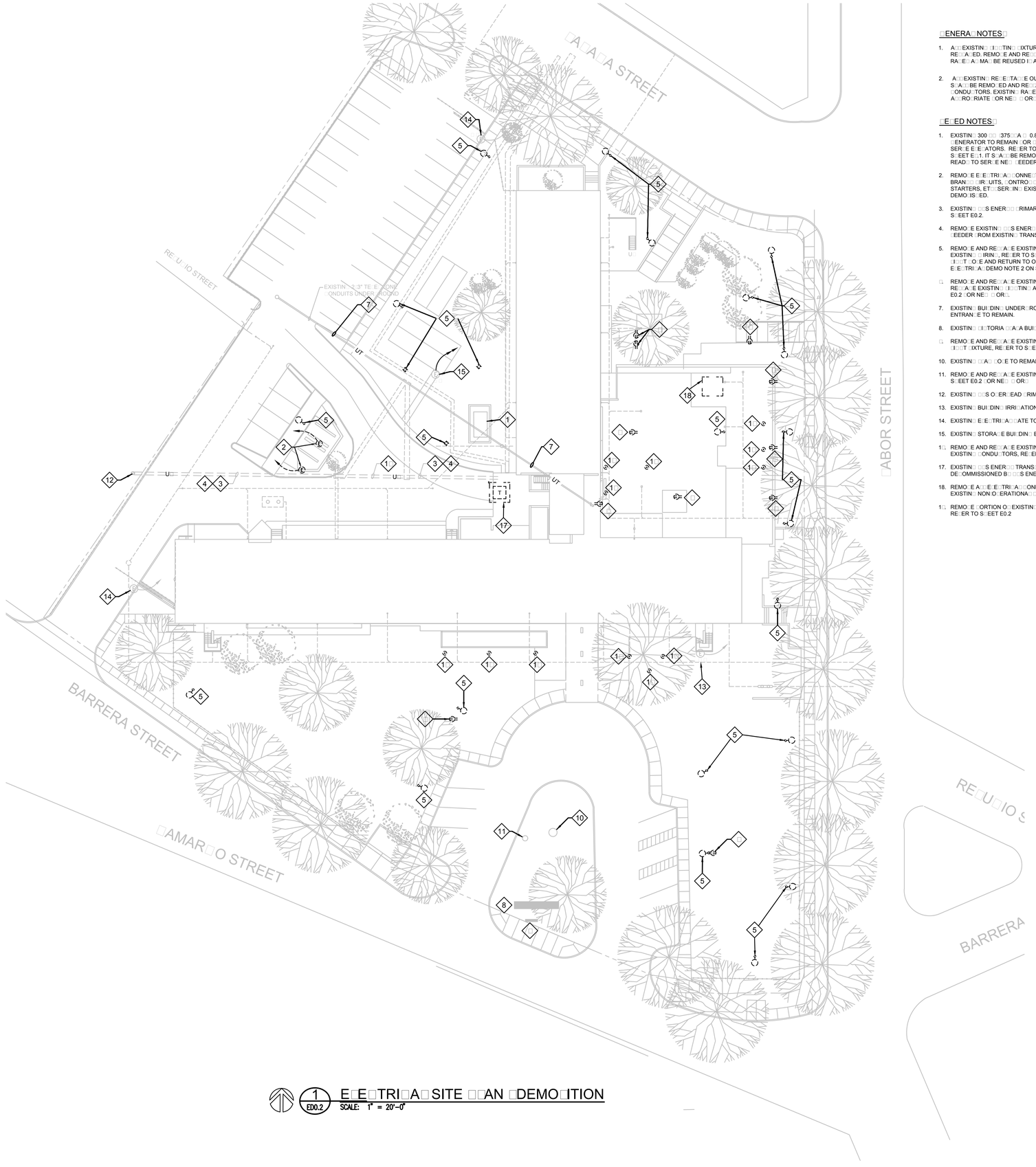

1 ED0.2 E E TRI A SITE AN DEMO ITION
SCALE: 1" = 20'-0"

ENERA NOTES

1. A EXISTIN IXTURES S A BE REMO ED AND RE A ED. REMO E AND RE A E ONDU TORS. EXISTIN RA E A MA BE REUSED I A RO RIATE OR NE OR.
2. A EXISTIN RE E TA E OUT ETS AND E E TRI A DE I ES S A BE REMO ED AND RE A ED. REMO E AND RE A E ONDU TORS. EXISTIN RA E A MA BE REUSED I A RO RIATE OR NE OR.

E ED NOTES

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4. REMO E EXISTIN S ENER E E TRI A RIMAR SER I E EEDER ROM EXISTIN TRANS ORMER AU T. S TO REMO E
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13. EXISTIN BUI DIN IRRI ATION ONTRO ER TO REMAIN.
14. EXISTIN E E TRI A ATE TO REMAIN.
15. EXISTIN STORA E BUI DIN E E TRI A SER I E TO REMAIN.
16. REMO E AND RE A E EXISTIN BO ARD IXTURES. RE E A E EXISTIN ONDU TORS, RE ER TO S EET E0.2 OR NE OR.
17. EXISTIN S ENER TRANS ORMER AU T TO BE DE OMMISSIONED B S ENER.
18. REMO E A E E TRI A ONNE TIONS, IRIN , AND ONDUIT TO EXISTIN NON O ERATIONA OUNTAIN.
19. REMO E ORTION O EXISTIN S ENER RIMAR DU TBAN RE ER TO S EET E0.2

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REVISIONS		
ISSUE	DESCRIPTION	DATE

PERMIT SET 05/25/18

STATE OF TEXAS
RALPH E. MARTIN, JR.
28858
REGISTERED
PROFESSIONAL ENGINEER
05.25.2018

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
STATE LICENSE NO. 19-361

SITE PLAN - DEMOLITION

SHEET NUMBER
ED0.2

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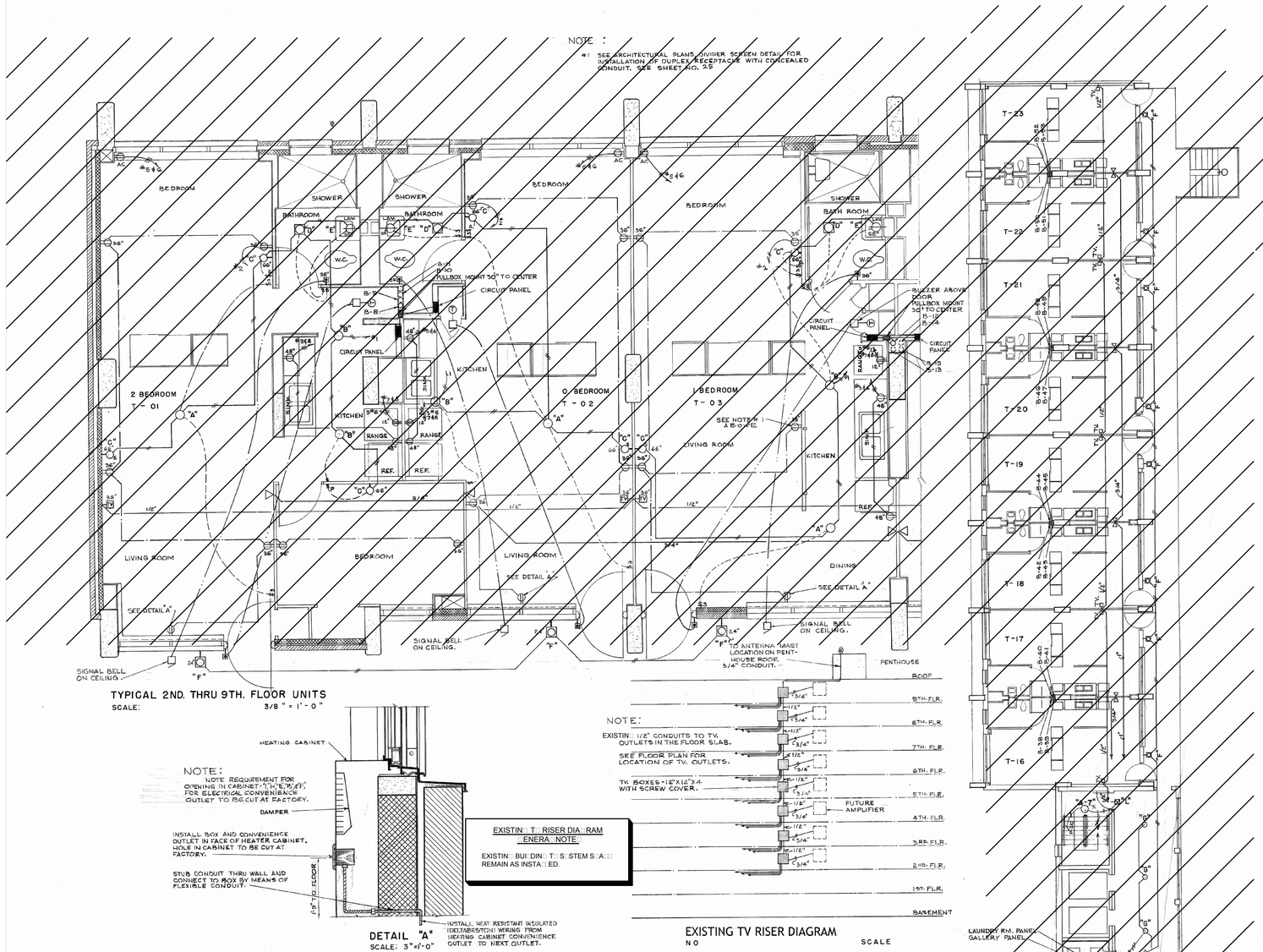


TYPICAL 2ND. THRU 9TH. FLOOR UNITS
SCALE: 3/8 " = 1' - 0 "

NOTE:
NOTE REQUIREMENT FOR OPENING IN CABINET-"J","E","S","F" FOR ELECTRICAL CONVENIENCE OUTLET TO BE CUT AT FACTORY.

DETAIL "A"
SCALE: 3"=1'-0"

EXISTING TV RISER DIAGRAM
NO SCALE

NOTE:
EXISTING 1/2" CONDUITS TO TV. OUTLETS IN THE FLOOR SLAB.
SEE FLOOR PLAN FOR LOCATION OF TV. OUTLETS.
TV. BOXES - 18"X12"X4" WITH SCREW COVER.
FUTURE AMPLIFIER

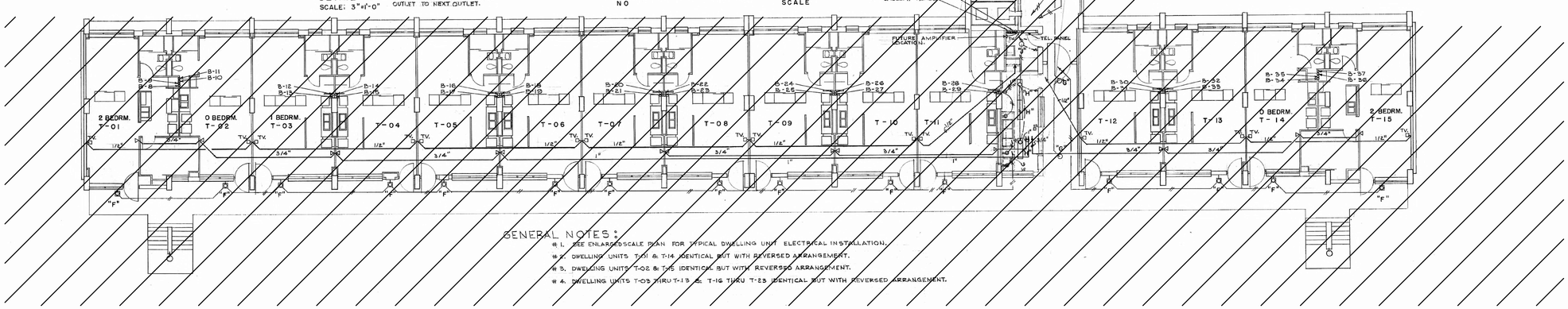
EXISTING TV RISER DIAGRAM
GENERAL NOTE:
EXISTING BUILDING TV SYSTEM SHALL REMAIN AS INSTALLED.

ELECTRICAL SYMBOL SCHEDULE

- — RECESSED WALL OUTLET
- — RECESSED CEILING OUTLET
- — CEILING OUTLET
- — BRACKET OUTLET
- — BRACKET FIXTURE (SWITCH INTEGRAL)
- J — JUNCTION BOX
- — DUPLEX CONVENIENCE RECPT.
- — BRACKET FIXTURE WITH RECPT.
- — FLOOR RECEPTACLE
- — RANGE OUTLET
- — WASHING MACHINE OUTLET
- — EXIT LIGHT OUTLET
- — SPECIAL PURPOSE OUTLET (DESCRIBE IN SPEC.)
- S — SINGLE POLE SWITCH
- S^2 — DOUBLE POLE SWITCH
- S^3 — THREE-WAY SWITCH
- S^4 — FOUR-WAY SWITCH
- S^L — LOCKING TYPE SWITCH
- S^P — SWITCH AND OUTLET WITH NIGHT LIGHT
- PC — PULL CHAIN SWITCH
- G — GLOCK OUTLET
- M 1/2 — MOTOR - 1/2 HORSEPOWER, ETC.
- — CONDUCTOR GOING DOWN
- — CONDUCTOR GOING UP
- — CONTROLLER
- — SERVICE EQUIPMENT (DESCRIBE IN SPEC.)
- — LIGHTING PANEL
- — POWER PANEL
- — FEEDER DISTRIBUTION PANEL
- — PULL BOX
- — METER
- 2 — BRANCH CIRCUIT TO PANEL - CIRCUIT NOS. 1,2,3, ETC.
- — BRANCH CIRCUIT; CONCEALED IN CEILING OR WALL
- — SWITCHING DESIGNATION
- — BRANCH CIRCUIT; CONCEALED IN FLOOR
- — FEEDER CONCEALED
- — FEEDER EXPOSED
- — PUSH BUTTON
- — BUZZER
- T — BELL RINGING TRANSFORMER
- — TELEPHONE OUTLET
- — PUBLIC TELEPHONE OUTLET
- — SIGNAL CONDUCTORS IN RACEWAY (CONCEALED)
- TV — TELEVISION CONVENIENCE RECPT.

GENERAL NOTES:

1. REMOVE EXISTING BRANCH CIRCUIT AND FEEDER CONDUCTORS.
2. REMOVE EXISTING PANEBOARDS IN RESIDENT UNITS.
3. REMOVE EXISTING LIGHTING FIXTURES AND TRIM DEVICES. EXISTING RACEWAYS, SIGNAL SYSTEM, EXISTING BOXES AND STRUCTURE MAY BE REUSED IF APPROPRIATE FOR NEW WORK.
4. TV AND TEL EQUIPMENT OUTLETS AND CABLES SHALL REMAIN AS INSTALLED U.O.N.
5. REMOVE ALL FIRE ALARM DEVICES AND CABLES.



GENERAL NOTES:
#1. SEE ENLARGED SCALE PLAN FOR TYPICAL DWELLING UNIT ELECTRICAL INSTALLATION.
#2. DWELLING UNITS T-01 & T-14 IDENTICAL BUT WITH REVERSED ARRANGEMENT.
#3. DWELLING UNITS T-02 & T-13 IDENTICAL BUT WITH REVERSED ARRANGEMENT.
#4. DWELLING UNITS T-03 THRU T-12 & T-16 THRU T-23 IDENTICAL BUT WITH REVERSED ARRANGEMENT.

1 ED0.3 TYPICAL 2 THRU 9 FLOOR PLAN – DEMOLITION
SCALE: 1/8" = 1'-0"

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PROFESSIONAL ENGINEER
05.25.2018

PROJECT ARCHITECT
JAMES DURAND-HOLLIS, AIA
PROJECT MANAGER

TYPICAL 2 THRU 9 FLOOR PLAN - DEMOLITION ELECTRICAL

SHEET NUMBER
ED0.3

□ENERA□ NOTES□

1. A□□EXISTIN□ □□□TIN□ □IXTURES S□A□□ BE REMO□ED AND RE□□A□ED. REMO□E AND RE□□A□E □ONDU□TORS, EXISTIN□ RA□E□ A□ MA□ BE REUSED I□A□□RO□RIATE □OR NE□ □ OR□.
2. A□□EXISTIN□ □□□TIN□ S□IT□□ES ASSO□IATED □IT□ T□E □□□TIN□ □IXTURES BEIN□ REMO□ED S□A□□ BE REMO□ED.

1 ED1.0 BASEMENT – DEMOLITION – LIGHTING
SCALE: 1/4" = 1'-0"

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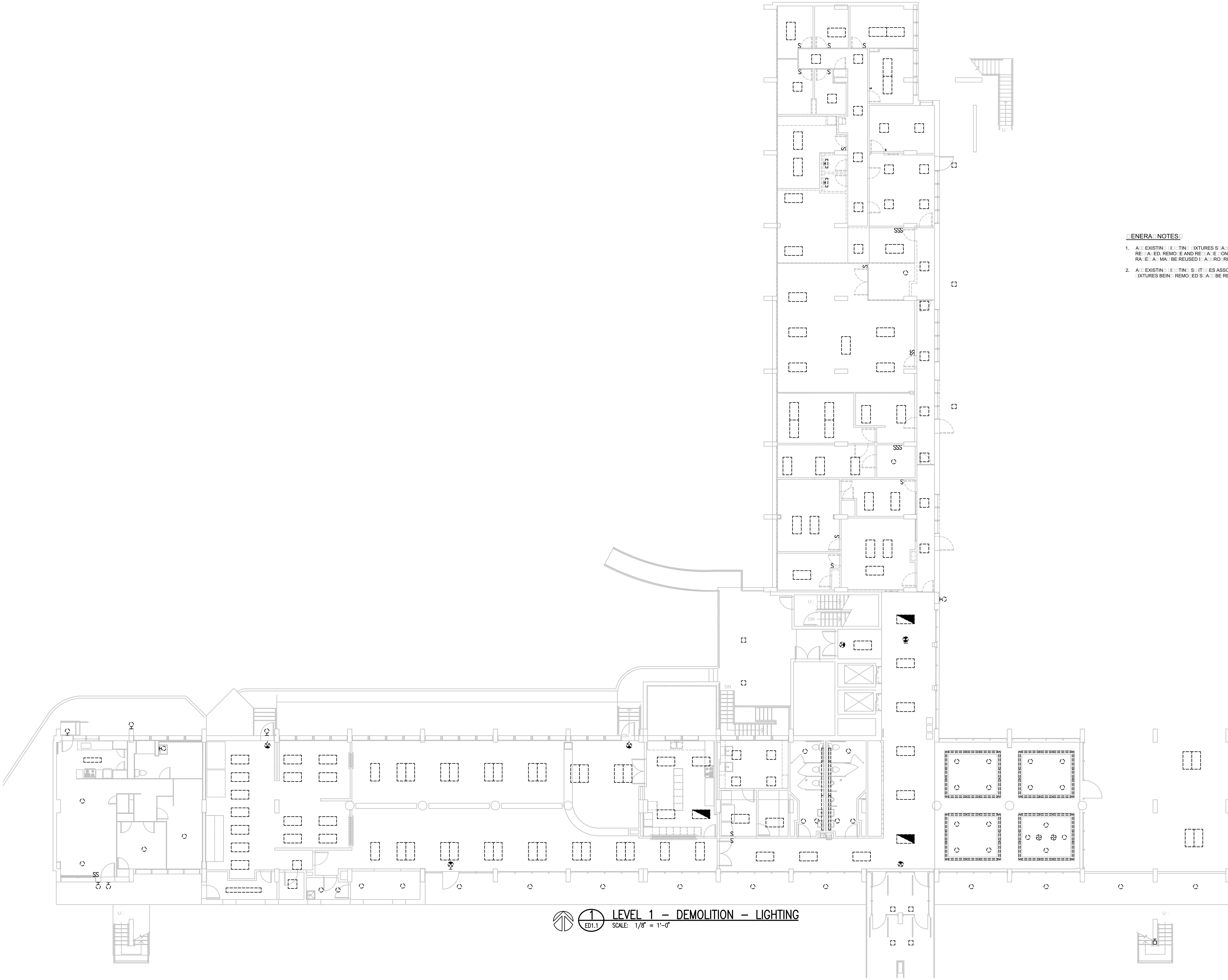
PROJECT ARCHITECT
DANIEL THOMAS HOLLIS, AIA
STATE LICENSE NO. 13-13847

BASEMENT - DEMOLITION - LIGHTING

SHEET NUMBER
ED1.0



1 ED1.1 LEVEL 1 – DEMOLITION – LIGHTING
SCALE: 1/8" = 1'-0"

□ENERA□ NOTES□

1. A□□ EXISTIN□ □I□□TIN□ □IXTURES S□A□□ BE REMO□ED AND RE□□A□ED. REMO□E AND RE□□A□E □ONDU□TORS. EXISTIN□ RA□E□ A□ MA□ BE REUSED I□ A□□RO□RIATE □OR NE□ □OR□.
2. A□□ EXISTIN□ □I□□TIN□ S□IT□□ES ASSO□IATED □IT□ T□E □I□□TIN□ □IXTURES BEIN□ REMO□ED S□A□□ BE REMO□ED.

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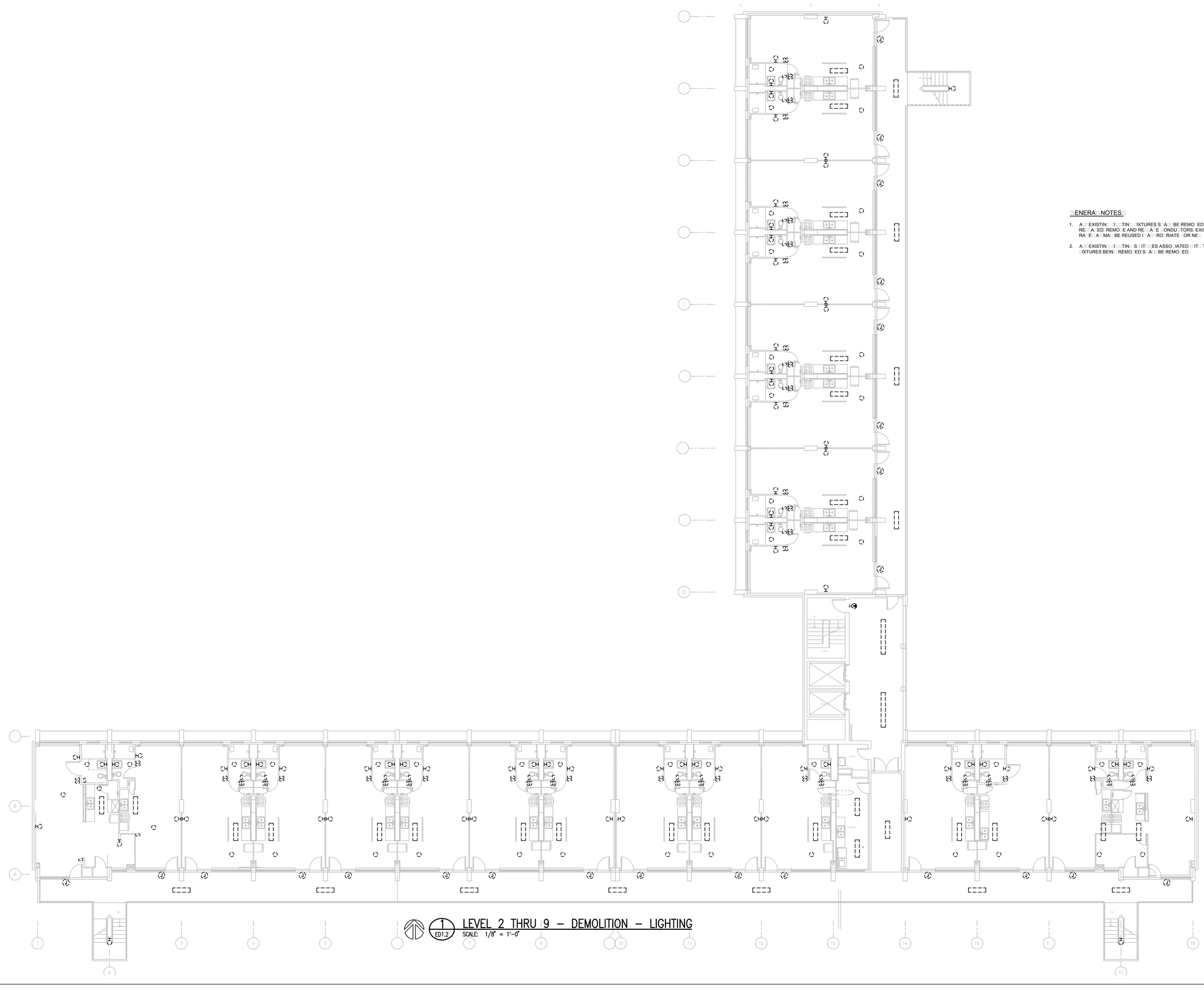
05.25.2018

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

LEVEL 1 - DEMOLITION - LIGHTING

SHEET NUMBER
ED1.1



1 ED1.2 LEVEL 2 THRU 9 – DEMOLITION – LIGHTING
SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. ALL EXISTING LIGHTING FIXTURES SHALL BE REMOVED AND RETURNED TO THE OWNER AND RELOCATED ELECTRICAL EQUIPMENT SHALL BE REUSED IN ACCORDANCE WITH NEW LIGHTING FIXTURES.
2. ALL EXISTING LIGHTING FIXTURES ASSOCIATED WITH THE EXISTING LIGHTING FIXTURES BEING REMOVED SHALL BE REMOVED.

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PROJECT ARCHITECT
DARREL DURAND-HOLLIS, AIA
STATE LICENSE NO. 15-9841

LEVEL 2 THRU 9 - DEMOLITION - LIGHTING

SHEET NUMBER
ED1.2

1 ED1.3 ROOF LEVEL – DEMOLITION – LIGHTING
SCALE: 1/8" = 1'-0"

□ENERA□ NOTES□

1. A□□ EXISTIN□ □I□ □TIN□ □IXTURES S□A□□ BE REMO□ED AND RE□□A□ED. REMO□E AND RE□□A□E □ONDU□TORS. EXISTIN□ RA□E□ A□ MA□ BE REUSED I□ A□□RO□RIATE □OR NE□ □ OR□.
2. A□□ EXISTIN□ □I□ □TIN□ S□ IT□□ES ASSO□IATED □ IT□ T□E □I□ □TIN□ □IXTURES BEIN□ REMO□ED S□A□□ BE REMO□ED.

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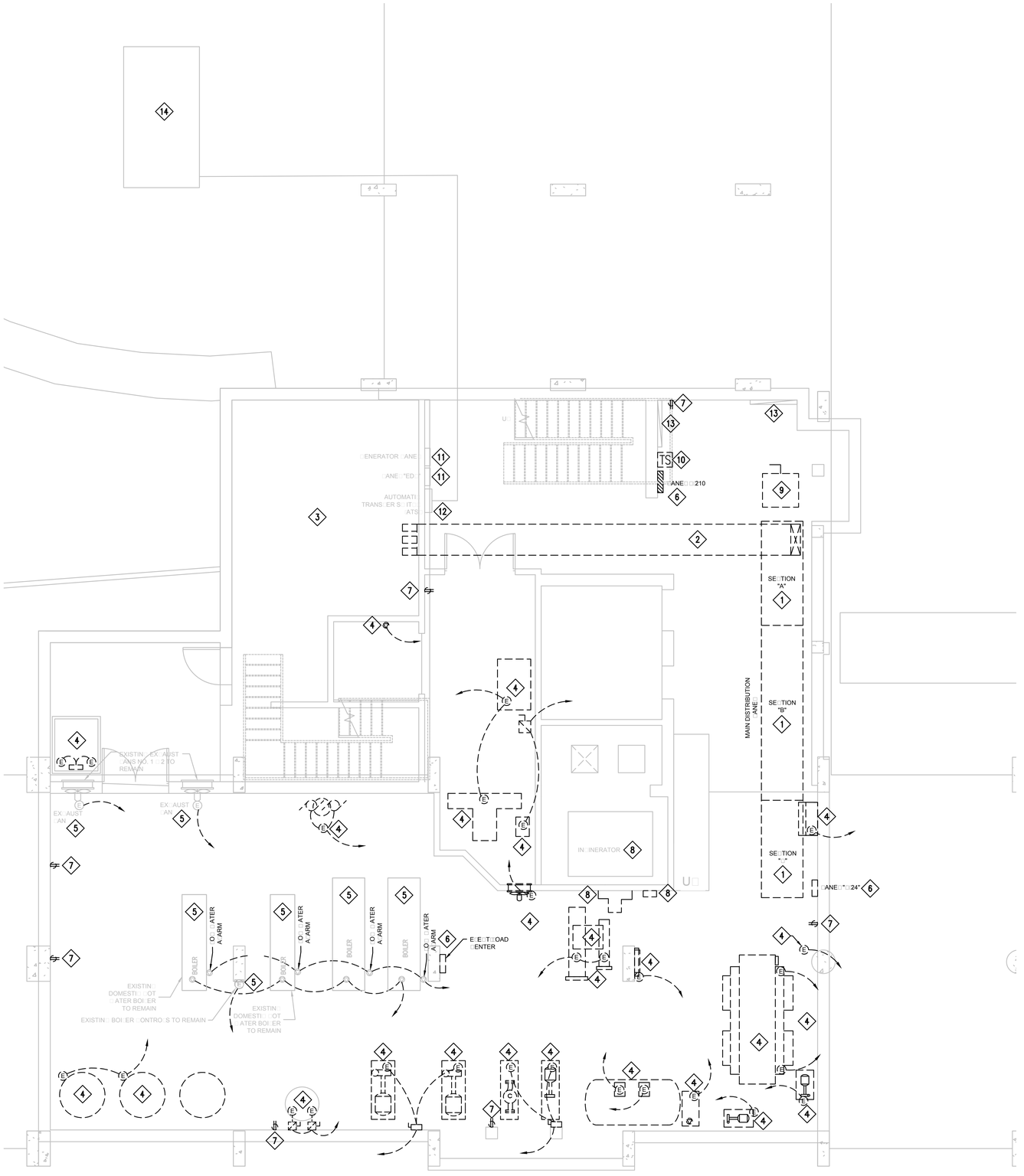
REGISTERED PROFESSIONAL ENGINEER
05.25.2018

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

ROOF LEVEL - DEMOLITION - LIGHTING

SHEET NUMBER
ED1.3



1 ED2.0 BASEMENT – DEMOLITION – ELECTRICAL
SCALE: 1/4" = 1'-0"

ENERA NOTES

1. A EXISTIN RE E TA ES OUT ETS S A BE REMO ED AND RE A ED, REMO E AND RE A E ONDU TORS, EXISTIN RA E A MA BE REUSED I A RO RIATE OR NE OR .
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E ED NOTES

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2. REMO E EXISTIN 4000AM , 208 120 O T BUS DU T ONNE TED TO EXISTIN TRANS ORMER TA BOX.
3. EXISTIN S TRANS ORMER AU T TO BE DE OMMISSIONED B S.
4. REMO E A E E TRI A ONNE TIONS AND A E E TRI A E UI MENT, EEDERS, BRAN IR UITS, ONTRO IRES, DIS ONNE TIN MEANS, STARTERS, ET , ROM EXISTIN A AND UMBIN E UI MENT DEMO IS ED, REMO E BRAN IR UIT BA TO SOUR E.
5. EXISTIN A AND UMBIN E UI MENT TO REMAIN, REMO E E E TRI A ONNE TIONS EEDERS AND BRAN IR UITS ROM E E TRI A S IT BOARD AND ANE BOARDS BEIN REMO ED, RO IDE NE EEDERS AND BRAN IR UITS ROM NE E E TRI A ANE BOARDS, SEE S EET E2.0 OR NE OR .
6. REMO E EXISTIN E E TRI A ANE BOARD AND EEDER.
7. REMO E AND RE A E EXISTIN IRIN DE I ES. REMO E AND RE A E ONDU TORS, EXISTIN RA E A MA BE REUSED I A RO RIATE OR NE OR , RE ER TO NE OR .
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11. EXISTIN ANE BOARDS TO REMAIN. EXISTIN EEDER TO ANE "ED ". RE ER TO E E TRI A ONE INE DIA RAM S EET E 1.
12. EXISTIN 1000AM AUTOMATI TRANS ER S IT ATS TO REMAIN. REMO E EXISTIN NORMA O ER EEDER, RO IDE NE NORMA O ER EEDER. RE ER TO E E TRI A ONE INE DIA RAM S EET E 1, T IS ATS, AND ASSO IATED EEDER AND ANE S S A BE REMO ED ON T E NE E E TRI A SER I E IS READ TO SER E T E BUI DIN E E ATORS AND NE STANDB O ER E UI MENT.
13. EXISTIN BUI DIN TE E ONE SER I E ENTRAN E TO REMAIN.
14. T E EXISTIN DIESE ENERATOR S A REMAIN IN SER I E UNTI NE E E TRI A S STEM IS A AI AB E TO O ERATE T E E E ATORS AND ESSENTIA STANDB O ER NEEDS OR T E BUI DIN .

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PROJECT ARCHITECT
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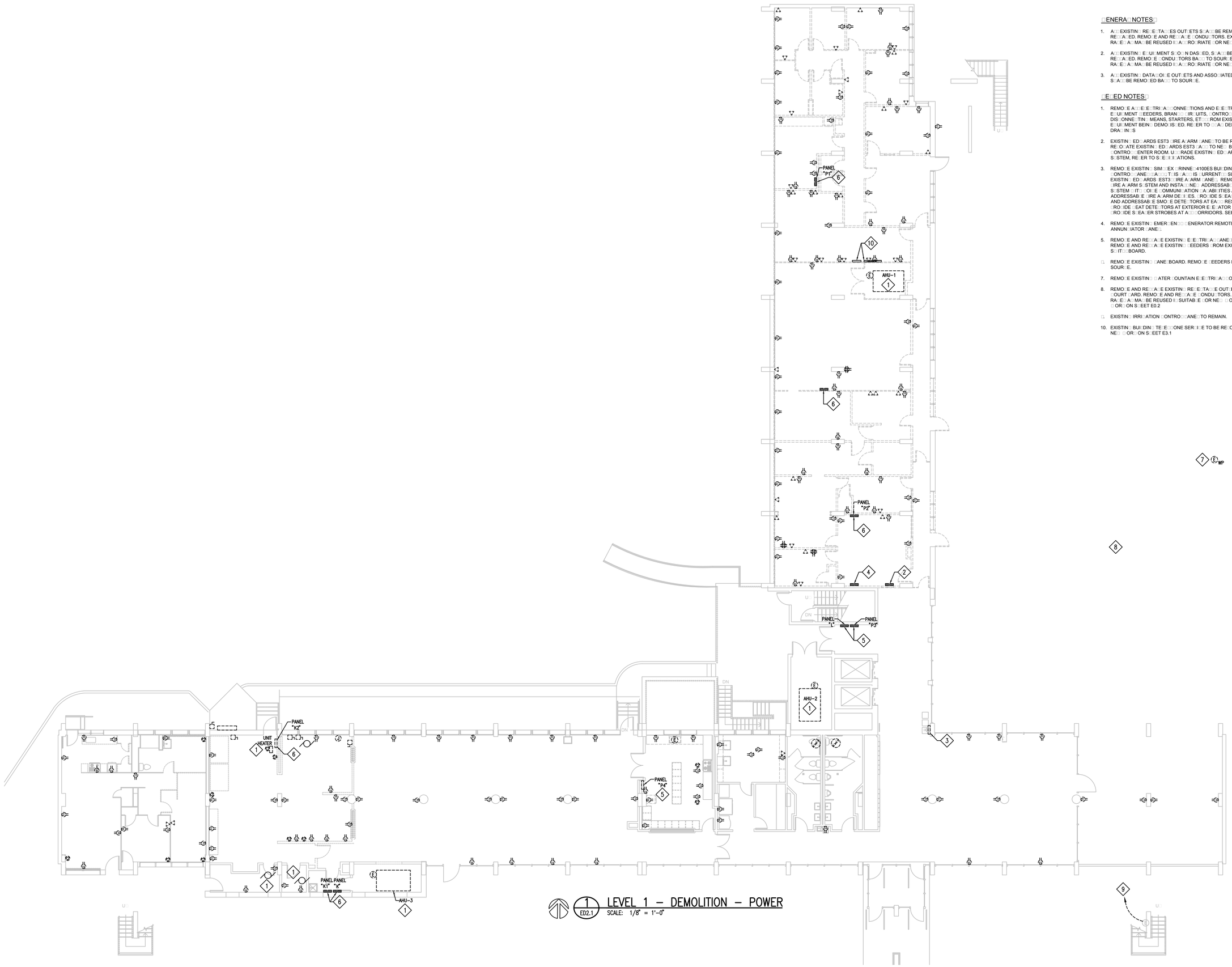
BASEMENT - DEMOLITION - ELECTRICAL

SHEET NUMBER
ED2.0



1 ED2.1 LEVEL 1 – DEMOLITION – POWER
SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. ALL EXISTING, RELATED ITEMS OUTLETS SHALL BE REMOVED AND RELOCATED, REMOVED AND RETURNED TO NEW LOCATIONS, EXISTING RACEWAY AND WIRE SHALL BE REUSED IF ALLOWED BY CODE OR NOTED.
2. ALL EXISTING, RELATED EQUIPMENT SHALL BE REMOVED AND RELOCATED, REMOVED AND RETURNED TO NEW LOCATIONS, EXISTING RACEWAY AND WIRE SHALL BE REUSED IF ALLOWED BY CODE OR NOTED.
3. ALL EXISTING DATA OUTLETS AND ASSOCIATED CONDUITS SHALL BE REMOVED BACK TO SOURCE.

KEYED NOTES:

1. REMOVE ALL ELECTRICAL CONNECTIONS AND ELECTRICAL EQUIPMENT, INCLUDING FEEDERS, BRANCH CIRCUITING, CONTROLLERS, DISCONNECTING MEANS, STARTERS, ETC. FROM EXISTING EQUIPMENT BEING DEMOLISHED, REFER TO ALL DEMOLITION DRAWINGS
2. EXISTING FEEDERS SHALL REMAIN ACTIVE TO BE RELOCATED, REFER TO ARCHITECTURAL DRAWINGS FOR NEW LOCATION. ENTER ROOM. UTILITY RACK EXISTING FEEDERS SHALL SYSTEM, REFER TO SPECIFICATIONS.
3. REMOVE EXISTING SIMPLEX RINNE 4100ES BUILDING FIRE ALARM CONTROL PANEL AND ASSOCIATED TRIM AS REQUIRED FOR NEW FIRE ALARM SYSTEM AND INSTALLING ADDRESSABLE FIRE ALARM SYSTEM AS REQUIRED BY CODE. COMMUNICATION ALARM ABILITIES AND ADDRESSABLE FIRE ALARM DEVICES. PROVIDE SPEAKER STROBES AND ADDRESSABLE SMOKE DETECTORS AT EACH RESIDENT UNIT. PROVIDE SPEAKER STROBES AT EXTERIOR ENTRATOR OBBIES, PROVIDE SPEAKER STROBES AT ALL CORRIDORS. SEE NOTE 10 ON
4. REMOVE EXISTING EMERGENCY GENERATOR REMOTE ANNUNCIATOR PANEL.
5. REMOVE AND RELOCATE EXISTING ELECTRICAL PANEL BOARD.. REMOVE AND RELOCATE EXISTING FEEDERS FROM EXISTING SWITCHBOARD.
6. REMOVE EXISTING PANEL BOARD. REMOVE FEEDERS BACK TO SOURCE.
7. REMOVE EXISTING WATER MOUNTAIN ELECTRICAL ALL CONNECTIONS.
8. REMOVE AND RELOCATE EXISTING, RELATED ITEMS OUTLETS IN TIME COURT YARD. REMOVE AND RETURN EXISTING RACEWAY AND WIRE SHALL BE REUSED IF SUITABLE FOR NEW OR NOTED ON SHEET E0.2
9. EXISTING IRRIGATION CONTROL PANEL TO REMAIN.
10. EXISTING BUILDING TELEPHONE SERVICE TO BE RELOCATED, SEE NOTE ON SHEET E3.1

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LEVEL 1 - DEMOLITION - POWER

SHEET NUMBER
ED2.1

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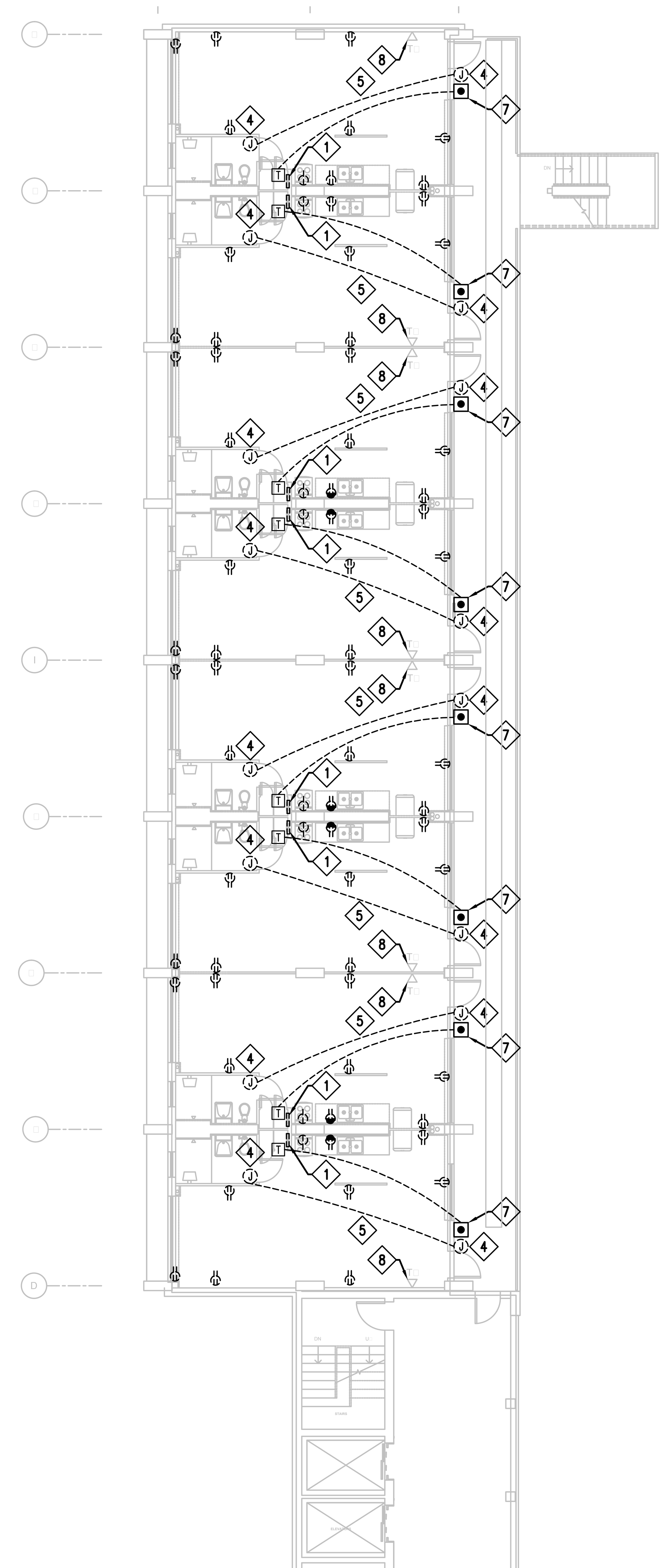
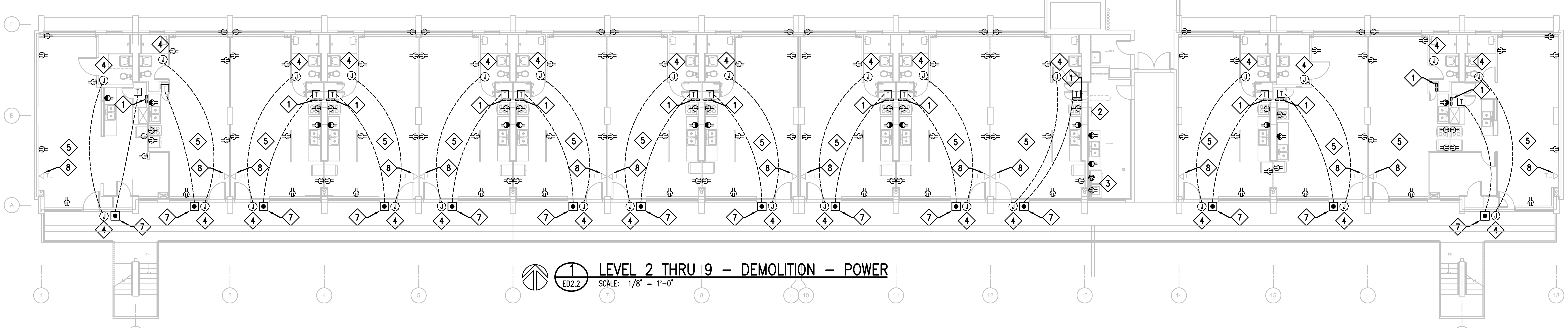
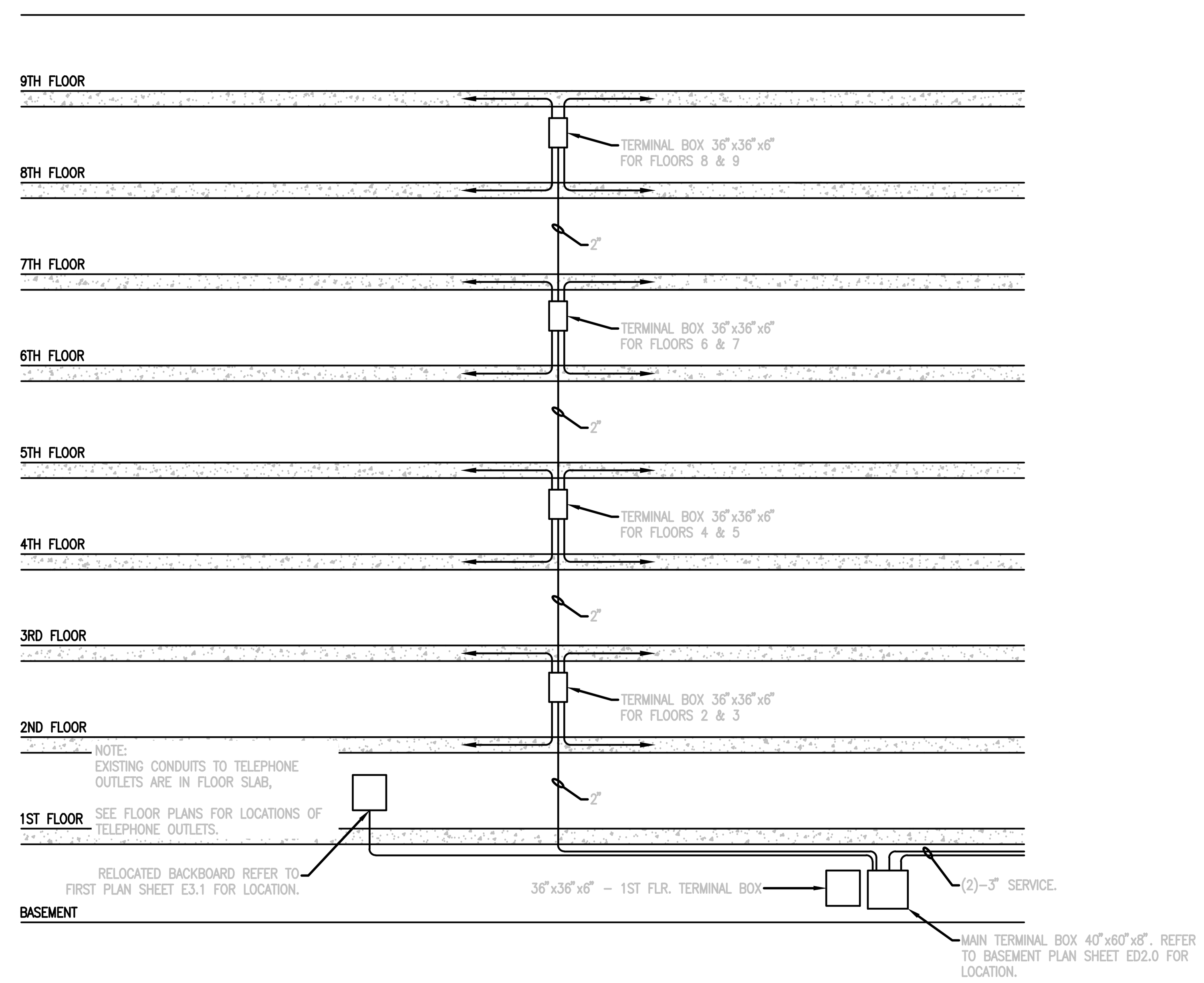



2 EXISTING TELEPHONE RISER DIAGRAM (TO REMAIN)
ED2.2 SCALE: NOT TO SCALE



1 LEVEL 2 THRU 9 – DEMOLITION – POWER
ED2.2 SCALE: 1/8" = 1'-0"

□ENERA□ NOTES□

1. A□□ EXISTIN□ RE□E□TA□□ES OUT□ETS S□A□□ BE REMO□ED AND RE□□A□ED. REMO□E AND RE□□A□E □ONDU□TORS. EXISTIN□ RA□E□ A□ MA□ BE REUSED I□ A□□RO□RIATE □OR NE□ □OR□.
2. A□□ EXISTIN□ E□UI□MENT S□O□ N DAS□ED, S□A□□ BE REMO□ED AND RE□□A□ED. REMO□E □ONDU□TORS BA□□ TO SOUR□E. EXISTIN□ RA□E□ A□ MA□ BE REUSED I□ A□□RO□RIATE □OR NE□ □OR□. UON.
3. A□□ EXISTIN□ TE□E□□ONE AND T□ OUT□ETS AND ASSO□IATED □ONDU□TORS S□A□□ REMAIN.

□E□ED NOTES□

1. REMO□E 100AM□, 120□240□O□T, 1□□ASE E□E□TRI□A□ □ANE□BOARDS AND □EEDERS IN EXISTIN□ RESIDENTIA□ UNITS □T□□I□A□□.
2. REMO□E EXISTIN□ □AUNDR□ ROOM, AND □A□□E□ 100AM□, 120□240□O□T, 1□□ASE E□E□TRI□A□ □ANE□BOARD AND □EEDER.
3. REMO□E EXISTIN□ □AUNDR□ ROOM □AS□ER□S□AND DR□ER□S□ □IRIN□ DE□I□ES AND ASSO□IATED BRAN□□ □IR□UITS.
4. REMO□E EXISTIN□ SI□NA□BE□□ IN EXISTIN□ RESIDENTIA□ UNITS. □T□□I□A□ □OR E□ER□ A□ARTMENT□IN□□UDIN□ □IRIN□.
5. REMO□E EXISTIN□ □IRIN□ DE□I□ES IN EXISTIN□ RESIDENTIA□ UNITS. □T□□I□A□□IN□□UDIN□ BRAN□□ □IR□UITS.

□. EXISTIN□ SUR□A□E MOUNTED □□ASTI□ RA□E□ A□ S□STEM □OR □AB□E T.□. □OAX □AB□E TO REMAIN.

7. REMO□E AND RE□□A□E EXISTIN□ A□ARTMENT DOOR BE□□.
8. EXISTIN□ T.□. OUT□ET TO REMAIN.

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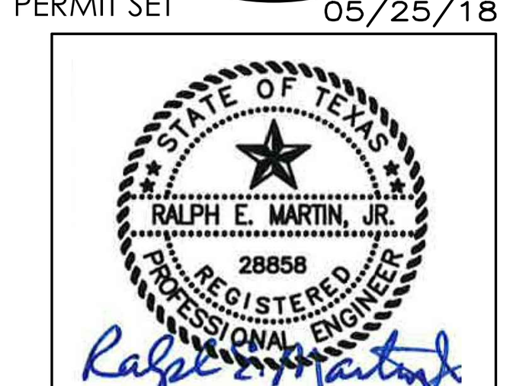
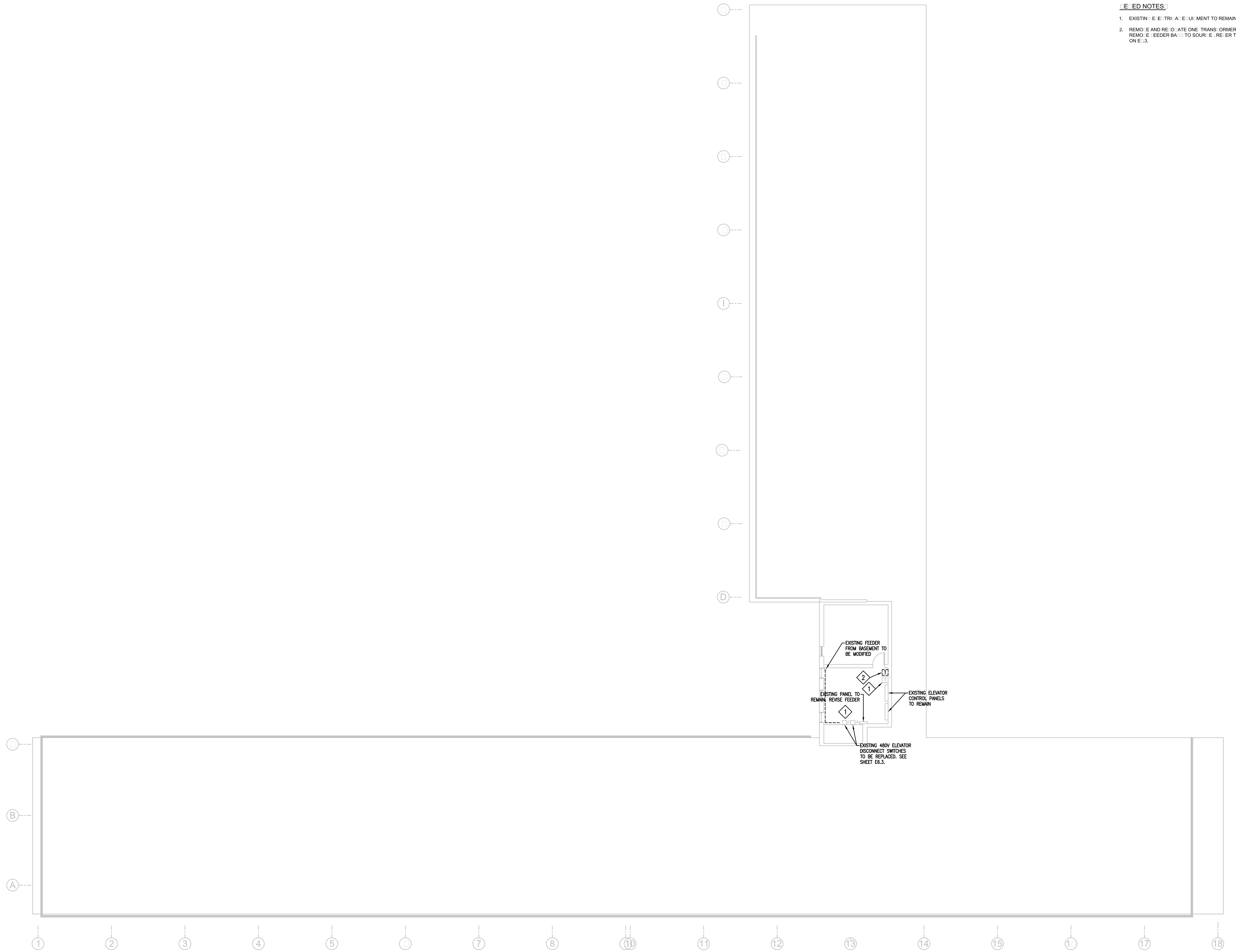


05.25.2018

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

LEVEL 2 THRU 9 - DEMOLITION - POWER

SHEET NUMBER
ED2.2



1 / ED2.3 ROOF LEVEL – DEMOLITION – POWER
SCALE: 1/8" = 1'-0"

□E□ED NOTES□

1. EXISTIN□ E□E□TRI□A□ E□UI□MENT TO REMAIN.
2. REMO□E AND RE□O□ATE ONE TRANS□ORMER TO BASEMENT. REMO□E □EEDER BA□□ TO SOUR□E . RE□ER TO ONE □INE DIA□RAM ON E□.3.

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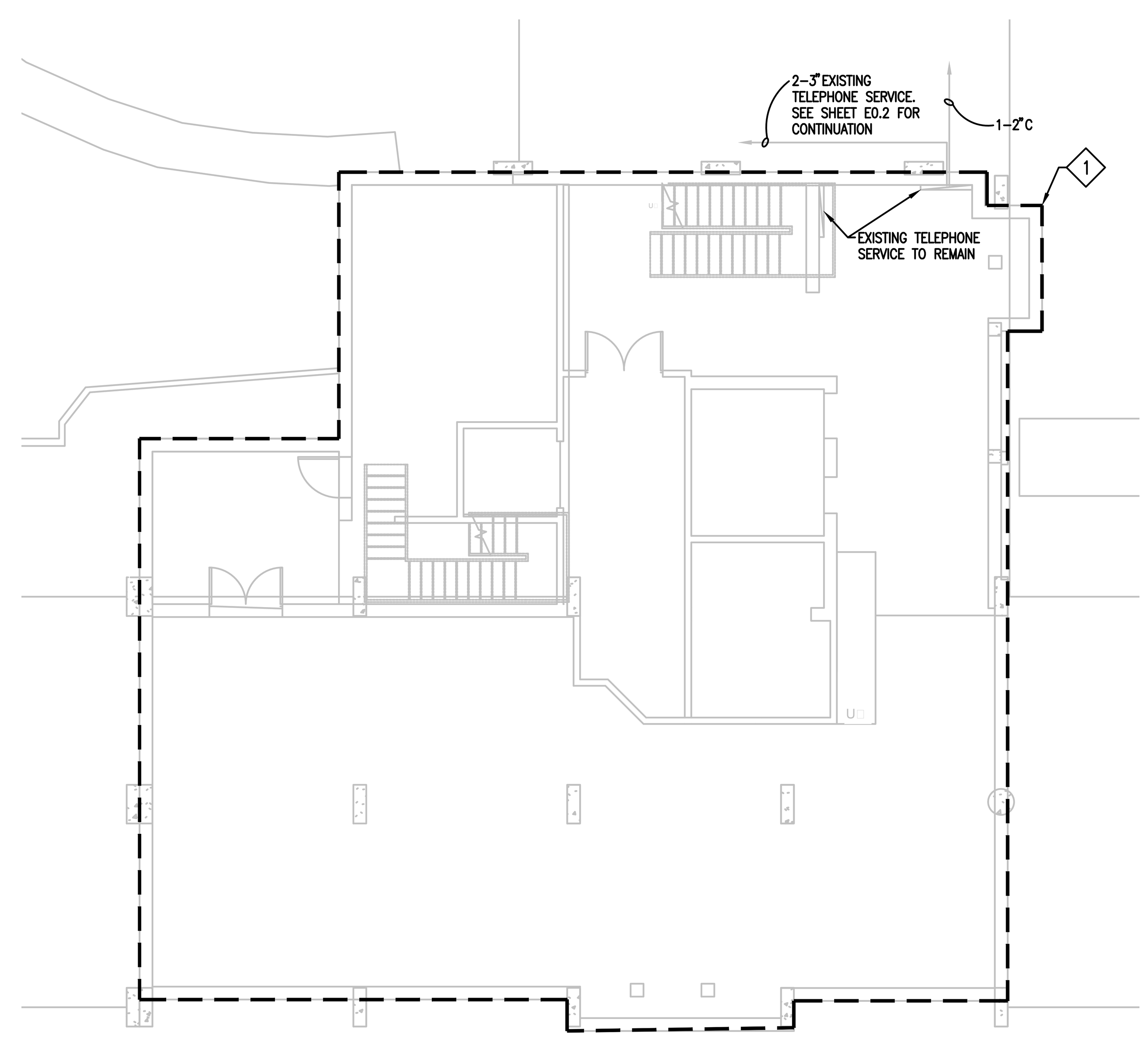
ROOF LEVEL - DEMOLITION - POWER

SHEET NUMBER
ED2.3



1 ED3.0 BASEMENT – DEMOLITION – SPECIAL SYSTEMS
SCALE: 1/8" = 1'-0"

□E□ED NOTES□

1. REMO□E A□□ EXISTIN□ □IRE A□ARM□S□E□IA□ S□STEMS DE□I□ES IN T□IS AREA.

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TEXAS LICENSE NO. 10-881

BASEMENT - DEMOLITION - SPECIAL SYSTEMS

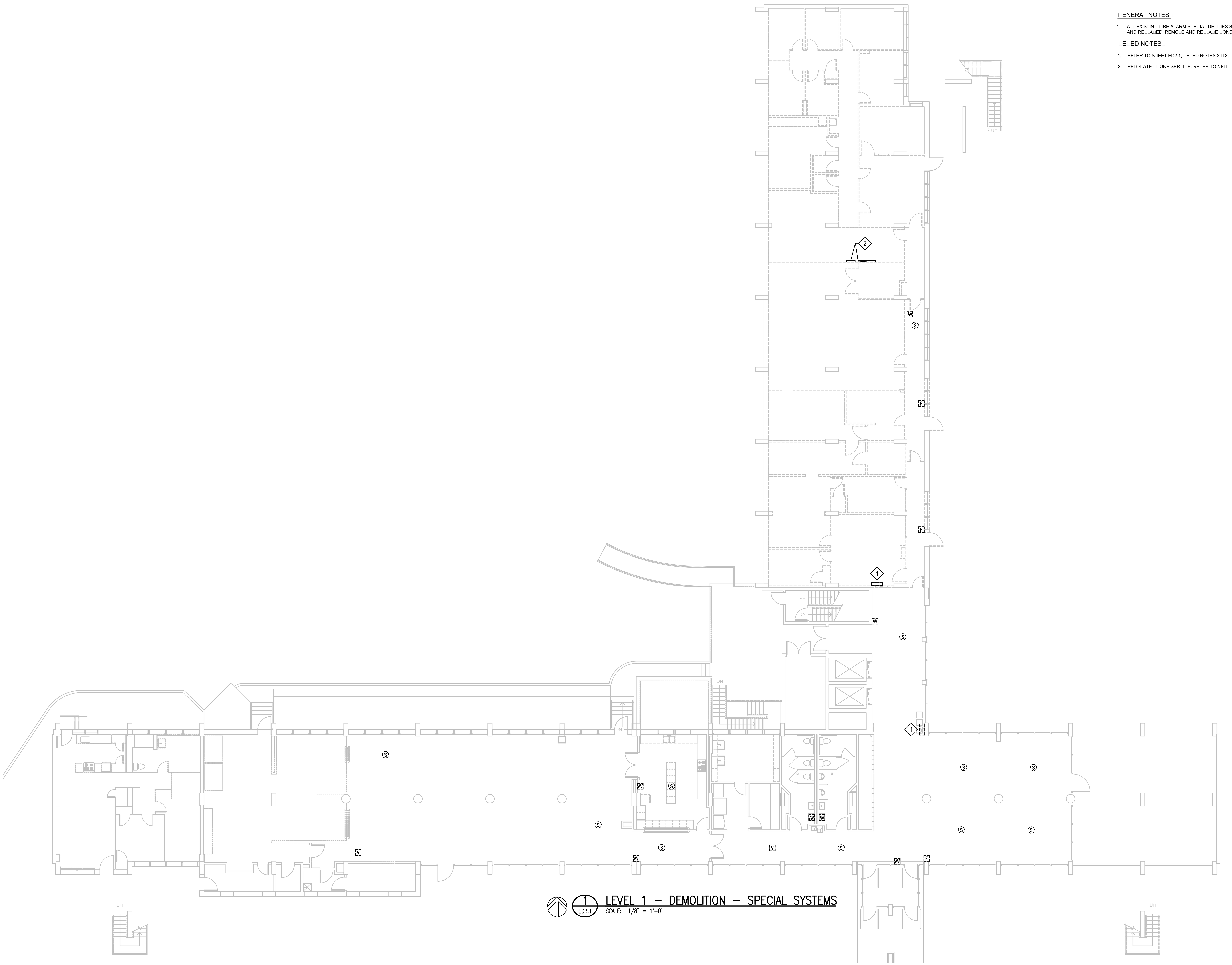
SHEET NUMBER
ED3.0

□ENERA□ NOTES□

1. A□□ EXISTIN□ □IRE A□ARM S□E□IA□ DE□I□ES S□A□□ BE REMO□ED AND RE□□A□ED. REMO□E AND RE□□A□E □ONDU□TORS.

□E□ED NOTES□

1. RE□ER TO S□EET ED2.1, □E□ED NOTES 2 □ 3.
2. RE□O□ATE □□ONE SER□I□E. RE□ER TO NE□ □ OR□ S□EET E3.1



1 ED3.1 LEVEL 1 – DEMOLITION – SPECIAL SYSTEMS
SCALE: 1/8" = 1'-0"

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TEXAS LICENSE NO. 10-881

LEVEL 1 - DEMOLITION - SPECIAL SYSTEMS

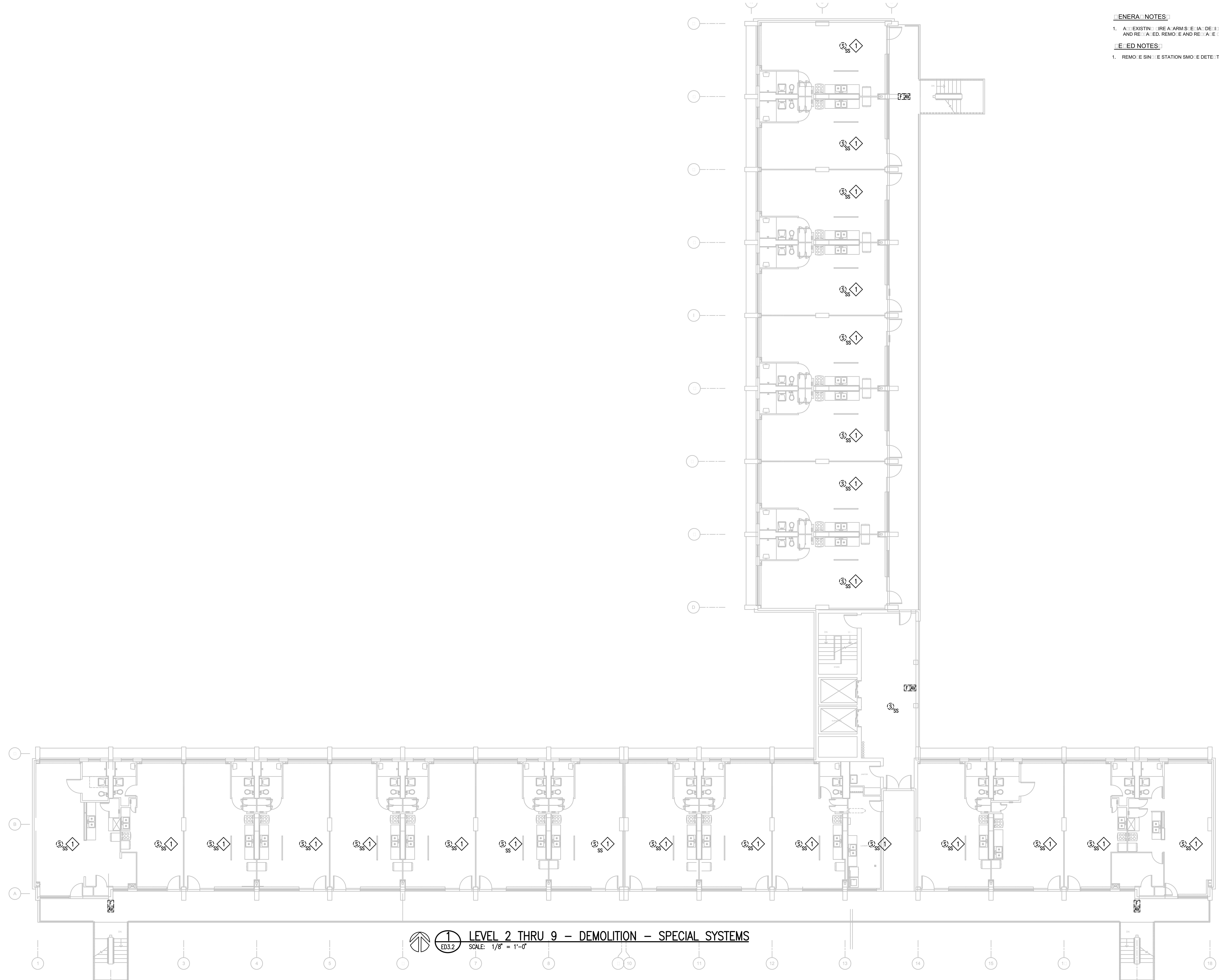
SHEET NUMBER
ED3.1

GENERAL NOTES:

1. ALL EXISTING FIRE ALARM SPECIAL DEVICES SHALL BE REMOVED AND REPLACED. REMOVE AND REPLACE CONDUCTORS.

KEYED NOTES:

1. REMOVE SINGLE STATION SMOKE DETECTORS.



1 ED3.2 LEVEL 2 THRU 9 – DEMOLITION – SPECIAL SYSTEMS
SCALE: 1/8" = 1'-0"

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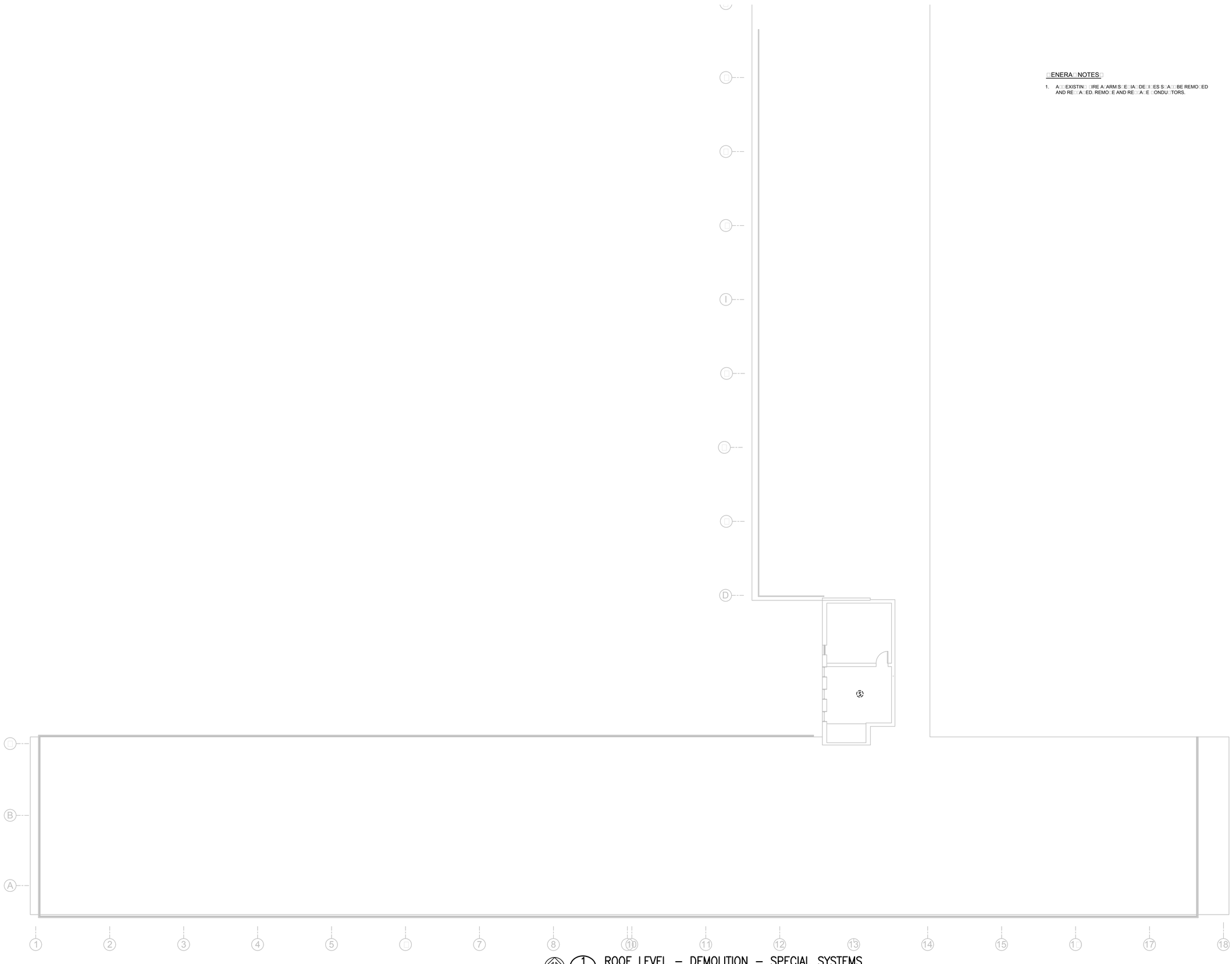
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

LEVEL 2 THRU 9 - DEMOLITION - SPECIAL SYSTEMS

SHEET NUMBER
ED3.2

□ENERA□NOTES□

1. A□□EXISTIN□□IRE A□ARM S□E□IA□DE□I□ES S□A□□ BE REMO□ED AND RE□□A□ED. REMO□E AND RE□□A□E □ONDU□TORS.



1 ED3.3 ROOF LEVEL – DEMOLITION – SPECIAL SYSTEMS
SCALE: 1/8" = 1'-0"

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PROJECT ARCHITECT
[redacted]

ROOF LEVEL - DEMOLITION - SPECIAL SYSTEMS

SHEET NUMBER
ED3.3

MAIN DISTRIBUTION PANEL, FEEDERS, & FEEDER CONNECTIONS

ENTIRE BOARD SERVED BY 4000 AMP. BUS-DUCT FROM MAIN METER LOOP

SECTION	LOAD ITEM	Ø	VOLTS	MAX. AMPS. PER LEG	FUSE SIZE	BRK. SIZE	STARTER	P.B.	PILOT LIGHT	FEEDER NO.	FEEDER SIZE	CONDUIT SIZE	REMOTE SWITCH	REMARKS
SECTION "A" 1200 AMP. MAIN DISCONNECT SW. SEPARATE METERING IN SECTION	CIRC. PAN. P-1 CLINIC AREA	3	120/208	139	–	175	NO	NO	NO	A-1	4-2/0 RH	2 1/2"	IN CIRC. PAN.	
	" " P-2 - OFF., LIB., & STOR.	3	120/208	107	–	175	NO	NO	NO	A-2	4-2/0 RH	2 1/2"	IN CIRC. PAN.	
	" " P-3 - E. LOBBY & PUB. TOIL.	3	120/208	107	–	150	NO	NO	NO	A-3	4-1/0 RH	2"	IN CIRC. PAN.	
	" " P-4 REC., KITCH. & OFFICES	3	120/208	149	–	200	NO	NO	NO	A-4	4-4/0 RH	3"	IN CIRC. PAN	
	" " P-5 MAINT. & STORAGE	3	120/208	107	–	175	NO	NO	NO	A-5	4-NO.2 RH	2"	IN CIRC. PAN.	
	" " P-6 - CUSTODIAN APT.	1	120/208	96	–	100	NO	NO	NO	A-6	3-2/0 RH	2 1/2	IN CIRC. PAN.	
	" " P-7 - YARD LIGHTS	3	120/208	160	–	200	200 A CONTACTOR	ON-OFF-AUTO	YES	A-7	4-3/0 RH	2 1/2"	IN CIRC. PAN	TIME CONTROL & CONTACTOR ABOVE PANEL
	(3) " " S-LAUNDRIES (2-4)	1	120/208	108	–	175	NO	NO	NO	A-8	3-NO.1 RH	1 1/2"	IN CIRC. PAN	SINGLE FEEDER TO 3 PANELS
	(3) " " S-LAUNDRIES (5-7)	1	120/208	108	–	175	NO	NO	NO	A-9	3-NO.1 RH	1 1/2"	IN CIRC. PAN	SINGLE FEEDER TO 3 PANELS
	(2) " " S-LAUNDRIES (8-9)	1	120/208	72	–	125	NO	NO	NO	A-10	3-NO.1 RH	1 1/2"	IN CIRC. PAN	SINGLE FEEDER TO 2 PANELS
	(3) " " S-GALLERIES (2-4)	1	120/208	36	–	50	EA. WITH ONE 50 AMPERE CONTACTOR. ONE TIME SW. FOR ALL 3.	ON-OFF-AUTO	YES	A-11	3-NO.6 RH	1"	IN CIRC. PAN	SINGLE FEEDER TO 3 PANELS
	(3) " " S-GALLERIES (5-7)	1	120/208	36	–	50		ON-OFF-AUTO	YES	A-12	3-NO.6 RH	1"	IN CIRC. PAN	SINGLE FEEDER TO 3 PANELS
	(2) " " S-GALLERIES (8-9)	1	120/208	20	–	50		ON-OFF-AUTO	YES	A-13	3-NO.6 RH	1"	IN CIRC. PAN.	SINGLE FEEDER TO 2 PANELS
	" " P-24 BAS. BOILER RM.	1	120/208	43	–	60	NO	NO	NO	A-14	4-NO.6 RH	1 1/4"	NO	BAS. LIGHTING & CONV. OUTLETS
	CONDENSATE PMP. - 2 - 3/4 h.p.	3	208	6	–	30	NO-AT PUMP	NO	NO	A-15	3-NO.12 RH	1/2"	2-30 AT PMP.	DUPLEX PMP. WITH ALTERNATOR
	UNDER FLR. PUMP - 2 - 2 h.p.	3	208	13	–		NO-AT PUMP	NO	NO	A-16	3-NO.10 RH	3/4"	2-30 AT PMP.	DUPLEX PMP. WITH ALTERNATOR
	BAS. VENT FAN #1 - 1 - 3/8 h.p.	1	120	7.2	–	30	SIZE 1	ON-OFF-AUTO	YES	A-17	2-NO.12 RH	1/2"	1-30 AT FAN.	OPERATION BY INDIVIDUAL THERMOSTAT
	BAS. VENT FAN #2 - 1 - 3/8 h.p.	1	120	7.2	–	30	SIZE 1	ON-OFF-AUTO	YES	A-18	2-NO.12 RH	1/2"	1-30 AT FAN	OPERATION BY INDIVIDUAL THERMOSTAT
	SEWAGE PUMP 2 - 1 1/2 h.p.	3	208	10	–	30	NO-AT PUMP	NO	NO	A-19	3-NO.10 RH	3/4"	2-30 AT PMP.	DUPLEX PUMP WITH ALTERNATOR
	ASH LIFT 5 H.P.	3	208	10	–	60	NO-AT LIFT	NO	NO	A-20	3-NO.8 RH	3/4"	YES	STARTER WITH UNIT
			UNDER-FLR PUMPS CHANGED TO EMERGENCY PANEL P-210											
SEC'D "D" CONN. DIRECT INCLUDE IN SECTION "A"	CIRC. PANEL P-210 (EXIT LTS.)	1	120/208	60		60	NO	NO	NO	D-1	3-NO.6 RH	1"	IN CIRC. PAN	EMERG. & EXIT - CONN. DIRECT TO 400A. BUS
	(CHANGED TO EMERGENCY PANEL AT NEW LOCATION)	WITH	1-30A-3Ø BKR & 9 SP-20A BKRS. (EXIT LTS - STAIR LTS - INTERCOM - BOILER ALARM - UNDERFLR PUMPS - ELEV. LTS)											
SECTION "C" 400 A. MAIN DISC. SW. SEP. METER IN SECT.	COMPRESSOR NO.1 - 30 h.p.	3	208	83	–	200	SIZE 3	ON-OFF-AUTO	YES	C-1	3-1/0 RH	2"	NO	
	COMPRESSOR NO.2 - 30 h.p.	3	208	83	–	200	SIZE 3	ON-OFF-AUTO	YES	C-2	3-1/0 RH	2"	NO	
	COND. PUMP NO.1 - 3 h.p.	3	208	10	–	30	SIZE 1	ON-OFF-AUTO	YES	C-3	3-NO.10 RH	1/2"	NO	
	COND. PUMP NO.2 - 3 h.p.	3	208	10	–	30	SIZE 1	ON-OFF-AUTO	YES	C-4	3-NO.10 RH	1/2"	NO	
	COOL. TOWER FAN NO.1 - 1 1/2 h.p.	3	208	5	–	30	SIZE 1	ON-OFF-AUTO	YES	C-5	3-NO.10 RL	1"	YES - W.P.	THERMOSTAT SW. CUT-OUT OVERRIDE
	COOL. TOWER FAN NO.2 - 1 1/2 h.p.	3	208	5	–	30	SIZE 1	ON-OFF-AUTO	YES	C-6	3-NO.10 RL	1"	YES - W.P.	— DO —
	FAN & COIL UNIT NO.1 - 5 h.p.	3	208	10	–	60	SIZE 1	ON-OFF	YES	C-7	3-NO.8 RH	3/4"	YES	
	FAN & COIL UNIT NO.2 - 5 h.p.	3	208	10	–	60	SIZE 1	ON-OFF	YES	C-8	3-NO.8 RH	3/4"	YES	
	FAN & COIL UNIT NO.3 - 5 h.p.	3	208	10	–	60	SIZE 1	ON-OFF	YES	C-9	3-NO.8 RH	3/4"	YES	
	CHILL WATER PUMP 2 - 5 h.p.	3	208	10	–	60	SIZE 1	ON-OFF-AUTO	YES	C-10	3-NO.8 RH	3/4"	1-3P/DT	ONE PMP. ALWAYS IN STANDBY.
	CONTROLS (AIR COND.)	3	120/208	5	–	30	NO	NO	NO	C-11	3-NO.12	1/2"	AS REQ'D.	SPECIAL CONTROLS - SEE AIR COND.
	CONTROLS (BOILERS)	3	120/208	5	–	30	NO	NO	NO	C-12	3-NO.12	1/2"	AS REQ'D.	SPECIAL CONTROLS - SEE AIR COND.
SECTION "B" 3000 A. MAIN DISC. SW. SEP. METER IN SECT.	ELEVATORS & PENTHOUSE CIRC. PANEL	3	120/208	230	–	400	NO	NO	NO	B-1	4-250 MCM-RH	3"	2-200 & 1-60	FEEDER TO PENTHOUSE SUB SWITCHES
	DWELLING UNIT HTG. PUMP 2-20 h.p.	3	208	55	–	100	SIZE 3	ON-OFF-AUTO	YES	B-2	3-NO.1 RH	1 1/2"	1-3P/DT	ONE PMP. ALWAYS IN STANDBY
	STAIRWELL LTG. (FLRS. 1-9)	1	120/208	16	–	30	NO	NO	NO	B-3	(IN PANEL)	—	NO	USE DISC. AS 2 CIRCUIT PANEL
	INCINERATOR BURNER	3	120/208	3	–	30	NO	NO	NO	B-4	3-NO.12 RH		YES	CONTROLS AT BURNER LOCATION
	WATER BOOSTER PMP. 5 h.p	3	208	10	–	60	SIZE 1	ON-OFF-AUTO	YES	B-5	3-NO.8 RH	3/4"	NO	CONTROLS AT PUMP LOCATION
	WATER BOOSTER PMP. 10 h.p.	3	208	28	–	100	SIZE 2	ON-OFF-AUTO	YES	B-6	3-NO.4 RH	1 1/4"	NO	CONTROLS AT PUMP LOCATION
	WATER BOOST. CONTROLS - 1 1/2 HP	3	120/208	6	–	30A	NO	NO	NO	B-7	3-NO.12	4-NO.12	AS REQ'D.	SPECIAL PANEL & AIR COMPRESSOR
	(4) CIRC. PANELS (DWELL. UNITS) ★	1	120/208	130	–	46-200A.	NO	NO	NO	(B-8 THRU B-53)	(VARIES - SEE SCHEMATIC)	—	—	184 CIRC. PANELS - 4 PANELS EA. FEEDER

★ THE ABOVE 46 SINGLE PH DISCONNECTS SHALL BE BALANCED BETWEEN PHASES A, B, C (15 ON A-B, 15 ON B-C AN 16 ON C-A)

NOTES: - BALANCE PHASE LOADS TO ABOVE LOADS WITHIN EACH SECTION - PILOT LIGHTS: GREEN OFF; AMBER HAND WHERE "HAND-OFF-AUTO", & ALL "ON" RED. - SEE SPECS. FOR LABELS ON PANEL

CIRCUIT PANEL SCHEDULE

PANEL NO.	FEEDER NO.	PHASE	MAIN BRK. AMPS.	TWO POLE BRKS. 50 AMP.	TWO POLE 30 AMP.	TWO POLE 20 AMP.	TWO POLE 15 AMP.	SINGLE POLE BRKS. 50 AMP.	SINGLE POLE 30 AMP.	SINGLE POLE 20 AMP.	SINGLE POLE 15 AMP.	CABINET FLUSH OR SURF.	CABINET DOOR	CABINET LOCK	FEEDER	REMARKS
P-1	A-1	3	150	1	–	–	–	–	–	26	–	F	YES	YES	2/0	
P-2	A-2	3	150	–	–	–	–	–	–	20	–	F	YES	YES	2/0	
P-3	A-3	3	150	–	–	–	–	–	–	20	–	F.	YES	YES	NO.1	
P-4	A-4	3	200	2	–	–	–	–	–	22	–	F	YES	YES	4/0	
P-5	A-5	3	150	–	–	–	–	–	–	20	–	F	YES	YES	NO.2	
P-6	A-6	1	125	1	–	–	3	–	–	8	–	F	NO	NO	2/0	
P-7	A-7	3	200	–		–	–	–	2	26	–	F	YES	YES	3/0	
P-8	A-8	1	60	–	–	1	–	–	–	–	6	F	NO	NO	NO.6	(FOR CLOTHES DRIERS)
P-9	A-8	1	60	–	–	1	–	–	–	–	6	F	NO	NO	NO.6	
P-10	A-8	1	60	–	–	1	–	–	–	–	6	F	NO	NO	NO.6	
P-11	A-9	1	60	–	–	1	–	–	–	–	6	F	NO	NO	NO.6	
P-12	A-9	1	60	–	–	1	–	–	–	–	6	F	NO	NO	NO.6	
P-13	A-9	1	60	–	–	1	–	–	–	–	6	F	NO	NO	NO.6	
P-14	A-10	1	60	–	–	1	–	–	–	–	6	F	NO	NO	NO.6	
P-15	A-10	1	60	–	–	1	–	–	–	–	6	F	NO	NO	NO.6	
P-16	A-11	1	30	–	–	–	–	–	–	–	2	F	NO	NO	NO.6	
P-17	A-11	1	30	–	–	–	–	–	–	–	2	F	NO	NO	NO.6	
P-18	A-11	1	30	–	–	–	–	–	–	–	2	F	NO	NO	NO.6	
P-19	A-12	1	30	–	–	–	–	–	–	–	2	F	NO	NO	NO.6	
P-20	A-12	1	30	–	–	–	–	–	–	–	2	F	NO	NO	NO.6	
P-21	A-12	1	30	–	–	–	–	–	–	–	2	F	NO	NO	NO.6	
P-22	A-13	1	30	–	–	–	–	–	–	–	2	F	NO	NO	NO.6	
P-23	A-13	1	30	–	–	–	–	–	–	–	2	F	NO	NO	NO.6	
P-24	A-14	1	150	–	–	–	–	–	–	–	16	SURF.	YES	NO	NO.2	
P-25	PENT HOUSE	1	60	–	–	–	–	–	–	–	8	SURF.	NO	NO	NO.6	
P-26 THRU P-209	B-8 THRU B-53 SEE REMARKS	1	100	1	–	–	1	–	–	4	–	F.	NO	NO	TAP FEEDER (UNDER 5') NO.2 RH	4 PANELS SERVED BY ONE SERVICE IN ALL INSTANCES. REFER TO RISER DIAGRAM THIS SHEET FOR SIZES.
P-210	D-1	1	60	–	–	–	–	–	–	6	–	S.	YES	NO	NO.6	EMERGENCY & EXIT LIGHTING CONN. TO 400A. BUS

SEE SPECS. FOR LABELS ON ALL CIRCUIT PANELS.

□ENERA□ NOTE□

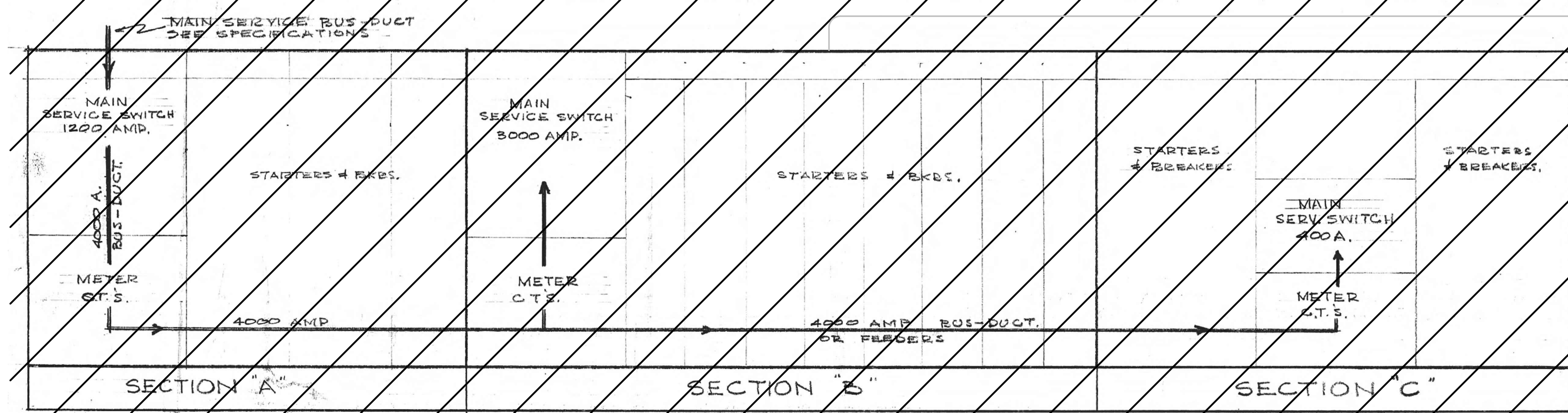
REMO□E EXISTIN□ 4,000AM□ 208□120□O□T, 3□SE□TION S□IT□□BOARD.

REMO□E A□□ □EEDERS SER□ED B□ EXISTIN□ S□IT□□BOARD.

REMO□E AND RE□□A□E E□E□TRI□A□ □ANE□BOARDS IN EXISTIN□ RESIDENTIA□ UNITS.

REMO□E EXISTIN□ □AUNDR□ ROOM E□E□TRI□A□ □ANE□BOARDS, AND EXISTIN□ □A□□ER□ E□E□TRI□A□ □ANE□BOARDS □ROM □E□E□2 T□ROU□□ □.

RE□ER TO □□OOR □□ANS □DEMO□ITION AND NE□ □OR□□□OR EXISTIN□ E□E□TRI□A□ □ANE□BOARDS AND E□E□TRI□A□ E□UI□MENT NOTED TO REMAIN.

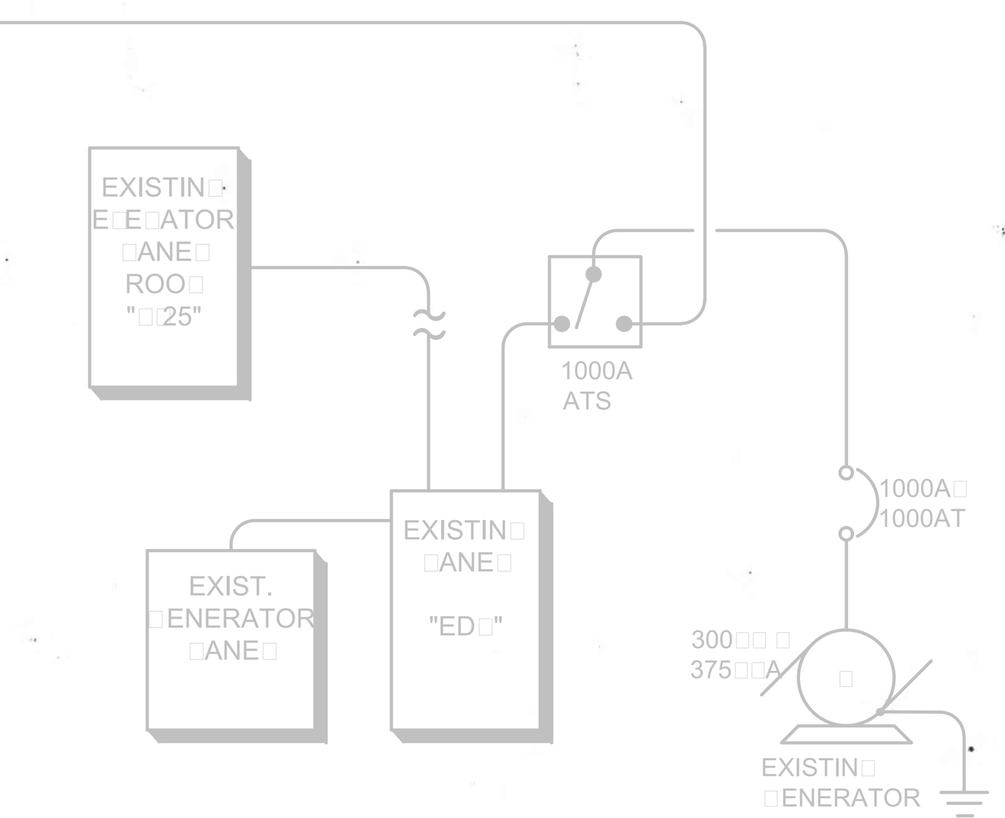


ALL FEEDER SHALL EXIT THRU TOP

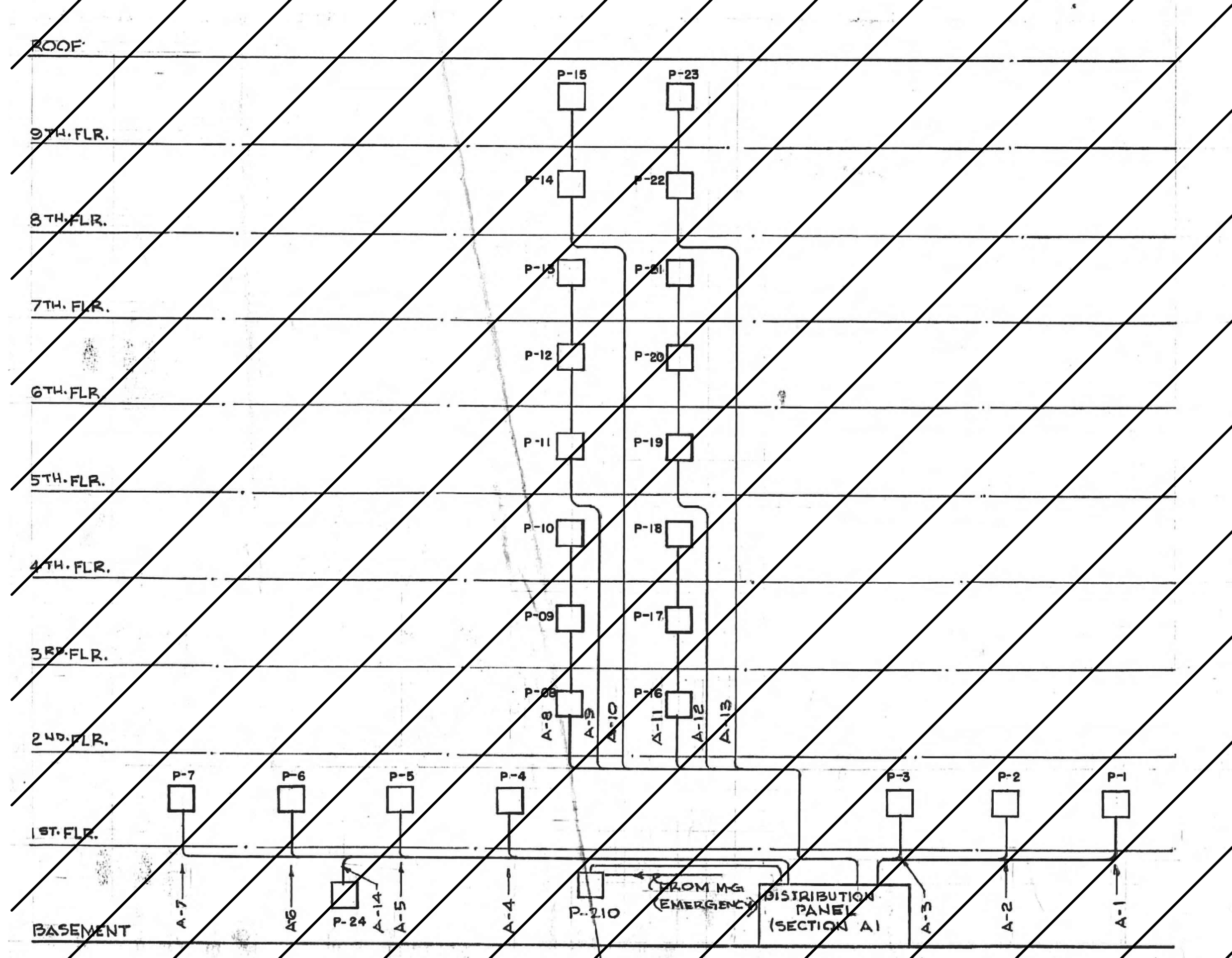
SEE SPECIFICATIONS FOR COMPONENTS.

THIS SKETCH IS DIAGRAMATIC ONLY

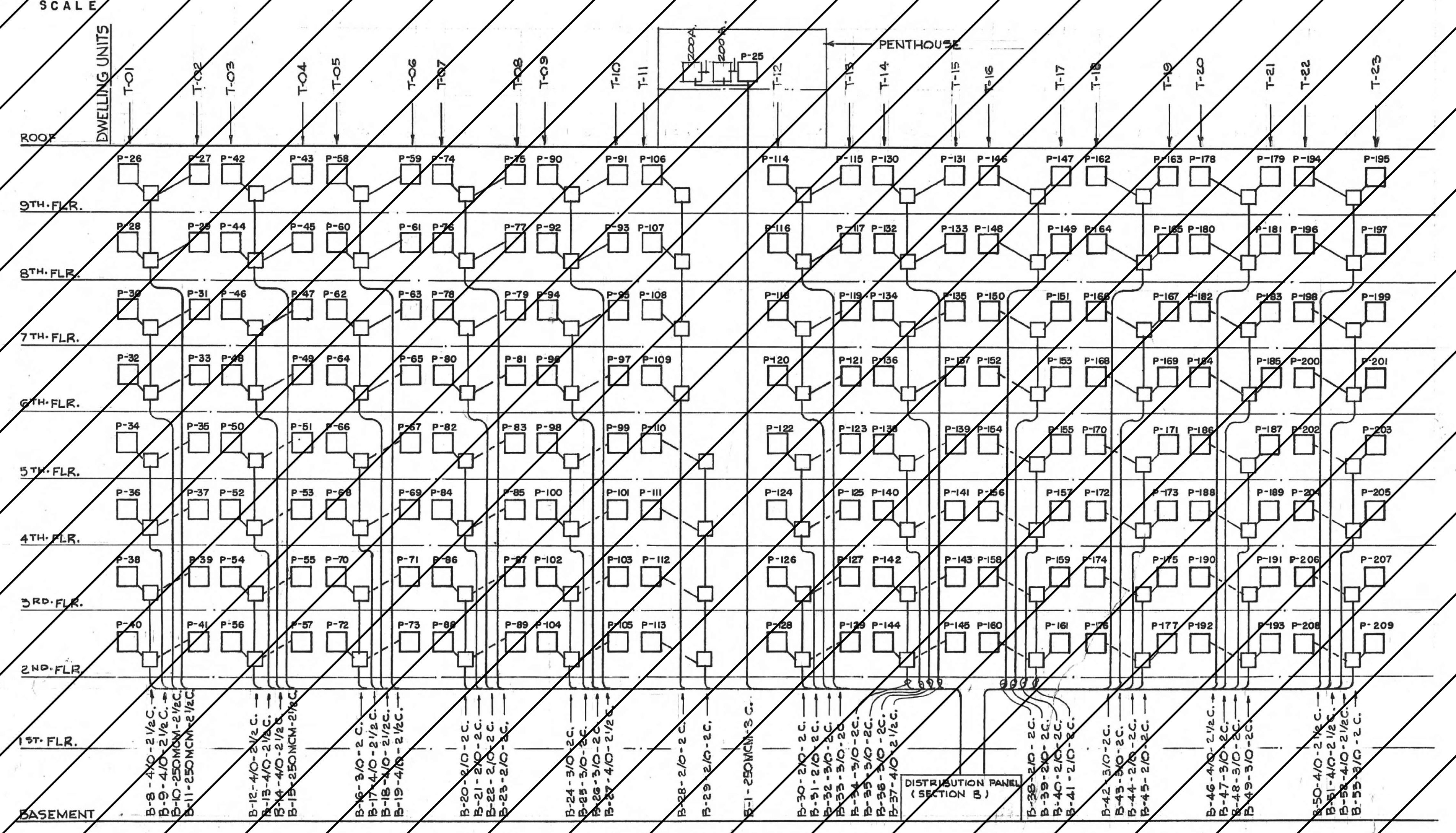
MAIN DISTRIBUTION PANEL – ELEVATION
NO SCALE



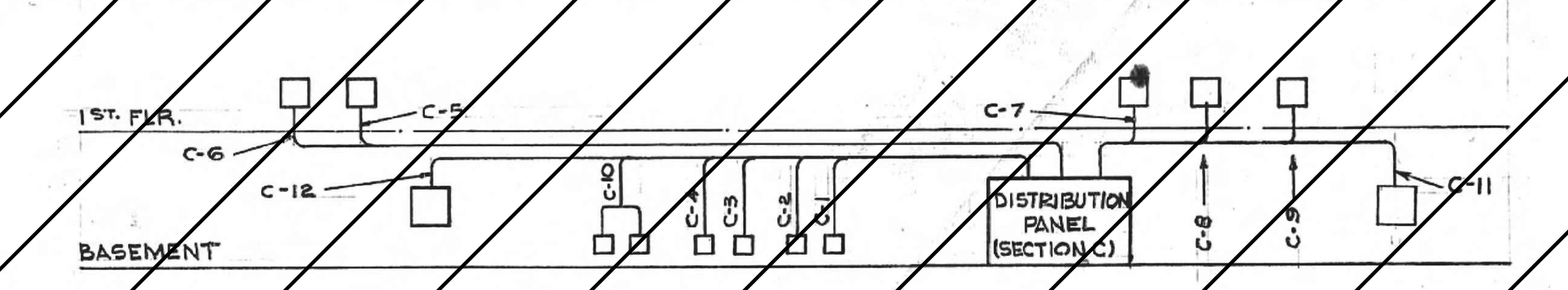
□ENERATOR TO REMAIN TO SER□E E□E□ATORS UNTI□ NE□ □□S E□E□TRI□ SER□I□E IS □OM□□ETED



SCHEMATIC SECTION "A" RISER DIAGRAM
NO SCALE



SCHEMATIC DWELLING UNITS RISER DIAGRAM
NO SCALE



SCHEMATIC SECTION "C" RISER DIAGRAM
NO SCALE

AS BUILT DRAWING

ELECTRICAL SCHEDULES & DET

1 ED6.1 EXISTING ELECTRICAL RISER DIAGRAM, DISTRIBUTION & CIRCUIT PANELS – DEMOLITION

SCALE: NOT TO SCALE

DHR ARCHITECTS
DURAND–HOLLIS RUPE ARCHITECTS, INC.
14603 HUEBNER ROAD BUILDING 18 SAN ANTONIO, TEXAS 78230
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OWNER:
SAHA SAN ANTONIO HOUSING AUTHORITY Opportunity Lives Here
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H2MG
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Office: 210.525.0220
Fax: 210.525.0225
Texas Firm Registration #F-12003

SAN ANTONIO HOUSING AUTHORITY VICTORIA PLAZA MODERNIZATION

411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

PERMIT SET 05/25/18

STATE OF TEXAS RALPH E. MARTIN, JR. 28858 REGISTERED PROFESSIONAL ENGINEER
05.25.2018

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

EXISTING ELECTRICAL RISER DIAGRAM, DISTRIBUTION & CIRCUIT PANELS - DEMOLITION

SHEET NUMBER
ED6.1

6/12/2017 1:01:24 PM Z:\99060 - Victoria Plaza Modernization\Phase 1\DESIGN\ELECT\99060-ED6.1.dwg

ELECTRICAL LEGEND (NOTE: ALL SYMBOLS SHOWN ARE NOT NECESSARILY USED ON DRAWINGS)

LIGHTING

- A — LED LIGHTING FIXTURE. LETTER INDICATES TYPE.
- A — LIGHTING FIXTURE.
- A — WALL MOUNTED LIGHTING FIXTURE.
- EXIT LIGHTING FIXTURE. ARROW, WHEN USED, INDICATES DIRECTION.(BRACKET WHEN USED INDICATES WALL MOUNTED). SHADED AREA(S)INDICATE FACE(S).
- EMERGENCY. "NL" DESIGNATION DEPICTS NIGHT LIGHTING FIXTURE.
- S — SINGLE POLE SWITCH..
- O — (O INDICATES A OCCUPANCY SENSOR WALL SWITCH, EQUIVALENT TO SENSORSWITCH #WSX-PDT-D-SA-WH.)
- LV — (LV INDICATES A LOW VOLTAGE SWITCH, REFER TO PLANS FOR EXACT PART NUMBERS.)
- D — (D INDICATES A 120V DIMMER SWITCH COMPATIBLE WITH SPECIFIED LED DIMMABLE FIXTURES.)
- D3 — (D3 INDICATES A 3-WAY, 120V DIMMER SWITCH COMPATIBLE WITH SPECIFIED LED DIMMABLE FIXTURES.)
- 2 — (2 INDICATES A TWO POLE WALL SWITCH WITH RAISE/LOWER, EQUIVALENT TO SENSORSWITCH #nPODM-2P-DX.)
- T — TIMER SWITCH. WALL MOUNTED IN SWITCH BOX AT 48"AFF UON. PTS-60-X- OR EQUAL
- OS — ROOM OCCUPANCY SENSOR. CEILING MOUNT, EQUIVALENT TO nLIGHT #nCM PDT 9.
- OS1 — ROOM OCCUPANCY SENSOR. CORNER MOUNT, EQUIVALENT TO nLIGHT #nWV PDT 16.
- OSP — OCCUPANCY SENSOR POWER PACK, EQUIVALENT TO nLIGHT #nPP16.
- OSP1 — POWER PACK, EQUIVALENT TO nLIGHT #nPP16-D.
- OSP2 — POWER PACK, EQUIVALENT TO nLIGHT #nPP16-ER.
- LCR — EMERGENCY LIGHTING CONTROL RELAY NINE 24 #ELCR SEE DETAIL 5 ON SHEET E5.1

WIRING DEVICES

- C — DUPLEX RECEPTACLE, 18" AFF UON. DECORATOR SERIES. ('C' INDICATES CEILING MOUNTED). NEMA 5-20R, UON.
- GFI WP — DUPLEX RECEPTACLE WITH INTERNAL GROUND FAULT PROTECTION, INSTALL 18" AFF UON. ('WP' INDICATES WEATHERPROOF).
- IG — ISOLATED GROUND DUPLEX RECEPTACLE, INSTALL 18" AFF UON.
- SPD — SURGE PROTECTION DEVICE DUPLEX RECEPTACLE, INSTALL 18" AFF UON.
- QUADRUPLEX RECEPTACLE AS DESCRIBED ABOVE, 18" AFF UON. DECORATORA STYLE
- CLK — SIMPLEX RECEPTACLE, INSTALL 96" AFF UON. 'CLK' INDICATES CLOCK HANGER RECEPTACLE, INSTALL 96" AFF UON.
- USB — 20AMP, 125VAC TWO USB TYPE 2.0 PORTS, 3.8AMP, 5 VOLT DC STYLE LINE DECORATOR SERIES DUPLEX RECEPTACLES.
- SPECIAL PURPOSE RECEPTACLE, SIZE AND NEMA CONFIGURATION AS INDICATED, INSTALL 18" AFF UON.
- 20AMP, 125VAC DUPLEX RECEPTACLE DECORATOR SERIES. MOUNT 48" A.F.F. OR 6" ABOVE COUNTER TOP WHERE COUNTER IS INDICATED. ALL DUPLEX RECEPTACLES ABOVE COUNTERTOPS TO BE MOUNTED HORIZONTALLY.
- COMBINATION RECEPTACLE AND TELE/DATA OUTLET INSTALLED IN FLUSH FLOOR BOX.

CONDUIT AND WIRE

- CONDUIT RUN CONCEALED IN CEILING, WALL, FLOOR, OR ABOVE SUSPENDED CEILING.
- CONDUIT RUN IN OR BELOW SLAB OR GROUND.
- SWITCH LEG. PROVIDE ADDITIONAL BRANCH CIRCUITRY AS REQUIRED TO ACCOMPLISH THE SWITCHING INIDICATED..
- LA-1,3,5 — HOMERUN TO PANEL AND CIRCUIT DESIGNATION. BRANCH CIRCUIT SHALL BE MINIMUM 3#12 AWG EXCLUDING NEUTRALS AND GROUND, 1/2"C. U.O.N. ON DRAWINGS OR SPECIFICATIONS.
- EC — EMPTY CONDUIT WITH PULLING LINE, SIZE AS INDICATED.
- E — CONDUIT TRANSITION FROM CONCEALED TO EXPOSED
- CAPPED CONDUIT.
- CONDUIT TURNED UP.
- CONDUIT TURNED DOWN.
- SURFACE MOUNTED MULTI-OUTLET ASSEMBLY, 6" ABOVE COUNTER TOP, UON.
- CABLE TRAY
- PP — POWER/DATA POLE
- SURFACE METAL RACEWAY.

GROUNDING

- 3/4" DIAMETER BY 10'-0" LONG COPPER CLAD GROUND ROD.
- G — GROUND CONDUCTOR. SIZE AS INDICATED.
- GROUND CONNECTION.
- G — GROUND BUS AS NOTED ON DRAWINGS AND SPECIFICATIONS
- GROUND CONNECTION (EXOTHERMIC WELD)

SITE

- -UP- — UNDERGROUND PRIMARY ELECTRIC UTILITY
- -US- — UNDERGROUND SECONDARY ELECTRIC UTILITY
- -UT- — UNDERGROUND TELEPHONE UTILITY
- HA — LIGHTING STANDARD WITH LUMINAIRE. LETTERS DENOTE TYPE.
- UTILITY POLE
- T — PAD MOUNTED UTILITY SERVICE TRANSFORMER
- P — PRECAST MANHOLE OR HANDHOLE AS INDICATED FOR POWER (P) OR COMMUNICATIONS (C) CABLES. SIZE AS NOTED.

TELEPHONE AND DATA

- 4'X8'X3/4" GRADE A/B FIRE TREATED PLYWOOD TELEPHONE TERMINAL BACKBOARD.
- DATA ONLY OUTLET JUNCTION BOX. REFER TO I.T. CONSULTANT OR INSTALLER FOR ROUGH-IN REQUIREMENTS. WHEN WALL MOUNTED ROUTE 1-1" EMPTY CONDUIT U.O.N. WITH PULL WIRE TO ACCESSIBLE CEILING.
- TV — TELEVISION ONLY OUTLET JUNCTION BOX. REFER TO I.T. CONSULTANT OR INSTALLER FOR ROUGH-IN REQUIREMENTS. WHEN WALL MOUNTED ROUTE 1-1" EMPTY CONDUIT U.O.N. WITH PULL WIRE TO ACCESSIBLE CEILING.
- DATA/TELECOMMUNICATIONS OUTLET JUNCTION BOX. REFER TO I.T. CONSULTANT OR INSTALLER FOR ROUGH-IN REQUIREMENTS. WHEN WALL MOUNTED ROUTE 1-1" EMPTY CONDUIT U.O.N. WITH PULL WIRE TO ACCESSIBLE CEILING.

DISTRIBUTION & CONTROLS

- ELECTRICAL PANELBOARD (480Y/277 VOLT).
- ELECTRICAL PANELBOARD (208Y/120 VOLT).
- B — ENCLOSED CIRCUIT BREAKER, RATING AND NO. OF POLES AS INDICATED. MOUNT 54" A.F.F.
- OR — NON-FUSED DISCONNECT SWITCH. 30A/3P NEMA 1 UON. 30A = SWITCH RATING, 3P = NO. OF POLES, NEMA 1 = ENCLOSURE STYLE.
- OR — FUSED DISCONNECT SWITCH. 30A/3P NEMA 1 UON. FUSE SIZE AS NOTED. 30A = SWITCH RATING, 3P = NO. OF POLES, NEMA 1 = ENCLOSURE STYLE.
- MAGNETIC MOTOR STARTER. SIZE 1, NEMA 1 UON.
- COMBINATION DISCONNECT AND MAGNETIC STARTER. SIZE 1, NEMA 1 UON.
- CONTROLLER PROVIDED WITH EQUIPMENT (HVAC, ELEVATOR, ETC.) INSTALLED BY DIVISION 26.
- S_M — MANUAL MOTOR STARTER WITH THERMAL OVERLOAD (S) UON, SIZED PER ACTUAL NAMEPLATE RATING.
- C OR — CONTACTOR, RATING AND NO. OF POLES AS INDICATED.
- PE — PHOTO-ELECTRIC SWITCH. INSTALL WITH SENSOR ELEMENT FACING NORTH, FLUSH MOUNTED WHERE POSSIBLE, UON.
- TC — TIME CLOCK, RATING AS INDICATED.
- J — JUNCTION BOX WITH COVER PLATE
- 1/2 — MOTOR CONNECTION, HP INDICATED.
- MD — MOTORIZED DAMPER.
- OR T — TRANSFORMER, RATING AS INDICATED.
- CURRENT TRANSFORMER, RATING AND NO. AS INDICATED.
- DRAW-OUT POWER CIRCUIT BREAKER, RATING AND NO. OF POLES, AS INDICATED.
- THERMAL AND/OR MAGNETIC CIRCUIT BREAKER, RATING AND NO. OF POLES AS INDICATED.
- FUSE, RATING AS INDICATED.
- SURGE ARRESTER, RATING AS INDICATED.
- MFM — DIGITAL SOLID STATE MULTI-FUNCTION METER.
- M — UTILITY COMPANY REVENUE METER UON.
- PUSHBUTTON, TYPE AS SPECIFIED ON DRAWING.
- SELECTOR SWITCH.
- E WP — ELECTRICAL CONNECTION. (CONTRACTOR SHALL FURNISH AND INSTALL ALL WIRING, RACEWAYS, MOTOR STARTER, OVERCURRENT PROTECTIVE DEVICE, DISCONNECT SWITCH, DUPLEX RECEPTACLES, ETC. REQUIRED TO CONNECT EQUIPMENT ELECTRICALLY. EQUIPMENT MAY BE PROVIDED BY DIVISION 26 OR OTHERS) REFER TO CONSTRUCTION DOCUMENTS. SUBSCRIPT "WP" WHEN USED INDICATES A WEATHER PROOF CONNECTION.
- SPD — SURGE PROTECTION DEVICE SYSTEM.
- PB — PULL BOX, SIZE PER NEC, UON.

FIRE ALARM SYSTEM

- FACP — FIRE ALARM CONTROL PANEL.
- ANN — FIRE ALARM SYSTEM REMOTE ANNUNCIATOR.
- F — FIRE ALARM MANUAL PULL STATION.
- S SS — FIRE ALARM SYSTEM SMOKE DETECTOR. MOUNT ON CEILING U.O.N. SUBSCRIPT "SS", WHEN USED, INDICATES BATTERY OPERATED AND HARD WIRED SINGLE STATION SMOKE DETECTORS. PROVIDE 120 VOLT POWER CONNECTION FROM DWELLING UNIT PANEL. 2#12 & 1#12 GND. IN 1/2" C.
- D — DUCT MOUNTED SMOKE DETECTOR.
- M — MAGNETIC DOOR HOLDER.
- F — FIRE ALARM HORN.
- T — REMOTE FIRE ALARM SYSTEM TROUBLE BELL (OR BUZZER).
- WF — SPRINKLER SYSTEM FLOW SWITCH.
- SS — SPRINKLER SYSTEM SUPERVISORY SWITCH.
- P — SPRINKLER SYSTEM PRESSURE SWITCH.
- K — KITCHEN HOOD FIRE EXTINGUISHING SYSTEM SWITCH
- H — FIRE ALARM SYSTEM HEAT DETECTOR
- SP CLG — FIRE ALARM SYSTEM SPEAKER/STROBE DEVICES. SUBSCRIPT "CLG", WHEN USED, INDICATES CEILING MOUNTED DEVICES. ALL CEILING AND EXPOSED SUSPENDED MOUNTED FIRE ALARM SPEAKER STROBES DEVICES SHALL BE WHITE. STROBE IN DWELING UNITS SHALL HAVE A CANDELA RATING OF 177CD.
- V SP — FIRE ALARM SYSTEM VISUAL DEVICES. ALL CEILING AND EXPOSED SUSPENDED MOUNTED FIRE ALARM VISUAL DEVICES SHALL BE WHITE. SUBSCRIPT "SP" WHEN USED INDICATES VISUAL/SPEAKER DEVICES.
- SV — CEILING MOUNTED SINGLE STATION 120 VOLT SMOKE DETECTOR WITH VISUAL DEVICE ATTACHED. VISUAL DEVICE CANDELA RATING SHALL BE 177CD.
- S — CEILING MOUNTED LOW FREQUENCY (520 HZ) FIRE ALARM SPEAKER.
- CR — CARD READER. ROUTE 3/4" E.C. WITH PULL WIRE TO NEAREST CABLE TRAY. REFER TO SECURITY CONTRACTOR INSTALLER FOR ROUGH-IN REQUIREMENTS.
- TS — SPRINKLER SYSTEM TAMPER SWITCH.
- NAC — FIRE ALARM NOTIFICATION APPLIANCE CIRCUIT PANEL. PROVIDE 120 VOLT EMERGENCY BRANCH CIRCUIT FROM NEAREST EMERGENCY PANEL. CONNECT TO 20AMP, 1-POLE SPARE CIRCUIT BREAKER. PROVIDE 2#12 & 1#12 GND IN 3/4"C.
- AV WP — FIRE ALARM SYSTEM HORN.
- FF — FIREFIGHTERS EMERGENCY PHONE JACK. INSTALL 44"AFF

GENERAL ELECTRICAL NOTES

(APPLIES TO ALL DRAWINGS.)

1. ALL CONDUCTORS SHALL BE COPPER, #12 AWG SOLID MINIMUM, UNLESS OTHERWISE NOTED.

2. ALL CONDUIT SHALL BE 1/2" MINIMUM, UNLESS OTHERWISE NOTED. MINIMUM CONDUIT SIZES FOR TELECOMMUNICATION WIRING DEVICES SHALL BE 1"C. REFER TO SPECIFICATIONS.

3. FOR EXACT LOCATION AND QUANTITIES OF EQUIPMENT MOUNTED IN SUSPENDED CEILINGS SUCH AS LIGHTING FIXTURES, SMOKE DETECTORS, SPEAKERS, ETC. REFER TO REFLECTED CEILING PLANS.

4. EACH RECEPTACLE ON THE EXTERIOR OF THE BUILDING SHALL BE PROVIDED WITH ITS OWN GROUND FAULT TRIP DEVICE, ON THE BREAKER CONTROLLING THE SEPARATE CIRCUITS, OR ON THE DEVICE ITSELF. IN-USE WEATHER PROOF COVERS SHALL BE AS MANUFACTURED BY TAYMAC CORP.

5. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE TO THE PROPER SIDE OF THE DOOR ANY SWITCH, RECEPTACLE OR DEVICE BEING AFFECTED BY ANY CHANGE IN DIRECTION OF DOOR SWINGS AS SHOWN ON THE ARCHITECTURAL FLOOR PLAN.

6. LIGHTING IN MECHANICAL AND ELECTRICAL ROOMS SHALL BE ADJUSTED IN THE FIELD FOLLOWING INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMENT TO PROVIDE RELATIVELY UNIFORM LIGHTING AS GENERALLY OUTLINED ON THE DRAWINGS. RECEPTACLES IN MECHANICAL & ELECTRICAL ROOMS, SHALL BE INSTALLED AT 44" AFF, UON.

7. MECHANICAL EQUIPMENT SIZES ARE AS DESIGNED, BREAKERS, CONDUIT, STARTERS, CONDUCTORS, ETC., SHALL BE ADJUSTED TO THE EQUIPMENT SUBMITTED AND APPROVED FOR INSTALLATION ON THIS PROJECT.

8. REMOTE MOUNTED MOTORS SHALL BE PROVIDED WITH RECEPTACLES AND PLUGS OR DISCONNECT SWITCHES TO BE COMPATIBLE WITH THE CONSTRUCTION TYPE AND THE NEC.

9. EACH MOTOR BEING INSTALLED ON THIS CONTRACT SHALL BE PROVIDED WITH THERMAL PROTECTION IN EITHER A MANUAL OR MAGNETIC STARTER. THERMAL ELEMENTS SHALL BE SIZED AND INSTALLED ACCORDING TO THE NAMEPLATE FULL LOAD AMP RATING OF THE MOTOR.

10. KILOWATT (KW) RATINGS FOR EQUIPMENT MOTOR LOADS ARE AS DESIGNED WITH 90% POWER FACTOR RATING ASSUMED (EXCEPT ON THE CHILLER). THE CONTRACTOR SHALL BE RESPONSIBLE FOR INCREASING THE SIZE, AS REQUIRED, OF ALL FEEDERS AND PROTECTIVE DEVICES SERVING ANY ITEMS OF EQUIPMENT SUPPLIED WITH POWER FACTOR RATINGS LESS THAN 90% EFFICIENCY.

11. IN ALL AREAS THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION BETWEEN THE ELECTRICAL AND MECHANICAL TRADES TO PROVIDE CLEARANCE ABOVE CEILING BETWEEN RECESSED LIGHTING FIXTURES AND THERMAL INSULATION OR DUCTWORK IN ACCORDANCE WITH THE NEC, PARAGRAPH 410.116.

12. FLOOR OUTLET LOCATION AS SHOWN ON THE DRAWINGS ARE SCHEMATIC ONLY. EACH OUTLET SHALL BE LOCATED IN THE FLOOR AS DIMENSIONED BY THE ARCHITECT BEFORE CHIPPING OUT EXISTING AND/OR POURING NEW CONCRETE.

13. IN UNDERGROUND RUNS OF PVC CONDUIT, ALL ELBOWS AND RISER THROUGH THE FLOOR OR TO ABOVE GROUND SHALL BE IN RIGID GALVANIZED STEEL (RGS) CONDUIT. UNDERGROUND RGS CONDUIT SHALL HAVE ALL JOINTS MADE UP WATER-TIGHT, AND BE PROTECTED USING 3" WIDE, 2 MIL THICK, PRESSURE SENSITIVE TAPE, HALF-LAPPED TO 6" ABOVE FINISHED GRADE OR FLOOR.

14. ELECTRICAL OUTLETS AND LIGHTS IN ELEVATOR PITS SHALL BE LOCATED AS TO NOT INTERFERE WITH ELEVATOR EQUIPMENT.

15. ALL COUNTERTOP RECEPTACLES WITHIN SIX FEET OF A SINK, SHALL BE GFI TYPE, UON.

16. ALL ELECTRICAL ENCLOSURES IN THIS PROJECT SHALL BE FURNISHED AND INSTALLED WITH MOUNTING BACK PLATE FOR MOUNTING BOX INSIDE THE ENCLOSURE BOX.

17. ALL PANELBOARDS, ALL TRANSFORMERS AND ALL SWITCHGEAR SHALL BE FURNISHED AND INSTALLED WITH FACTORY MANUFACTURED WEATHERSHIELDS.

18. FURNISH AND INSTALL IN-LINE FUSES FOR ALL UNSWITCHED LIGHT FIXTURES.

19. THE CONTRACTOR SHALL SUBMIT ELECTRICAL ROOM LAYOUTS WITH THE ELECTRICAL SUBMITTALS.

20. THE USE OF EXTENSION BOXES OF ANY TYPES IS NOT ACCEPTABLE NOR ALLOWED IN THIS PROJECT. THE CONTRACTOR SHALL USE PLASTER RINGS TO ACCOMMODATE FINISH SURFACE.

21. THE USE OF OCTAGONAL BOX EXTENSION RINGS OF ANY TYPE IS NOT ACCEPTABLE NOR ALLOWED IN THIS PROJECT.

22. ALL WIRING DEVICES AND WIRING DEVICE COVER PLATE FINISH COLORS SHALL BE COORDINATED WITH THE ARCHITECT PRIOR TO PROCUREMENT. PROVIDE WIRING DEVICES AND COVER PLATES IN COLORS DIRECTED BY THE ARCHITECT.

GEN. ELECTRICAL DEMO. NOTES

1. PRIOR TO BIDDING, THE DIVISION 26 INSTALLER SHALL VISIT THE SITE TO FAMILIARIZE HIMSELF WITH EXISTING CONDITIONS, AND TO VERIFY LOCATION SIZE AND QUANTITY OF ITEMS TO BE REMOVED. SUBMITTAL OF HIS BID SHALL SIGNIFY HIS WILLINGNESS TO COMPLY WITH THE DESIGN AND HIS ACCEPTANCE OF ON-SITE CONDITIONS AS THEY EXIST.

2. SALVAGE ITEMS AND MATERIALS SHALL REMAIN THE PROPERTY OF THE OWNER AND AS A PART OF THIS CONTRACT, THE CONTRACTOR SHALL DELIVER THESE TO A DESTINATION AS DIRECTED BY THE OWNER. VERIFY WITH OWNER'S REPRESENTATIVE FOR SALVAGE ITEMS. DELIVER TO OWNER IN UN-DAMAGED CONDITION WHERE POSSIBLE.

3. EACH ITEM OF EQUIPMENT, RECEPTACLES, LIGHT FIXTURES, SIGNAL EQUIPMENT, MOTORS, ETC., SHOWN TO BE DEMOLISHED SHALL HAVE ITS ASSOCIATED CIRCUITRY REMOVED BACK TO THE PROTECTIVE DEVICE IN THE PANEL, ETC., EXCEPT AS OTHERWISE MENTIONED BY NOTES 4, 5, AND 9 BELOW.

A. ASSOCIATED CIRCUITRY SHALL BE DEFINED TO INCLUDE ALL CONDUIT, CONDUCTORS, BOXES, WIRING DEVICES, COVERPLATES, LAMPS, FIXTURES, WIREWAYS, SWITCHES, STARTERS, ETC., WHICH ARE ASSOCIATED WITH THE ITEM SHOWN TO BE REMOVED.

B. THE PROTECTIVE DEVICE SHALL REMAIN AS AN INTEGRAL PART OF THE THE EXISTING PANEL, SWITCHBOARD, ETC., AND SHALL BE LABELED AS A SPARE OR BE USED FOR NEW CIRCUITRY AS SHOWN.

C. WHERE CONDUIT, ASSOCIATED WITH AN ITEM SHOWN TO BE REMOVED, IS IN AN INACCESSIBLE AREA, SUCH AS ENCASED IN CONCRETE, THIS INACCESSIBLE CONDUIT ONLY SHALL BE ABANDONED IN PLACE. ALL CONDUCTORS SHALL BE REMOVED, THEN CONDUIT SHALL BE SEALED, CAPPED OR OTHERWISE TERMINATED IN A SAFE MANNER ACCEPTABLE TO TO THE OWNER, OR AS OTHERWISE STATED IN ITEM 3D BELOW.

D. WHERE SUCH INACCESSIBLE CONDUIT ENDS OR MUST BE TERMINATED INFINISHED SPACE, THE CONDUIT OR J-BOX SHALL BE REMOVED TO BELOW THE FINISHED SURFACE OF WALL, CEILING OR FLOOR, THEN THE VOID SHALL BE FILLED WITH NON-SHRINKING GROUT, THEN RESURFACED AND REFINISHED TO MATCH SURROUNDING SURFACES.

4. WHERE ONLY A PORTION OF CIRCUIT'S LOAD IS SCHEDULED TO BE REMOVED, ONLY THAT PORTION ASSOCIATED WITH THE DEMOLISHED DEVICE SHALL BE REMOVED TO A POINT WHERE THE REMAINING LOAD IS ACTIVE AND IN A GOOD OPERATING CONDITION, UNLESS INDICATED OTHERWISE.

5. WHERE THE EXTENSION OF AN EXISTING CIRCUIT IS REQUIRED, CONDUIT AND WIRE SHALL BE RUN (CONCEALED WHERE POSSIBLE) FROM THE ITEM'S EXISTING LOCATION TO ITS NEW LOCATION. CONDUIT SHALL BE ROUTED SO AS NOT TO INTERFERE WITH THE USE OF, OR MAR THE AESTHETICS OF THE AREA. WHERE NECESSARY, THE CONTRACTOR SHALL RELOCATE AND RECONNECT CIRCUITRY ASSOCIATED WITH THE RELOCATION OF THE ITEM.

6. WHERE AN ITEM OF EQUIPMENT IS SCHEDULED TO BE REMOVED AND RELOCATED, ITS ASSOCIATED CIRCUITRY SHALL ALSO BE REMOVED AS PER NOTE 3 ABOVE ALONG WITH ITS ASSOCIATED SWITCHGEAR AND DEVICES, ETC., TO BE RELOCATED TO THE NEW LOCATION. PROVIDE CONNECTION OF SUCH RELOCATED ITEMS TO NEW OR EXTENDED CIRCUITRY AS SHOWN ON THE DRAWINGS.

7. ALL EXISTING ABANDONED CONDUIT, CABLES, ETC. ABOVE EXISTING CEILINGS SHALL BE REMOVED.

8. ALL EXISTING CIRCUITS IDENTIFIED TO BE REUSED FOR REPLACEMENT LIGHTING AND NEW DEVICES UTILIZING CONDUIT FOR GROUND. SHALL HAVE A GREEN INSULATED GROUNDING CONDUCTOR PROVIDED FOR ALL REUSED BRANCH CIRCUITS.

9. IN ALL AREAS WHERE THE EXISTING CEILING WILL BE EXPOSED FOR DEMOLITION AND/OR NEW WORK, PROPERLY SUPPORT EXISTING J/BOXES AND CONDUITS AS REQUIRED BEFORE NEW CEILING ARE INSTALLED. PROVIDE COVERS AND K.O. CLOSURES TO J/BOXES THAT DO NOT HAVE COVERS.

ABBREVIATIONS

A	A	AMPERE
	AF	AMP FRAME/AMP FUSE
	AFF	ABOVE FINISHED FLOOR
	AFG	ABOVE FINISHED GRADE
	AHU	AIR HANDLING UNIT
	AIC	AMPERE INTERRUPTING CAPACITY
	ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
	ATS	AUTOMATIC TRANSFER SWITCH
	AT	AMP TRIP
	AWG	AMERICAN WIRE GAUGE
B	BFG	BELOW FINISHED GRADE
	BPS	BOLTED PRESSURE SWITCH
C	C	CONDUIT
	CB	CIRCUIT BREAKER
	CCTV	CLOSED CIRCUIT TELEVISION
	CF	COMPACT FLUORESCENT
	CFCI	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED
	CKT	CIRCUIT
	CLG	CEILING
	CLK	CLOCK
	CPS	CITY PUBLIC SERVICE
	CT'S	CURRENT TRANSFORMERS
	CU	CONDENSING UNIT OR COPPER
D	DEMO	DEMOLITION
	DISC SW	DISCONNECT SWITCH
	DGP	DATA GATHERING PANEL
E	EA	EACH
	EC	EMPTY CONDUIT
	EDF	ELECTRIC DRINKING FOUNTAIN
	EWC	ELECTRIC WATER COOLER
	EF	EXHAUST FAN
	ELEC	ELECTRICAL
	EMT	ELECTRICAL METALLIC TUBING
	EPO	EMERGENCY POWER OFF
	EQUIP	EQUIPMENT
	EWH	ELECTRIC WATER HEATER
	EXIST	EXISTING
	EXP	EXPLOSION PROOF
F	FACP	FIRE ALARM CONTROL PANEL
	FCU	FAN COIL UNIT
	FLA	FULL LOAD AMPS
	FLUOR	FLUORESCENT
G	GEC	GROUNDING ELECTRODE CONDUCTOR
	GEN	GENERATOR OR GENERAL
	GFI/GFCI	GROUND FAULT CIRCUIT INTERRUPTER
	GND	GROUND
	GRS	GALVANIZED RIGID STEEL
H	HID	HIGH INTENSITY DISCHARGE
	HPS	HIGH PRESSURE SODIUM
I	IDS	INTRUSION DETECTION SYSTEM
	IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS
	IMC	INTERMEDIATE METAL CONDUIT
	INC	INCANDESCENT
	IPS	INTERRUPTIBLE POWER SUPPLY
K	KAIC	THOUSAND AMP INTERRUPTING CAPACITY RMS SYMMETRICAL
	MCM/KCMIL	THOUSAND CIRCULAR MILS
	KVA	THOUSAND VOLT AMPERE
	KW	KILOWATT
L	LRA	LOCKED ROTOR AMPS
	LSI	LONG TIME/SHORT TIME/INSTANTANEOUS TRIP SETTINGS INCLUDED WITH CIRCUIT BREAKER
	LSIG	L.T./S.T./I.T./GROUND FAULT TRIP SETTINGS INCLUDED WITH CIRCUIT BREAKER.
M	MCA	MINIMUM CIRCUIT AMPERES
	MCB	MAIN CIRCUIT BREAKER
	MCC	MOTOR CONTROL CENTER
	MFR	MANUFACTURER
	MH	METAL HALIDE
	MLO	MAIN LUGS ONLY
	MOCP	MAXIMUM OVERCURRENT PROTECTION
	MTD	MOUNTED
	MTG HT	MOUNTING HEIGHT
	MV	MERCURY VAPOR
N	NC	NORMALLY CLOSED
	NEC	NATIONAL ELECTRICAL CODE
	NECA	NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION
	NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
	NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
	NIC	NOT IN CONTRACT
	NL	NIGHT LIGHT
	NO	NUMBER OR NORMALLY OPEN
	NTS	NOT TO SCALE
O	OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
	OFOI	OWNER FURNISHED, OWNER INSTALLED
P	PH	PHASE
	PNL	PANELBOARD
R	RCPT	RECEPTACLE
	REP	REPRESENTATIVE
	REQ'D	REQUIRED
	RLA	RUNNING LOAD AMPERES
	RTU	ROOF TOP UNIT
S	SC	SPLIT BRANCH CIRCUIT INDICATES REFERENCED BRANCH CIRCUIT HAS MORE THAN ONE HOMERUN DESIGNATION SHOWN
	SQ FT	SQUARE FEET
T	TEL	TELEPHONE
	TV	TELEVISION
	TYP	TYPICAL
U	UH	UNIT HEATER
	UON	UNLESS OTHERWISE NOTED
	UPS	UNINTERRUPTIBLE POWER SUPPLY
V	V	VOLT
	VA	VOLT AMPERE
	VFD/VSD	VARIABLE FREQUENCY/SPEED DRIVE
W	W	WIRE
	W/	WITH
	W/O	WITHOUT
	WP	WEATHERPROOF
X	XFMR	TRANSFORMER
	XMTR	TRANSMITTER
	XFER SW	TRANSFER SWITCH
Z	%Z	PERCENT IMPEDANCE

GENERAL

- 1 — NOTE REFERENCE NUMBER.
- 168 — ROOM NUMBER INDICATION

DEMOLITION

- HATCHING INDICATES REMOVAL OF EXISTING EQUIPMENT OR ITEM.

LIGHTING FIXTURE SCHEDULE

NOTE: IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO CONFIRM COMPATIBILITY BETWEEN THE CEILING TYPE, AS DEFINED ON THE ARCHITECTURAL ROOM FINISH SCHEDULE, AND THE LIGHT FIXTURE TRIM AS DEFINED ON THE FIXTURE SCHEDULE. NO CHANGES OR DEVIATIONS SHALL BE MADE FROM THE CONTRACT DOCUMENTS, HOWEVER, WITHOUT WRITTEN APPROVAL OF THE ENGINEER/ARCHITECT.

TYPE	MANUFACTURER AND MODEL NUMBER	LAMPS	VA	VOLTAGE	MOUNTING	DESCRIPTION	REMARKS
D1	NUTONE #QTXN110HL	(2)A19 & (1) C7 NIGHT LIGHT	20	120	CEILING RECESSED	COMBINATION HEATER, FAN, LIGHT AND NIGHT LIGHT	PROVIDE WITH 60W EQUIVALENT LED NON-DIMMABLE BULBS AND 7W EQUIVALENT LED NIGHT LIGHT BULB COORDINATE EXHAUST DUCT CONNECTOR WITH DIV. 23 INSTALLER
D2	LITHONIA #LDN6-35/10-L06-AR-LSS-MVOLT-EZ10 HALO COMMERCIAL #PD6-10-D010B-PDM6B-835-61V-H	LED 3500K	13	MVOLT	CEILING RECESSED	6" DIA. LED DOWNLIGHT	RESTROOMS
O1	KENALL #MR13FFL-PP-X-20L40K-DV CGF DESIGN #TA2-LED-CT4-UNV	LED 4000K	20	120	CEILING RECESSED	OUTDOOR LED CAST FLUSH MOUNT	EXTERIOR
O2	KENALL #FN9-3-7-DB-16L-40K8-DV LUMARK #XTOR2B-W-BZ-	LED 4000K	20	MVOLT	SURFACE WALL MOUNTED	LED WALL PACK FULL CUTOFF	STAIRS. NOTE 3
O3	KENALL #MLHA8-48-F-MW-CP-45L35K-DCC-DV METALUX #4SWLED-LD4-44HL-LC-UNV-L835-CD1-U	LED 3500K	49	MVOLT	SURFACE WALL / CEILING MOUNTED	8"X4' LED DECORATIVE STRIPLIGHT	LAUNDRY ROOMS
O4	ANTIQUE STREET LAMPS #EML25-RT-49LED 525MA-4K-GCSG-MVOLT-R5-SF-DDB SPRING CITY/ VALMONT #ALMETN-LE040-EV1/EV7-X2-40-GPLO-DB / AARROC-1S	LED 4000K	49	MVOLT	POLE MOUNTED	LED ANTIQUE STREET LIGHT	PROVIDE WITH 12' ROUND STEEL POLE AND ANTIQUE STREET LAMP #EAK5/1-ANDB 5" DIAMETER ARM. SEE DETAIL 3 ON SHEET E5.3
O5	HYDREL #3110C-H24-4COB-AMBLW-MVOLT-SYM-BZ CONCORD BOLLARD LED #UCN-10237-1-W27	LED 2000K	72	MVOLT	BOLLARD	LED IMPACT RESISTANT ROUND BOLLARD DOME TOP. 24" HEIGHT	SITE SEE DETAIL 7 ON SHEET E5.3
O6	HYDREL #RHY4-BPCB-WHT41K-MVOLT-MFL-SASM-CSL20-LDIM-DBL A-LIGHT #N1-XX-LH-40-U-B-G-XX-B-D	LED 4100K	57	MVOLT	GROUND	LINEAR LED FLOOD	BUILDING SIGN
O7	HYDREL #TPS1-18LED-WHT41K-MVOLT-NSP-YM-ARTL-LP-BZ LIGMAN #UOD-50011-36W-N-W40-06-120/277v-	LED 4100K	34	MVOLT	GROUND	LED FLOOD LIGHT	FLAG POLE AIM TO ILLUMINATE FLAG.
O8	LUMENPULSE #LOI ASHRAE-100/277-48-35K-WW-TS2.5-INTL-DIM LIGMAN #ULA-60004-55W-AS-W35-120/277V-DIM	LED 3500K	20	MVOLT	IN-GRADE RECESSED	LED INGROUND WALLWASH	SOUTH ENTRANCE
09	ECOSENSE #F080-1S-MO-40-8-15-X-A HOLM #DCST-13-UV-L10-K40-SP-SV	LED 4000K	8	MVOLT	GROUND	LED ACCENT LIGHT	STATUE AIM TO ILLUMINATE STATUE
P1	LITHONIA #ZL2N-L48-3000LM-MDD-MVOLT-35K-80CRI-WH METALUX #2SNLED-LD5-30SL-LC-UNV-CD-U	LED 3500K	42	MVOLT	CEILING SUSPENDED	LENSED LED STRIPLIGHT	MECHANICAL ROOMS
P2	LITHONIA #VAP-4000LM-FST-WD-MVOLT-GZ10-35K-80CRI METALUX #4VT2-LD4-4-FR50-W-UNV-EL10W-L840-CD1-WL-U	LED 3500K	42	MVOLT	SURFACE MOUNTED	INDUSTRIAL LED VAPORTIGHT, HIGH IMPACT LENS, STAINLESS STEEL LATCHES.	CRAWSPACE
P3	FINELITE #HP-4-ID-4-S-S-835-TG-BG-277-FA-SC A-LIGHT #D2-4-ILS+DLS-35-U-M-D-XX-S-1-D	LED 3500K	29	277	CEILING SUSPENDED	4" LINEAR LED LUMINAIRE - INDIRECT/DIRECT	CONFERENCE ROOMS
R1	LITHONIA #2BLT4-40L-ADP-EZ1-LP835 METALUX #24CZLD5-40-S-UNV-L840-CD-1	LED 3500K	30	MVOLT	CEILING RECESSED	2'X4' LOW PROFILE LED LUMINAIRE	LOBBY, LIBRARY
R2	LITHONIA #2GTL-4-48L-FW-A19-EZ1-LP835-ABC METALUX #24GR4835D	LED 3500K	47	MVOLT	CEILING RECESSED	2'X4' LED GRID TROFFER WITH INVERTED LENS AND 3-WAY GASKETING.	KITCHEN
R3	LITHONIA #2BLT2-40L-ADP-EZ1-LP835 METALUX #22CZ-LD5-39-UNV-L935-CD-1	LED 3500K	30	MVOLT	CEILING RECESSED	2'X2' LOW PROFILE LED LUMINAIRE	OFFICES
R4	FINELITE #HP-2 R-XX-S-835-F-277V-SC-XX NEO RAY #QS-S122-DR-LO-35-XX-XX-XX-U-ED	LED 3500K	--	277V	CEILING RECESSED	2"APERTURE, LINEAR LED LUMINAIRE	RESTROOMS
S2-2	LITHONIA #ZL1N-L24-1500LM-L/LENS-MVOLT-35K-80CRI-WH METALUX #2SNLED-LD5-20SL-UNV-L835-CD-1	LED 3500K	15	MVOLT	SURFACE COVE	24"LENGTH LED STRIPLIGHT	LOBBY STRIP FIXTURE MOUNTED IN EXISTING COVE
S2-4	LITHONIA #ZL1N-L48-3000LM-L/LENS-MVOLT-35K-80CRI-WH METALUX #4SNLED-LD5-32SL-UNV-L835-CD-1	LED 3500K	25	MVOLT	SURFACE COVE	48"LENGTH LED STRIPLIGHT	LOBBY STRIP FIXTURE MOUNTED IN EXISTING COVE
S3	LITHONIA #FMMUSL-9-148-30-WH LIGHTWAY #PLVC-17-LED-U-13W-2-W2-FSG	LED 3000K	20	120	CEILING SURFACE MOUNTED	LED MUSHROOM	APARTMENT UNITS
S4	LITHONIA #FMVCSL-24IN-MVOLT-30K-90CRI-BN WAC #WS-77624-30-AL	LED 3000K	18	MVOLT	SURFACE WALL MOUNTED	24" LED VANITY LED	RESTROOMS
S5	LITHONIA #MWSB-BNP WAC #WS58LED-G512-WT-BN	LED 3000K	10	120	SURFACE WALL MOUNTED	BULLET LED MINI-SCONCE FITTER	APARTMENT UNITS PROVIDE WITH LITHONIA #DMCN-BNP SHADE. FIXTURE TO BE AIMED UP
S6	LITHONIA #FMLBDRL-48IN-30K-90CRI-BN METALUX #4WSNLED-LD4-32SL-F-UNV-L830-CD-1-U	LED 3000K	40	120	CEILING SURFACE MOUNTED	48" LINEAR LED FLUSH MOUNT	KITCHEN - APARTMENT UNITS
S7	KENALL #MLHA8-24-F-MW-CP-25L35K-DCC-DV FAIL-SAFE #HVL8-XX-2-LD4-1-LO-35-UNV-C-EDD-XX-S	LED 3500K	25	MVOLT	CEILING SURFACE MOUNTED	8"X2' LED DECORATIVE STRIPLIGHT	STORAGE
S8	LITHONIA #WL4-30L-MVOLT-EZ1-LP835-MSD7-DIM50-SC METALUX #4-SWLED-LD4-32SL-UNV-L835-CD-1-SVPD1-U	LED 3500K	28	MVOLT	SURFACE MOUNTED	LED WALL BRACKET	STAIRS NOTE 3
X1	LITHONIA #WLTE-W-1-R SURE-LITES #LPXW-6-1-R-WH	LED SUPPLIED WITH FIXTURE	3	MVOLT	SURFACE WALL / CEILING MOUNTED	LED AC ONLY, EXIT SIGN WHITE HOUSING, SINGLE FACE, RED LETTERS, WET LOCATION RATED	UNIVERSAL MOUNTING
X2	LITHONIA #WLTE-W-2-R SURE-LITES #LPXW-6-2-R-WH	LED SUPPLIED WITH FIXTURE	3	MVOLT	SURFACE WALL / CEILING MOUNTED	LED AC ONLY, EXIT SIGN WHITE HOUSING, DOUBLE FACE, RED LETTERS, WET LOCATION RATED	UNIVERSAL MOUNTING
X3	LITHONIA #LQM-S-W-3-R-120/277 SURE-LITES #LPX-6	LED SUPPLIED WITH FIXTURE	1	MVOLT	SURFACE WALL / CEILING MOUNTED	LED AC ONLY, EXIT SIGN WHITE HOUSING, RED LETTERS	UNIVERSAL MOUNTING
X4	LITHONIA #LE-P-1-R-120/277-SW04 EVENLITE #CCDMR-AC-R-11-AA-1B	LED SUPPLIED WITH FIXTURE	1	MVOLT	SURFACE WALL / CEILING MOUNTED	LED AC ONLY, ALUMINUM SIGN, RED LETTERS	UNIVERSAL MOUNTING "AREA OF RESCUE ASSISTANCE" SIGN
X5	KENALL #METEDU-MW-R-RSC-DT EVENLITE #CDW-AC-R-U-WW	LED SUPPLIED WITH FIXTURE	2	MVOLT	SURFACE WALL / CEILING MOUNTED	LED AC ONLY, WHITE HOUSING SIGN, RED LETTERS	UNIVERSAL MOUNTING WET LOCATION "AREA OF RESCUE ASSISTANCE" SIGN

LIGHTING FIXTURE NOTES:

1. EQUIVALENT PRODUCTS FROM THE FOLLOWING MANUFACTURERS MAY BE ACCEPTABLE AS ALTERNATE SUBSTITUTIONS: (SUBSTITUTE PRODUCTS SHALL HAVE SUFFICIENT DATA INCLUDING POINT-BY-POINT CALCULATIONS WHERE CALLED FOR, IN THE DRAWINGS AND SPECIFICATIONS) USI/COLUMBIA, HUBBELL, COOPER/METALUX, LITHONIA, GENLYTE/LIGHTOLIER, THOMAS/DAYBRITE, LUMINAIRE, KIM, GARDCO.

2. FINAL RAL COLOR SELECTION OF ALL LIGHTING FIXTURES WILL BE MADE BY THE ARCHITECT DURING SUBMITTAL REVIEW.

3. VERIFY EXACT MOUNTING HEIGHT WITH ARCHITECT.

2015 IECC LIGHTING COMMISSIONING NOTES:

1. COMMISSIONING FOR LIGHTING SYSTEMS SHALL COMPLY WITH SECTION C408.3 OF 2015 IECC.

2. COMMISSIONING SHALL BE PERFORMED BY AN CERTIFIED COMMISSIONING AGENT.

3. THE PROPER FUNCTIONS AND OPERATIONS OF LIGHTING CONTROLS SHALL BE TESTED AND VERIFIED AGAINST EQUIPMENT MANUFACTURER SPECIFICATIONS.

4. LIGHTING CONTROLS INSTALLATION SHALL BE VERIFIED FOR COMPLIANCE WITH EQUIPMENT MANUFACTURER RECOMMENDATIONS AND ACCEPTED MINIMUM STANDARDS.

5. AT A MINIMUM, LIGHTING CONTROLS THAT SHALL BE TESTED INCLUDE TIME SWITCH CONTROLS, DIMMERS, AND OCCUPANCY SENSORS.

6. PROPER PERFORMANCE AND OPERATION OF LIGHTING CONTROLS EQUIPMENT SHALL BE DOCUMENTED.

7. COMMISSIONING PLAN SHALL BE PROVIDED BY COMMISSIONING AGENT.

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LOCATION:

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
ISSUE	DESCRIPTION	DATE

05/25/18

PERMIT SET

STATE OF TEXAS
RALPH E. MARTIN, JR.
28858
REGISTERED PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

ELECTRICAL SYMBOLS LEGEND

SHEET NUMBER
E0.1

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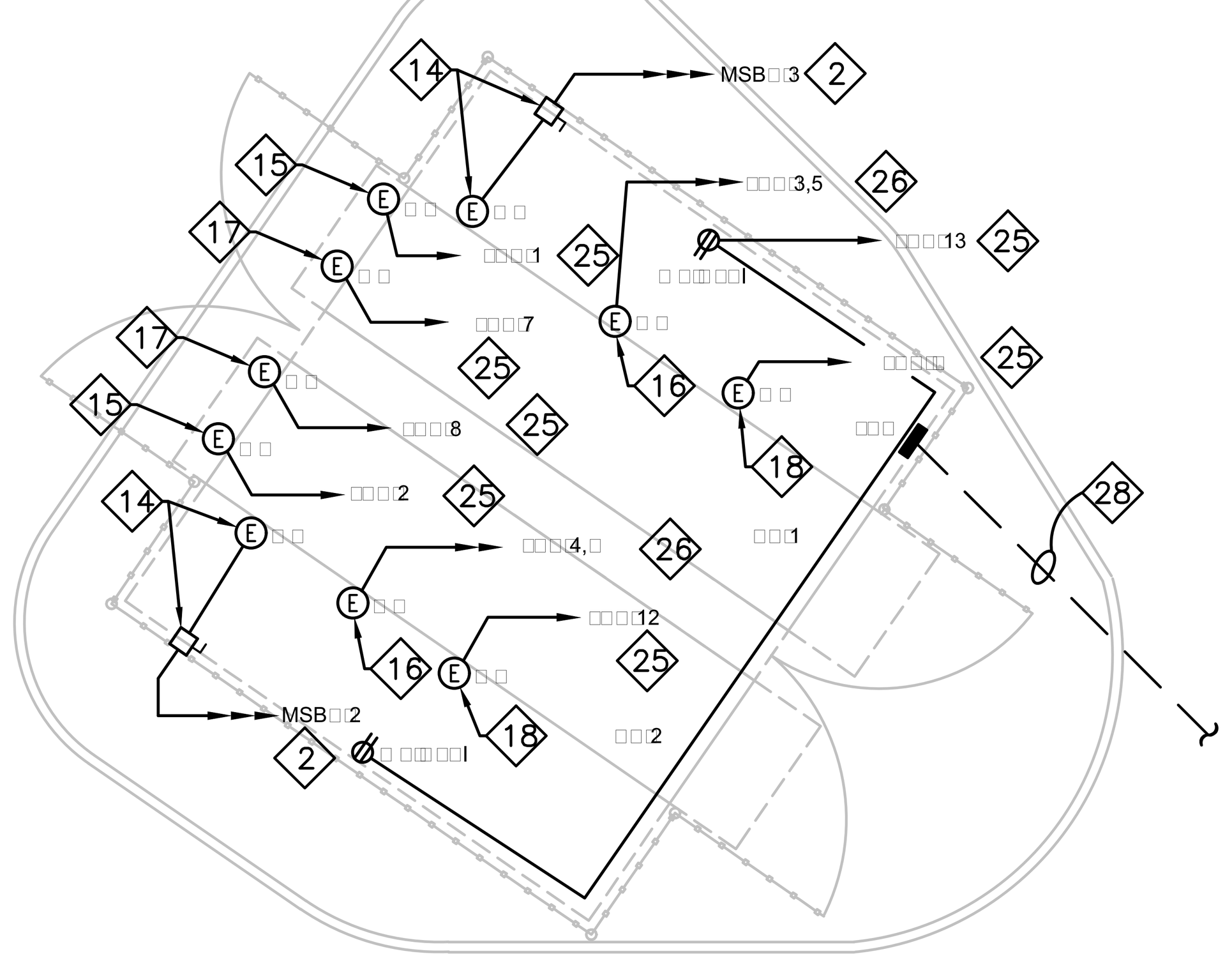
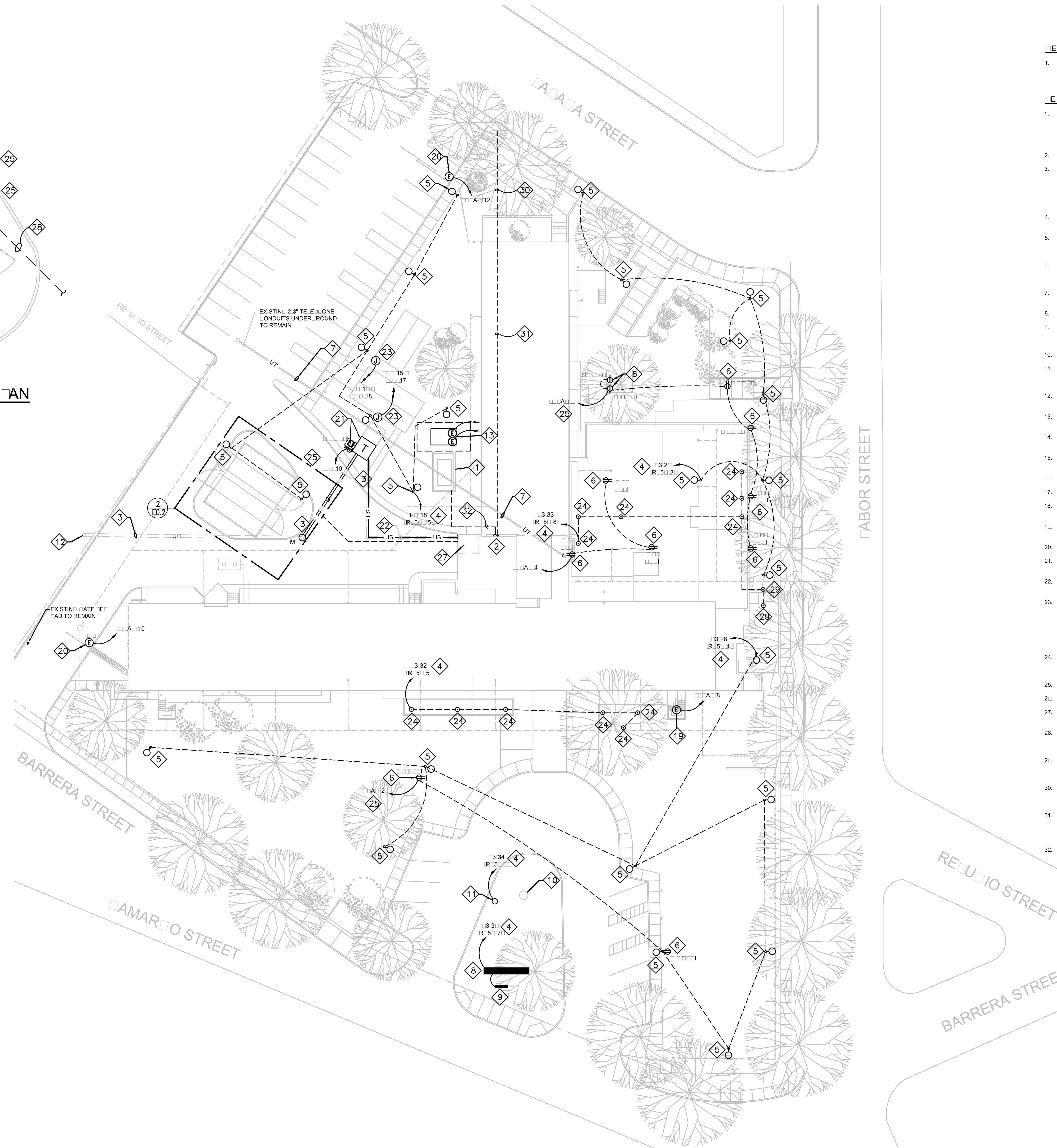


2 ENLARGED ELECTRICAL SITE PLAN
E0.2 SCALE: 1/8" = 1'-0"



1 ELECTRICAL SITE PLAN NEW
E0.2 SCALE: 20' = 1'-0"

GENERAL NOTES:

1. COORDINATE NEW ELECTRICAL SERVICE WITH CPS. CONTACT MR. JOHN SAN MIGUEL (210)353-37□0. ALL FEES AND PERMITS SHALL BE BY OWNER.

KEYED NOTES:

1. EXISTING 300 KW (375 KVA @ 0.80 P.F.) DIESEL DRIVEN EMERGENCY GENERATOR TO REMAIN UNTIL THE NEW ELECTRICAL SYSTEM IS AVAILABLE TO OPERATE THE BUILDING STANDBY POWER NEEDS. REFER TO ELECTRICAL ONE-LINE DIAGRAM SHEET E□.1. VERIZON WILL PROVIDE NEW GENERATOR IN SAME LOCATION.
2. REFER TO ENLARGED PLAN 2, SHEET E2.0 FOR CONTINUATION.
3. EXISTING CPS ENERGY PRIMARY DUCTBANK TO REMAIN. INTERCEPT EXISTING CPS ENERGY PRIMARY DUCTBANK. PROVIDE NEW MANHOLE PER CPS ENERGY ELECTRIC SERVICE STANDARDS. PROVIDE NEW CONCRETE ENCASED PRIMARY DUCTBANK FROM NEW MANHOLE TO PRIMARY COMPARTMENT OF NEW CPS ENERGY PAD MOUNTED TRANSFORMER.
4. CONTROLLED VIA LIGHTING CONTROL PANEL. REFER TO SHEET E1.1 FOR BRANCH CIRCUIT AND RELAY SCHEDULES.
5. PROVIDE NEW "O4" FIXTURE IN PLACE OF EXISTING, CONNECT FIXTURE TO NEW LIGHTING BRANCH CIRCUIT, ROUTING THROUGH NEW LIGHTING CONTROL PANEL "R□5□,".
6. PROVIDE NEW 20AMP 125VAC "GFCI" RECEPTACLES WITH ALL WEATHER USE COVER PLATE. PROVIDE NEW BRANCH CIRCUIT FROM NEW PANELBOARDS (TYP. ALL WIRING DEVICES ON SITE)
7. EXISTING BUILDING UNDERGROUND TELEPHONE SERVICE ENTRANCE TO REMAIN.
8. EXISTING VICTORIA PLAZA BUILDING SIGN TO REMAIN.
9. PROVIDE NEW TYPE "O□" LIGHT FIXTURE. CONNECT FIXTURE TO NEW LIGHTING BRANCH CIRCUIT, ROUTING THROUGH NEW LIGHTING CONTROL PANEL "R□5□," .
10. EXISTING FLAG POLE TO REMAIN.
11. PROVIDE NEW TYPE "07" LIGHT FIXTURE. CONNECT FIXTURE TO NEW LIGHTING BRANCH CIRCUIT, ROUTING THROUGH NEW LIGHTING CONTROL PANEL "R□5□,".
12. EXISTING CPS OVERHEAD PRIMARY POLE RISER TO REMAIN. CPS WILL MODIFY SERVICE FOR NEW PAD MOUNT TRANSFORMER.
13. NEW DIESEL DRIVEN EMERGENCY GENERATOR. REFER TO ELECTRICAL RISER DIAGRAM SHEET E□.1 AND SPECIFICATIONS
14. ELECTRICAL CONNECTION TO CHILLER CONTROLLERS, 480 VOLT, 3PHASE. REFER TO SHEET E□.1 KEYED NOTE 11.
15. ELECTRICAL CONNECTION TO CHILLER PIPING CONTROL VALVES, 120 VOLT. COORDINATE WITH HVAC FOR LOCATION.
16. ELECTRICAL CONNECTION TO CHILLER CONTROLS, 120 VOLT.
17. ELECTRICAL CONNECTION TO CHILLER FLOW METER, 120 VOLT.
18. ELECTRICAL CONNECTION TO CHILLER PIPING HEAT TRACE, 120 VOLT.
19. EXISTING BUILDING IRRIGATION CONTROLLER TO REMAIN. CONNECT TO NEW PANELBOARD
20. EXISTING ELECTRICAL GATE TO REMAIN. CONNECT TO NEW CIRCUIT.
21. ELECTRICAL SERVICE EQUIPMENT CONCRETE PAD. REFER TO ELECTRICAL RISER DIAGRAM SHEET E□.1.
22. REFER TO ELECTRICAL RISER DIAGRAM SHEET. E□.1 FOR ELECTRICAL SERVICE ENTRANCE FEEDER SIZE.
23. EXISTING STORAGE BUILDING PROVIDE TWO CIRCUITS AS INDICATED. ONE FOR RECEPTACLE AND OTHER FOR LIGHTING. PROVIDE TWO GFCI RECEPTACLES AND FOUR TYPE □1 FIXTURES WITH SWITCH PER BLDG. COORDINATE TRENCHING WITH EXISTING UTILITIES. CUT AND PATCH PAVEMENT TO EQUAL OR BETTER CONDITION. CONFIRM OUTLET AND LIGHTING LOCATIONS WITH OWNER.
24. PROVIDE NEW "O5" FIXTURE IN PLACE OF EXISTING, CONNECT FIXTURE TO NEW LIGHTING BRANCH CIRCUIT, ROUTING THROUGH NEW LIGHTING CONTROL PANEL "R□5□," .
25. 2□10 □ 1□10 GND IN 1□2 " □
26. 4□10 □ 2□10 GND IN 3□4 " □
27. EXISTING CPS ENERGY TRANSFORMER VAULT. REFER TO SHEET. ED0.2 CPS WILL REMOVE EXISTING SERVICE.
28. ROUTE FEEDER TO PANEL □□□A□ IN BASEMENT, MINIMUM 24"BELOW GRADE. COORDINATE ROUTE WITH EXISTING UTILITIES. REFER TO ONE LINE DIAGRAM SHEET E□.1.
29. NEW FIXTURE TYPE "O□" FOR STATUE LIGHTING. CONNECT TO NEW POLE LIGHTING BRANCH CIRCUIT, ROUTING THROUGH NEW LIGHTING CONTROL PANEL "R□5□,".
30. ROUTE 4" EMPTY PVC CONDUIT WITH PULLING LINES AT MIN. 24" BELOW GRADE FOR TELCO FIBER. COORDINATE ROUTE WITH EXISTING UTILITIES.
31. ROUTE 4"EMPTY EMT CONDUIT WITH PULLING UNDER THE BUILDING IN CRAWL SPACE ATTACHED TO STRUCTURE. PROVIDE MIN. 24"X24"X12" PULL BOXES AND SUPPORTS AS REQUIRED. SEAL ALL PENETRATIONS WEATHERTIGHT.
32. ROUTE 2-2" EMPTY CONDUIT WITH PULLING LINES FOR FUTURE VERIZON EMERGENCY POWER AND CHEMICAL GROUND. SECURE TO STRUCTURE AS REQUIRED. SEAL ALL PENETRATIONS WEATHERTIGHT.

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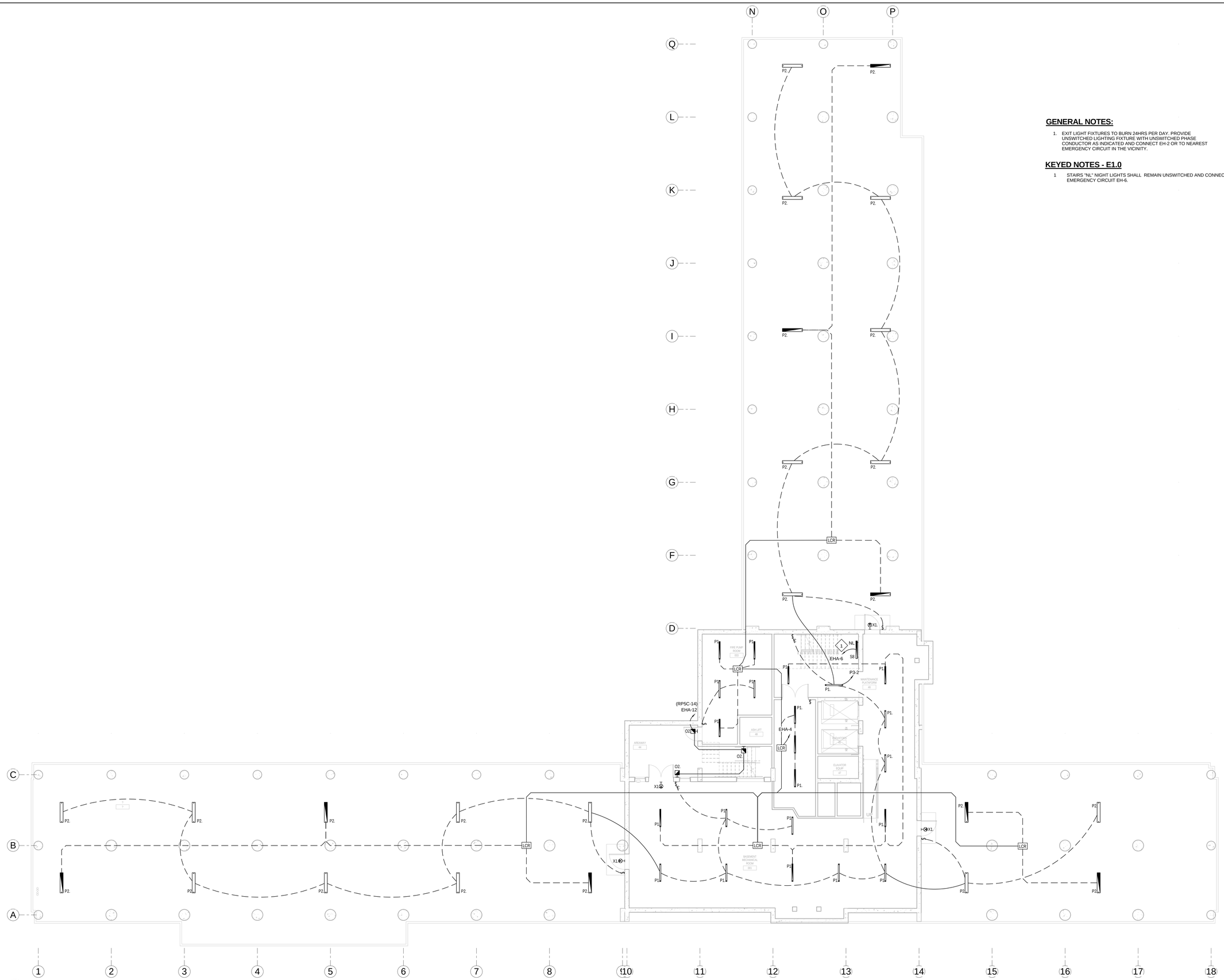
LICENSED PROFESSIONAL ENGINEER
05.25.2018

PROJECT ARCHITECT

SITE PLAN - NEW ELECTRICAL

SHEET NUMBER
E0.2



GENERAL NOTES:

1. EXIT LIGHT FIXTURES TO BURN 24HRS PER DAY. PROVIDE UNSWITCHED LIGHTING FIXTURE WITH UNSWITCHED PHASE CONDUCTOR AS INDICATED AND CONNECT EH-2 OR TO NEAREST EMERGENCY CIRCUIT IN THE VICINITY.

KEYED NOTES - E1.0

1 STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.

NORTH

1 E1.0 FLOOR PLAN - BASEMENT - LIGHTING
1/8" = 1'-0"

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PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-681

BASEMENT - LIGHTING

SHEET NUMBER
E1.0

RELAY PANEL RP5A SCHEDULE (4)

Relay No.	Area Controlled	Circuit No.
1	LVL 2 THRU 9 - ELEVATOR LOBBY	P3-10
2	LVL 2 - EAST/WEST CORRIDOR	P3-12
3	LVL 2 - NORTH/SOUTH CORRIDOR	P3-12
4	LVL 3 - EAST/WEST CORRIDOR	P3-12
5	LVL 3 - NORTH/SOUTH CORRIDOR	P3-12
6	LVL 4 - EAST/WEST CORRIDOR	P3-14
7	LVL 4 - NORTH/SOUTH CORRIDOR	P3-14
8	LVL 5 - EAST/WEST CORRIDOR	P3-14
9	LVL 5 - NORTH/SOUTH CORRIDOR	P3-14
10	-	-
11	-	-
12	EMERGENCY LVL 2	EH-14
13	EMERGENCY LVL 3	EH-14
14	EMERGENCY LVL 4	EH-14
15	EMERGENCY LVL 5	EH-14
16		

RELAY PANEL RP5B SCHEDULE (5)

Relay No.	Area Controlled	Circuit No.
1	LVL 6 - EAST/WEST CORRIDOR	P3-16
2	LVL 6 - NORTH/SOUTH CORRIDOR	P3-16
3	LVL 7 - EAST/WEST CORRIDOR	P3-16
4	LVL 7 - NORTH/SOUTH CORRIDOR	P3-16
5	LVL 8 - EAST/WEST CORRIDOR	P3-18
6	LVL 8 - NORTH/SOUTH CORRIDOR	P3-18
7	LVL 9 - EAST/WEST CORRIDOR	P3-18
8	LVL 9 - NORTH/SOUTH CORRIDOR	P3-18
9	-	-
10	-	-
11	-	-
12	EMERGENCY LVL 6	EH-16
13	EMERGENCY LVL 7	EH-16
14	EMERGENCY LVL 8	EH-16
15	EMERGENCY LVL 9	EH-16
16	-	-

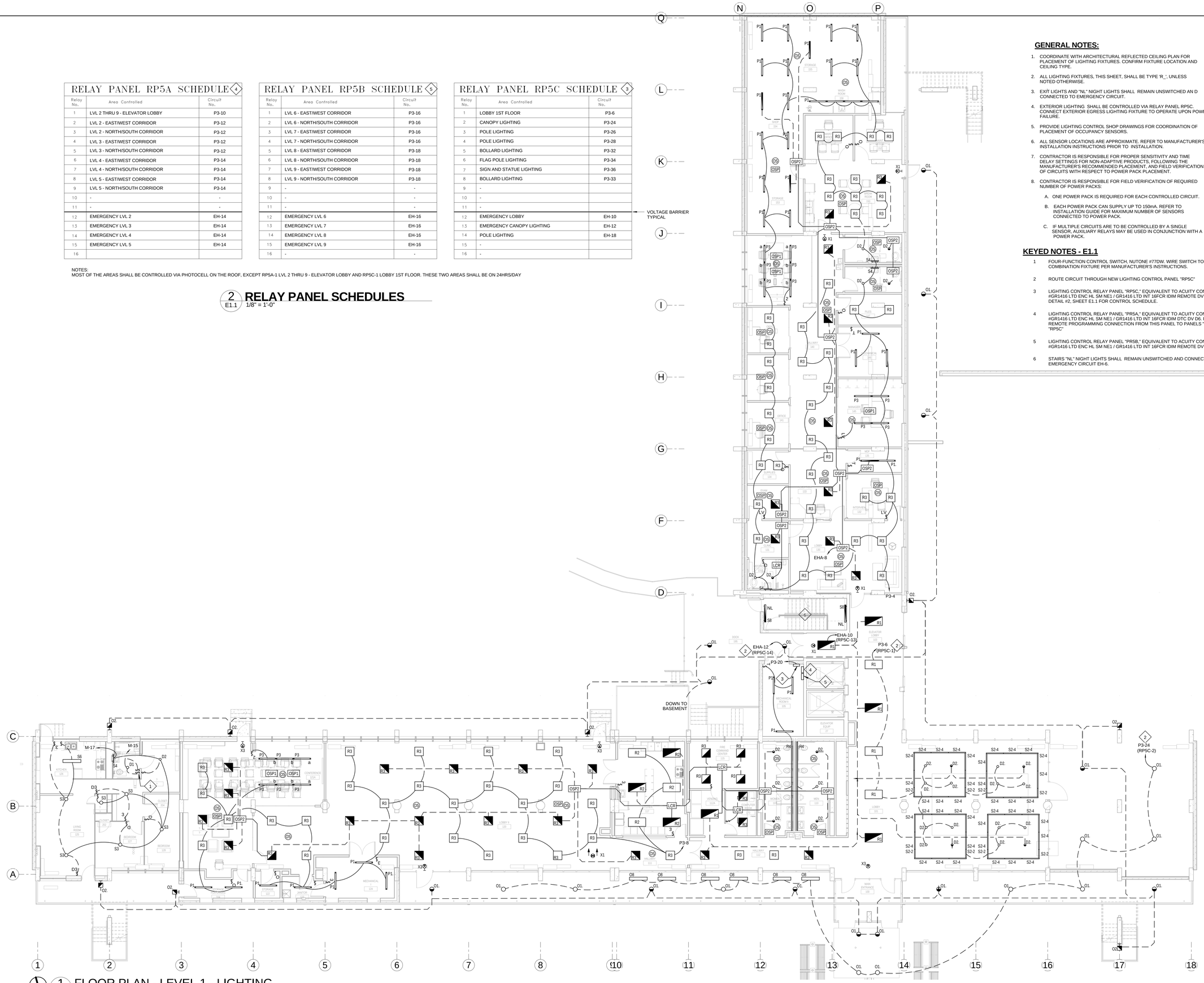
RELAY PANEL RP5C SCHEDULE (3)

Relay No.	Area Controlled	Circuit No.
1	LOBBY 1ST FLOOR	P3-6
2	CANOPY LIGHTING	P3-24
3	POLE LIGHTING	P3-26
4	POLE LIGHTING	P3-28
5	BOLLARD LIGHTING	P3-32
6	FLAG POLE LIGHTING	P3-34
7	SIGN AND STATUE LIGHTING	P3-36
8	BOLLARD LIGHTING	P3-33
9	-	
10	-	
11	-	
12	EMERGENCY LOBBY	EH-10
13	EMERGENCY CANOPY LIGHTING	EH-12
14	POLE LIGHTING	EH-18
15	-	
16	-	

NOTES:
MOST OF THE AREAS SHALL BE CONTROLLED VIA PHOTOCELL ON THE ROOF, EXCEPT RP5A-1 LVL 2 THRU 9 - ELEVATOR LOBBY AND RP5C-1 LOBBY 1ST FLOOR. THESE TWO AREAS SHALL BE ON 24HRS/DAY

2 RELAY PANEL SCHEDULES
E1.1 1/8" = 1'-0"

VOLTAGE BARRIER TYPICAL



1 FLOOR PLAN - LEVEL 1 - LIGHTING
NORTH
E1.1 1/8" = 1'-0"

GENERAL NOTES:

1. COORDINATE WITH ARCHITECTURAL REFLECTED CEILING PLAN FOR PLACEMENT OF LIGHTING FIXTURES. CONFIRM FIXTURE LOCATION AND CEILING TYPE.
2. ALL LIGHTING FIXTURES, THIS SHEET, SHALL BE TYPE 'R_'; UNLESS NOTED OTHERWISE.
3. EXIT LIGHTS AND "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AN D CONNECTED TO EMERGENCY CIRCUIT.
4. EXTERIOR LIGHTING SHALL BE CONTROLLED VIA RELAY PANEL RP5C. CONNECT EXTERIOR EGRESS LIGHTING FIXTURE TO OPERATE UPON POWER FAILURE.
5. PROVIDE LIGHTING CONTROL SHOP DRAWINGS FOR COORDINATION OF PLACEMENT OF OCCUPANCY SENSORS.
6. ALL SENSOR LOCATIONS ARE APPROXIMATE. REFER TO MANUFACTURER'S INSTALLATION INSTRUCTIONS PRIOR TO INSTALLATION.
7. CONTRACTOR IS RESPONSIBLE FOR PROPER SENSITIVITY AND TIME DELAY SETTINGS FOR NON-ADAPTIVE PRODUCTS, FOLLOWING THE MANUFACTURER'S RECOMMENDED PLACEMENT, AND FIELD VERIFICATION OF CIRCUITS WITH RESPECT TO POWER PACK PLACEMENT.
8. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFICATION OF REQUIRED NUMBER OF POWER PACKS:
   - A. ONE POWER PACK IS REQUIRED FOR EACH CONTROLLED CIRCUIT.
   - B. EACH POWER PACK CAN SUPPLY UP TO 150mA. REFER TO INSTALLATION GUIDE FOR MAXIMUM NUMBER OF SENSORS CONNECTED TO POWER PACK.
   - C. IF MULTIPLE CIRCUITS ARE TO BE CONTROLLED BY A SINGLE SENSOR, AUXILIARY RELAYS MAY BE USED IN CONJUNCTION WITH A POWER PACK.

KEYED NOTES - E1.1

1 FOUR-FUNCTION CONTROL SWITCH, NUTONE #77DW. WIRE SWITCH TO COMBINATION FIXTURE PER MANUFACTURER'S INSTRUCTIONS.

2 ROUTE CIRCUIT THROUGH NEW LIGHTING CONTROL PANEL "RP5C"

3 LIGHTING CONTROL RELAY PANEL "RP5C," EQUIVALENT TO ACUITY CONTROLS #GR1416 LTD ENC HL SM NE1 / GR1416 LTD INT 16FCR IDIM REMOTE DV D6. REFER TO DETAIL #2, SHEET E1.1 FOR CONTROL SCHEDULE.

4 LIGHTING CONTROL RELAY PANEL "PR5A," EQUIVALENT TO ACUITY CONTROLS #GR1416 LTD ENC HL SM NE1 / GR1416 LTD INT 16FCR IDIM DTC DV D6. PROVIDE REMOTE PROGRAMMING CONNECTION FROM THIS PANEL TO PANELS "RP5B" AND "RP5C"

5 LIGHTING CONTROL RELAY PANEL "PR5B," EQUIVALENT TO ACUITY CONTROLS #GR1416 LTD ENC HL SM NE1 / GR1416 LTD INT 16FCR IDIM REMOTE DV D6.

6 STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.

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RALPH E. MARTIN, JR.
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05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10-181

LEVEL 1 - LIGHTING

SHEET NUMBER
E1.1

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GENERAL NOTES:

1. EXIT LIGHT FIXTURES TO BURN 24HRS PER DAY. PROVIDE UNSWITCHED LIGHTING FIXTURE WITH UNSWITCHED PHASE CONDUCTOR AS INDICATED AND CONNECT EH-2 OR TO NEAREST EMERGENCY CIRCUIT IN THE VICINITY.
2. STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.
3. EXTERIOR LIGHTING SHALL BE CONTROLLED VIA RELAY PANEL. CONNECT EXTERIOR EGRESS LIGHTING FIXTURE TO OPERATE UPON POWER FAILURE.

KEYED NOTES - E1.2

1 FOUR-FUNCTION CONTROL SWITCH, NUTONE #77DW. WIRE SWITCH TO COMBINATION FIXTURE PER MANUFACTURER'S INSTRUCTIONS.

2 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE C PANEL SCHEDULE, SHEET E4.1.

3 CONNECT TO BREAKER #13 IN APARTMENT PANEL, REFER TO UNIT TYPE C PANEL SCHEDULE, SHEET E4.1.

4 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE E PANEL SCHEDULE, SHEET E4.2.

5 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE E PANEL SCHEDULE, SHEET E4.2.

6 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE G PANEL SCHEDULE, SHEET E4.2.

7 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE G PANEL SCHEDULE, SHEET E4.2.

8 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE H PANEL SCHEDULE, SHEET E4.2.

9 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE H PANEL SCHEDULE, SHEET E4.2.

10 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE K PANEL SCHEDULE, SHEET E4.3.

11 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE K PANEL SCHEDULE, SHEET E4.3.

12 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE J PANEL SCHEDULE, SHEET E4.3.

13 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE J PANEL SCHEDULE, SHEET E4.3.

14 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE F PANEL SCHEDULE, SHEET E4.2.

15 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE F PANEL SCHEDULE, SHEET E4.2.

16 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE B PANEL SCHEDULE, SHEET E4.1.

17 CONNECT TO BREAKER #13 IN APARTMENT PANEL, REFER TO UNIT TYPE B PANEL SCHEDULE, SHEET E4.1.

18 STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.

19 DO NOT CONNECT EXHAUST FAN

1 FLOOR PLAN - LEVEL 2 - LIGHTING
E1.2 — 1/8" = 1'-0"

NORTH

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05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

LEVEL 2 - LIGHTING

SHEET NUMBER
E1.2

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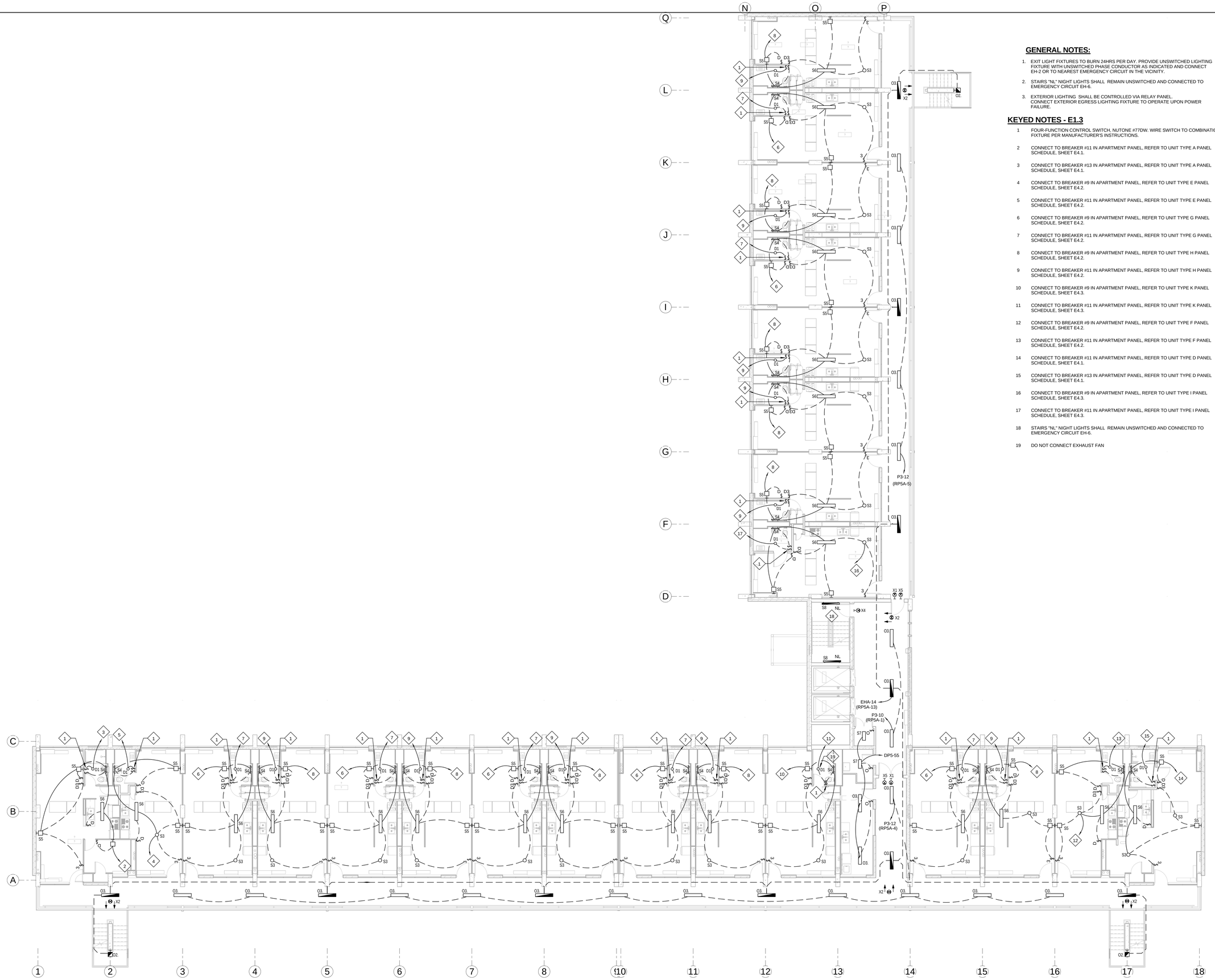

GENERAL NOTES:

1. EXIT LIGHT FIXTURES TO BURN 24HRS PER DAY. PROVIDE UNSWITCHED LIGHTING FIXTURE WITH UNSWITCHED PHASE CONDUCTOR AS INDICATED AND CONNECT EH-2 OR TO NEAREST EMERGENCY CIRCUIT IN THE VICINITY.
2. STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.
3. EXTERIOR LIGHTING SHALL BE CONTROLLED VIA RELAY PANEL. CONNECT EXTERIOR EGRESS LIGHTING FIXTURE TO OPERATE UPON POWER FAILURE.

KEYED NOTES - E1.3

1 FOUR-FUNCTION CONTROL SWITCH, NUTONE #77DW. WIRE SWITCH TO COMBINATION FIXTURE PER MANUFACTURER'S INSTRUCTIONS.

2 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE A PANEL SCHEDULE, SHEET E4.1.

3 CONNECT TO BREAKER #13 IN APARTMENT PANEL, REFER TO UNIT TYPE A PANEL SCHEDULE, SHEET E4.1.

4 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE E PANEL SCHEDULE, SHEET E4.2.

5 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE E PANEL SCHEDULE, SHEET E4.2.

6 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE G PANEL SCHEDULE, SHEET E4.2.

7 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE G PANEL SCHEDULE, SHEET E4.2.

8 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE H PANEL SCHEDULE, SHEET E4.2.

9 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE H PANEL SCHEDULE, SHEET E4.2.

10 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE K PANEL SCHEDULE, SHEET E4.3.

11 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE K PANEL SCHEDULE, SHEET E4.3.

12 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE F PANEL SCHEDULE, SHEET E4.2.

13 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE F PANEL SCHEDULE, SHEET E4.2.

14 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE D PANEL SCHEDULE, SHEET E4.1.

15 CONNECT TO BREAKER #13 IN APARTMENT PANEL, REFER TO UNIT TYPE D PANEL SCHEDULE, SHEET E4.1.

16 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE I PANEL SCHEDULE, SHEET E4.3.

17 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE I PANEL SCHEDULE, SHEET E4.3.

18 STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.

19 DO NOT CONNECT EXHAUST FAN

1 FLOOR PLAN - LEVEL 3 - LIGHTING
E1.3 1/8" = 1'-0"

NORTH

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SAN ANTONIO HOUSING AUTHORITY
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LOCATION: 411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
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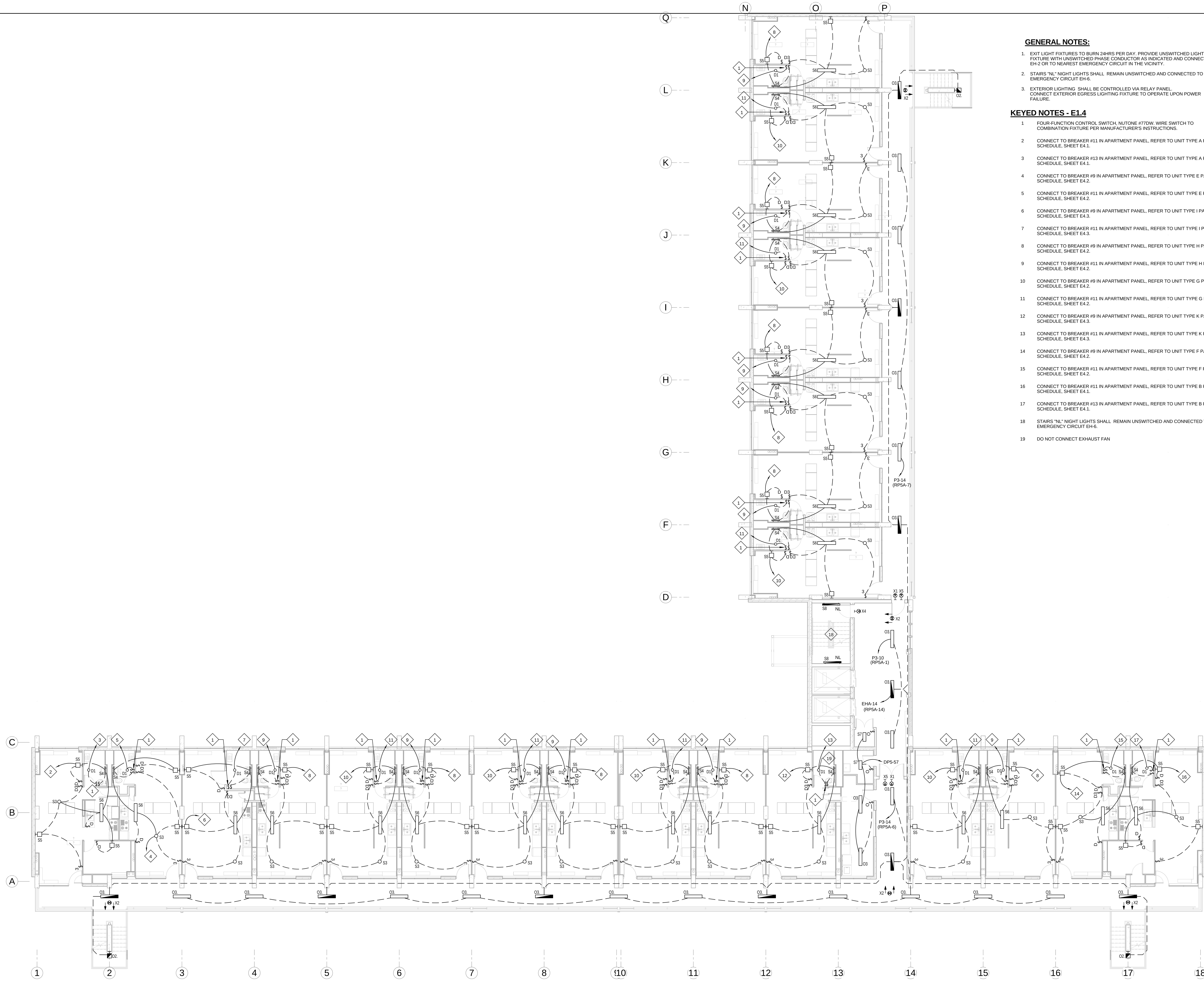
PERMIT SET

STATE OF TEXAS
RALPH E. MARTIN, JR.
75858
LICENSED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–987

LEVEL 3 - LIGHTING

SHEET NUMBER
E1.3



1 FLOOR PLAN - LEVEL 4 - LIGHTING
E1.4 1/8" = 1'-0"
NORTH

GENERAL NOTES:

1. EXIT LIGHT FIXTURES TO BURN 24HRS PER DAY. PROVIDE UNSWITCHED LIGHTING FIXTURE WITH UNSWITCHED PHASE CONDUCTOR AS INDICATED AND CONNECT EH-2 OR TO NEAREST EMERGENCY CIRCUIT IN THE VICINITY.
2. STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.
3. EXTERIOR LIGHTING SHALL BE CONTROLLED VIA RELAY PANEL. CONNECT EXTERIOR EGRESS LIGHTING FIXTURE TO OPERATE UPON POWER FAILURE.

KEYED NOTES - E1.4

1 FOUR-FUNCTION CONTROL SWITCH, NUTONE #77DW. WIRE SWITCH TO COMBINATION FIXTURE PER MANUFACTURER'S INSTRUCTIONS.

2 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE A PANEL SCHEDULE, SHEET E4.1.

3 CONNECT TO BREAKER #13 IN APARTMENT PANEL, REFER TO UNIT TYPE A PANEL SCHEDULE, SHEET E4.1.

4 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE E PANEL SCHEDULE, SHEET E4.2.

5 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE E PANEL SCHEDULE, SHEET E4.2.

6 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE I PANEL SCHEDULE, SHEET E4.3.

7 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE I PANEL SCHEDULE, SHEET E4.3.

8 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE H PANEL SCHEDULE, SHEET E4.2.

9 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE H PANEL SCHEDULE, SHEET E4.2.

10 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE G PANEL SCHEDULE, SHEET E4.2.

11 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE G PANEL SCHEDULE, SHEET E4.2.

12 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE K PANEL SCHEDULE, SHEET E4.3.

13 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE K PANEL SCHEDULE, SHEET E4.3.

14 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE F PANEL SCHEDULE, SHEET E4.2.

15 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE F PANEL SCHEDULE, SHEET E4.2.

16 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE B PANEL SCHEDULE, SHEET E4.1.

17 CONNECT TO BREAKER #13 IN APARTMENT PANEL, REFER TO UNIT TYPE B PANEL SCHEDULE, SHEET E4.1.

18 STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.

19 DO NOT CONNECT EXHAUST FAN

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LOCATION:

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STATE OF TEXAS
RALPH E. MARTIN, JR.
28858
REGISTERED PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

LEVEL 4 - LIGHTING

SHEET NUMBER
E1.4

GENERAL NOTES:

1. EXIT LIGHT FIXTURES TO BURN 24HRS PER DAY. PROVIDE UNSWITCHED LIGHTING FIXTURE WITH UNSWITCHED PHASE CONDUCTOR AS INDICATED AND CONNECT EH-2 OR TO NEAREST EMERGENCY CIRCUIT IN THE VICINITY.
2. STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.
3. EXTERIOR LIGHTING SHALL BE CONTROLLED VIA RELAY PANEL. CONNECT EXTERIOR EGRESS LIGHTING FIXTURE TO OPERATE UPON POWER FAILURE.

KEYED NOTES - E1.5

1 FOUR-FUNCTION CONTROL SWITCH, NUTONE #77DW. WIRE SWITCH TO COMBINATION FIXTURE PER MANUFACTURER'S INSTRUCTIONS.

2 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE A PANEL SCHEDULE, SHEET E4.1.

3 CONNECT TO BREAKER #13 IN APARTMENT PANEL, REFER TO UNIT TYPE A PANEL SCHEDULE, SHEET E4.1.

4 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE E PANEL SCHEDULE, SHEET E4.2.

5 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE E PANEL SCHEDULE, SHEET E4.2.

6 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE G PANEL SCHEDULE, SHEET E4.1.

7 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE G PANEL SCHEDULE, SHEET E4.1.

8 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE J PANEL SCHEDULE, SHEET E4.1.

9 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE J PANEL SCHEDULE, SHEET E4.1.

10 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE H PANEL SCHEDULE, SHEET E4.1.

11 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE H PANEL SCHEDULE, SHEET E4.1.

12 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE I PANEL SCHEDULE, SHEET E4.1.

13 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE I PANEL SCHEDULE, SHEET E4.1.

14 STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.

15 DO NOT CONNECT EXHAUST FAN

16 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE K PANEL SCHEDULE, SHEET E4.1.

17 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE K PANEL SCHEDULE, SHEET E4.1.

18 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE F PANEL SCHEDULE, SHEET E4.1.

19 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE F PANEL SCHEDULE, SHEET E4.1.

20 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE B PANEL SCHEDULE, SHEET E4.1.

21 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE B PANEL SCHEDULE, SHEET E4.1.

NORTH

1 E1.5 FLOOR PLAN - LEVEL 5 - LIGHTING
1/8" = 1'-0"

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RALPH E. MARTIN, JR.
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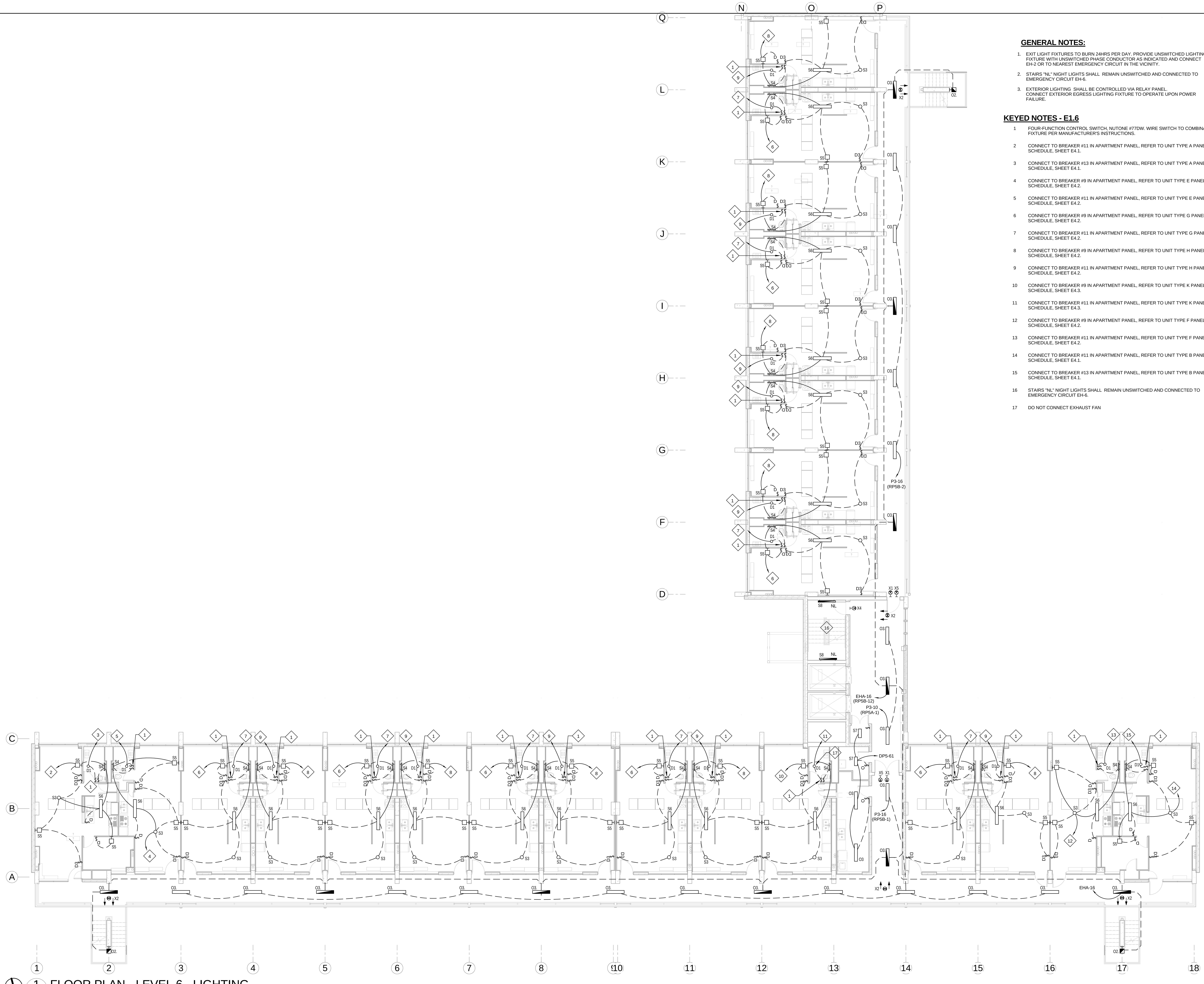
REGISTERED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

LEVEL 5 - LIGHTING

SHEET NUMBER
E1.5



1 E1.6 FLOOR PLAN - LEVEL 6 - LIGHTING
1/8" = 1'-0"
NORTH

GENERAL NOTES:

1. EXIT LIGHT FIXTURES TO BURN 24HRS PER DAY. PROVIDE UNSWITCHED LIGHTING FIXTURE WITH UNSWITCHED PHASE CONDUCTOR AS INDICATED AND CONNECT EH-2 OR TO NEAREST EMERGENCY CIRCUIT IN THE VICINITY.
2. STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.
3. EXTERIOR LIGHTING SHALL BE CONTROLLED VIA RELAY PANEL. CONNECT EXTERIOR EGRESS LIGHTING FIXTURE TO OPERATE UPON POWER FAILURE.

KEYED NOTES - E1.6

1 FOUR-FUNCTION CONTROL SWITCH, NUTONE #77DW. WIRE SWITCH TO COMBINATION FIXTURE PER MANUFACTURER'S INSTRUCTIONS.

2 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE A PANEL SCHEDULE, SHEET E4.1.

3 CONNECT TO BREAKER #13 IN APARTMENT PANEL, REFER TO UNIT TYPE A PANEL SCHEDULE, SHEET E4.1.

4 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE E PANEL SCHEDULE, SHEET E4.2.

5 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE E PANEL SCHEDULE, SHEET E4.2.

6 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE G PANEL SCHEDULE, SHEET E4.2.

7 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE G PANEL SCHEDULE, SHEET E4.2.

8 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE H PANEL SCHEDULE, SHEET E4.2.

9 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE H PANEL SCHEDULE, SHEET E4.2.

10 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE K PANEL SCHEDULE, SHEET E4.3.

11 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE K PANEL SCHEDULE, SHEET E4.3.

12 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE F PANEL SCHEDULE, SHEET E4.2.

13 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE F PANEL SCHEDULE, SHEET E4.2.

14 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE B PANEL SCHEDULE, SHEET E4.1.

15 CONNECT TO BREAKER #13 IN APARTMENT PANEL, REFER TO UNIT TYPE B PANEL SCHEDULE, SHEET E4.1.

16 STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.

17 DO NOT CONNECT EXHAUST FAN

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STATE OF TEXAS
RALPH E. MARTIN, JR.
28858
REGISTERED PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-891

LEVEL 6 - LIGHTING

SHEET NUMBER
E1.6

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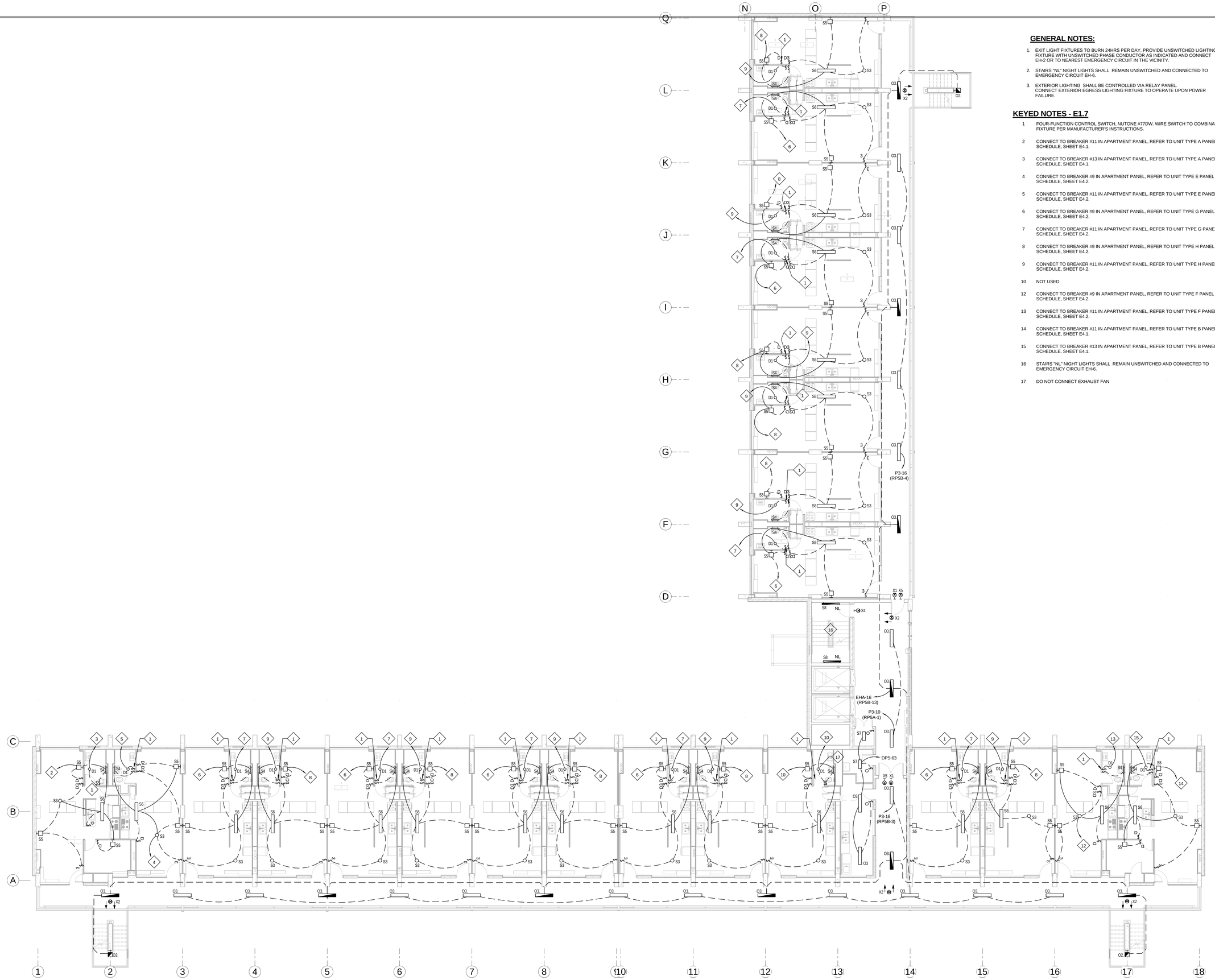

GENERAL NOTES:

1. EXIT LIGHT FIXTURES TO BURN 24HRS PER DAY. PROVIDE UNSWITCHED LIGHTING FIXTURE WITH UNSWITCHED PHASE CONDUCTOR AS INDICATED AND CONNECT EH-2 OR TO NEAREST EMERGENCY CIRCUIT IN THE VICINITY.
2. STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.
3. EXTERIOR LIGHTING SHALL BE CONTROLLED VIA RELAY PANEL. CONNECT EXTERIOR EGRESS LIGHTING FIXTURE TO OPERATE UPON POWER FAILURE.

KEYED NOTES - E1.7

1 FOUR-FUNCTION CONTROL SWITCH, NUTONE #77DW. WIRE SWITCH TO COMBINATION FIXTURE PER MANUFACTURER'S INSTRUCTIONS.

2 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE A PANEL SCHEDULE, SHEET E4.1.

3 CONNECT TO BREAKER #13 IN APARTMENT PANEL, REFER TO UNIT TYPE A PANEL SCHEDULE, SHEET E4.1.

4 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE E PANEL SCHEDULE, SHEET E4.2.

5 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE E PANEL SCHEDULE, SHEET E4.2.

6 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE G PANEL SCHEDULE, SHEET E4.2.

7 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE G PANEL SCHEDULE, SHEET E4.2.

8 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE H PANEL SCHEDULE, SHEET E4.2.

9 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE H PANEL SCHEDULE, SHEET E4.2.

10 NOT USED

12 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE F PANEL SCHEDULE, SHEET E4.2.

13 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE F PANEL SCHEDULE, SHEET E4.2.

14 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE B PANEL SCHEDULE, SHEET E4.1.

15 CONNECT TO BREAKER #13 IN APARTMENT PANEL, REFER TO UNIT TYPE B PANEL SCHEDULE, SHEET E4.1.

16 STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.

17 DO NOT CONNECT EXHAUST FAN

1 FLOOR PLAN - LEVEL 7 - LIGHTING
E1.7 1/8" = 1'-0"

NORTH

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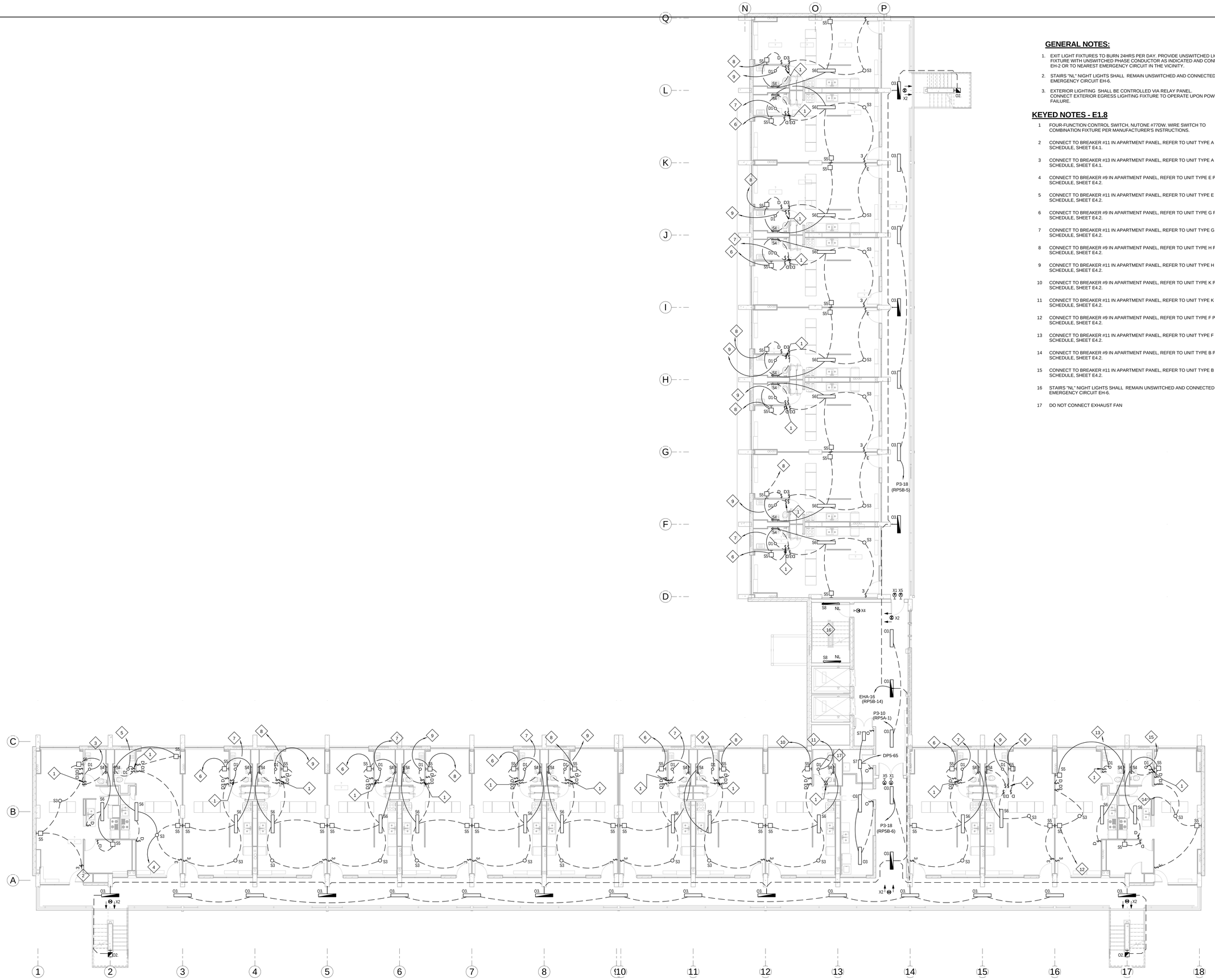
REGISTERED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

LEVEL 7 - LIGHTING

SHEET NUMBER
E1.7



GENERAL NOTES:

1. EXIT LIGHT FIXTURES TO BURN 24HRS PER DAY. PROVIDE UNSWITCHED LIGHTING FIXTURE WITH UNSWITCHED PHASE CONDUCTOR AS INDICATED AND CONNECT EH-2 OR TO NEAREST EMERGENCY CIRCUIT IN THE VICINITY.
2. STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.
3. EXTERIOR LIGHTING SHALL BE CONTROLLED VIA RELAY PANEL. CONNECT EXTERIOR EGRESS LIGHTING FIXTURE TO OPERATE UPON POWER FAILURE.

KEYED NOTES - E1.8

1 FOUR-FUNCTION CONTROL SWITCH, NUTONE #77DW. WIRE SWITCH TO COMBINATION FIXTURE PER MANUFACTURER'S INSTRUCTIONS.

2 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE A PANEL SCHEDULE, SHEET E4.1.

3 CONNECT TO BREAKER #13 IN APARTMENT PANEL, REFER TO UNIT TYPE A PANEL SCHEDULE, SHEET E4.1.

4 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE E PANEL SCHEDULE, SHEET E4.2.

5 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE E PANEL SCHEDULE, SHEET E4.2.

6 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE G PANEL SCHEDULE, SHEET E4.2.

7 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE G PANEL SCHEDULE, SHEET E4.2.

8 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE H PANEL SCHEDULE, SHEET E4.2.

9 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE H PANEL SCHEDULE, SHEET E4.2.

10 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE K PANEL SCHEDULE, SHEET E4.2.

11 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE K PANEL SCHEDULE, SHEET E4.2.

12 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE F PANEL SCHEDULE, SHEET E4.2.

13 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE F PANEL SCHEDULE, SHEET E4.2.

14 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE B PANEL SCHEDULE, SHEET E4.2.

15 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE B PANEL SCHEDULE, SHEET E4.2.

16 STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.

17 DO NOT CONNECT EXHAUST FAN

NORTH

1 E1.8 FLOOR PLAN - LEVEL 8 - LIGHTING

1/8" = 1'-0"

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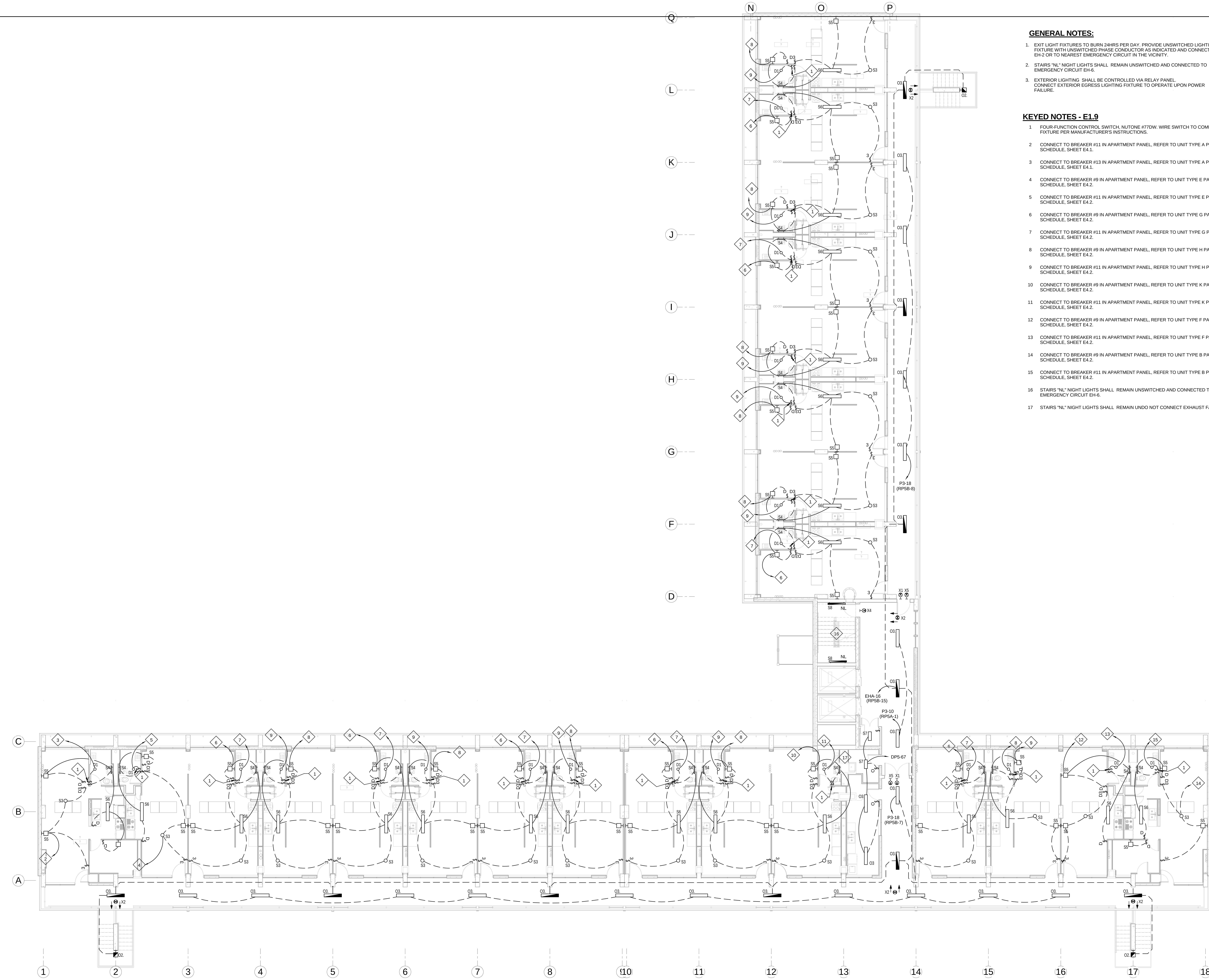
28858
REGISTERED
PROFESSIONAL ENGINEER

05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

LEVEL 8 - LIGHTING

SHEET NUMBER
E1.8



1 FLOOR PLAN - LEVEL 9 - LIGHTING
E1.9 1/8" = 1'-0"

NORTH

GENERAL NOTES:

1. EXIT LIGHT FIXTURES TO BURN 24HRS PER DAY. PROVIDE UNSWITCHED LIGHTING FIXTURE WITH UNSWITCHED PHASE CONDUCTOR AS INDICATED AND CONNECT EH-2 OR TO NEAREST EMERGENCY CIRCUIT IN THE VICINITY.
2. STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.
3. EXTERIOR LIGHTING SHALL BE CONTROLLED VIA RELAY PANEL. CONNECT EXTERIOR EGRESS LIGHTING FIXTURE TO OPERATE UPON POWER FAILURE.

KEYED NOTES - E1.9

1 FOUR-FUNCTION CONTROL SWITCH, NUTONE #77DW. WIRE SWITCH TO COMBINATION FIXTURE PER MANUFACTURER'S INSTRUCTIONS.

2 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE A PANEL SCHEDULE, SHEET E4.1.

3 CONNECT TO BREAKER #13 IN APARTMENT PANEL, REFER TO UNIT TYPE A PANEL SCHEDULE, SHEET E4.1.

4 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE E PANEL SCHEDULE, SHEET E4.2.

5 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE E PANEL SCHEDULE, SHEET E4.2.

6 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE G PANEL SCHEDULE, SHEET E4.2.

7 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE G PANEL SCHEDULE, SHEET E4.2.

8 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE H PANEL SCHEDULE, SHEET E4.2.

9 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE H PANEL SCHEDULE, SHEET E4.2.

10 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE K PANEL SCHEDULE, SHEET E4.2.

11 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE K PANEL SCHEDULE, SHEET E4.2.

12 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE F PANEL SCHEDULE, SHEET E4.2.

13 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE F PANEL SCHEDULE, SHEET E4.2.

14 CONNECT TO BREAKER #9 IN APARTMENT PANEL, REFER TO UNIT TYPE B PANEL SCHEDULE, SHEET E4.2.

15 CONNECT TO BREAKER #11 IN APARTMENT PANEL, REFER TO UNIT TYPE B PANEL SCHEDULE, SHEET E4.2.

16 STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.

17 STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNDO NOT CONNECT EXHAUST FAN

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RALPH E. MARTIN, JR.
28858
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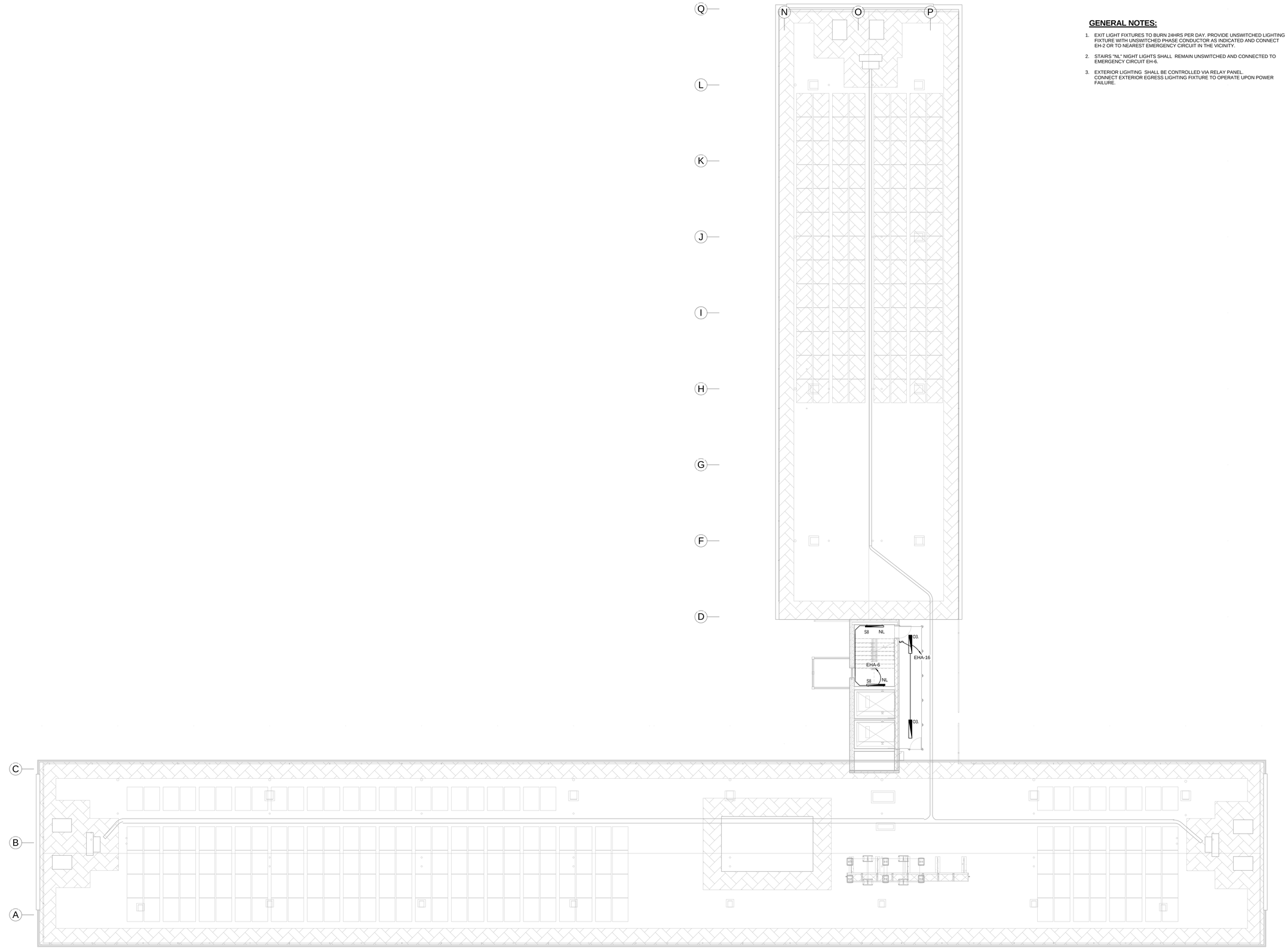
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

LEVEL 9 - LIGHTING

SHEET NUMBER
E1.9



GENERAL NOTES:

1. EXIT LIGHT FIXTURES TO BURN 24HRS PER DAY. PROVIDE UNSWITCHED LIGHTING FIXTURE WITH UNSWITCHED PHASE CONDUCTOR AS INDICATED AND CONNECT EH-2 OR TO NEAREST EMERGENCY CIRCUIT IN THE VICINITY.
2. STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.
3. EXTERIOR LIGHTING SHALL BE CONTROLLED VIA RELAY PANEL. CONNECT EXTERIOR EGRESS LIGHTING FIXTURE TO OPERATE UPON POWER FAILURE.

1 FLOOR PLAN - LEVEL 10 - LIGHTING

E1.10 1/8" = 1'-0"

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TEXAS LICENSE NO. 10-881

LEVEL 10 - LIGHTING

SHEET NUMBER
E1.10

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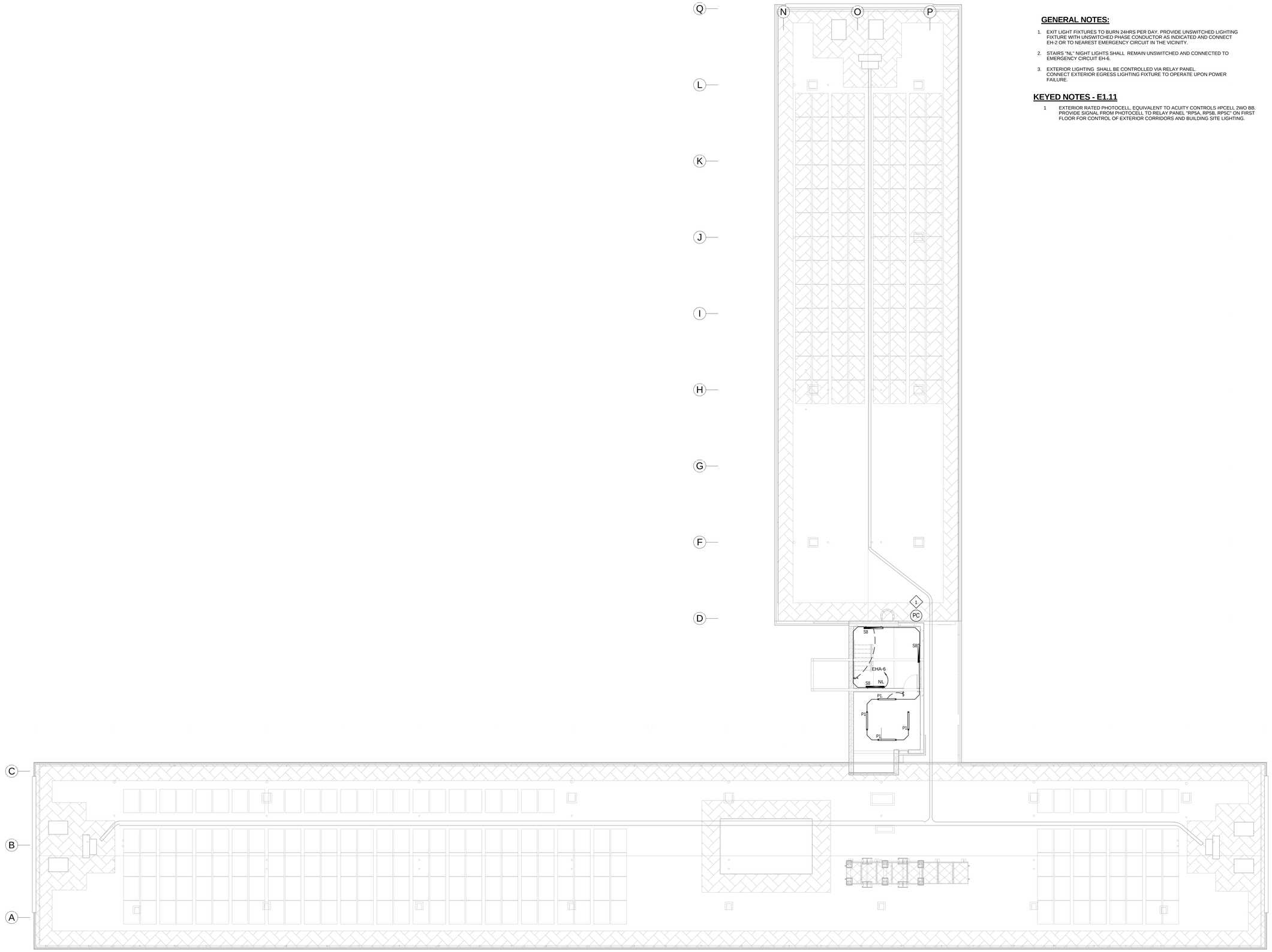

1 E1.11 **FLOOR PLAN - LEVEL 11 - LIGHTING**
1/8" = 1'-0"

GENERAL NOTES:

1. EXIT LIGHT FIXTURES TO BURN 24HRS PER DAY. PROVIDE UNSWITCHED LIGHTING FIXTURE WITH UNSWITCHED PHASE CONDUCTOR AS INDICATED AND CONNECT EH-2 OR TO NEAREST EMERGENCY CIRCUIT IN THE VICINITY.
2. STAIRS "NL" NIGHT LIGHTS SHALL REMAIN UNSWITCHED AND CONNECTED TO EMERGENCY CIRCUIT EH-6.
3. EXTERIOR LIGHTING SHALL BE CONTROLLED VIA RELAY PANEL. CONNECT EXTERIOR EGRESS LIGHTING FIXTURE TO OPERATE UPON POWER FAILURE.

KEYED NOTES - E1.11

1 EXTERIOR RATED PHOTOCELL, EQUIVALENT TO ACUITY CONTROLS #PCELL 2WO BB. PROVIDE SIGNAL FROM PHOTOCELL TO RELAY PANEL "RPSA, RPSB, RPSC" ON FIRST FLOOR FOR CONTROL OF EXTERIOR CORRIDORS AND BUILDING SITE LIGHTING.

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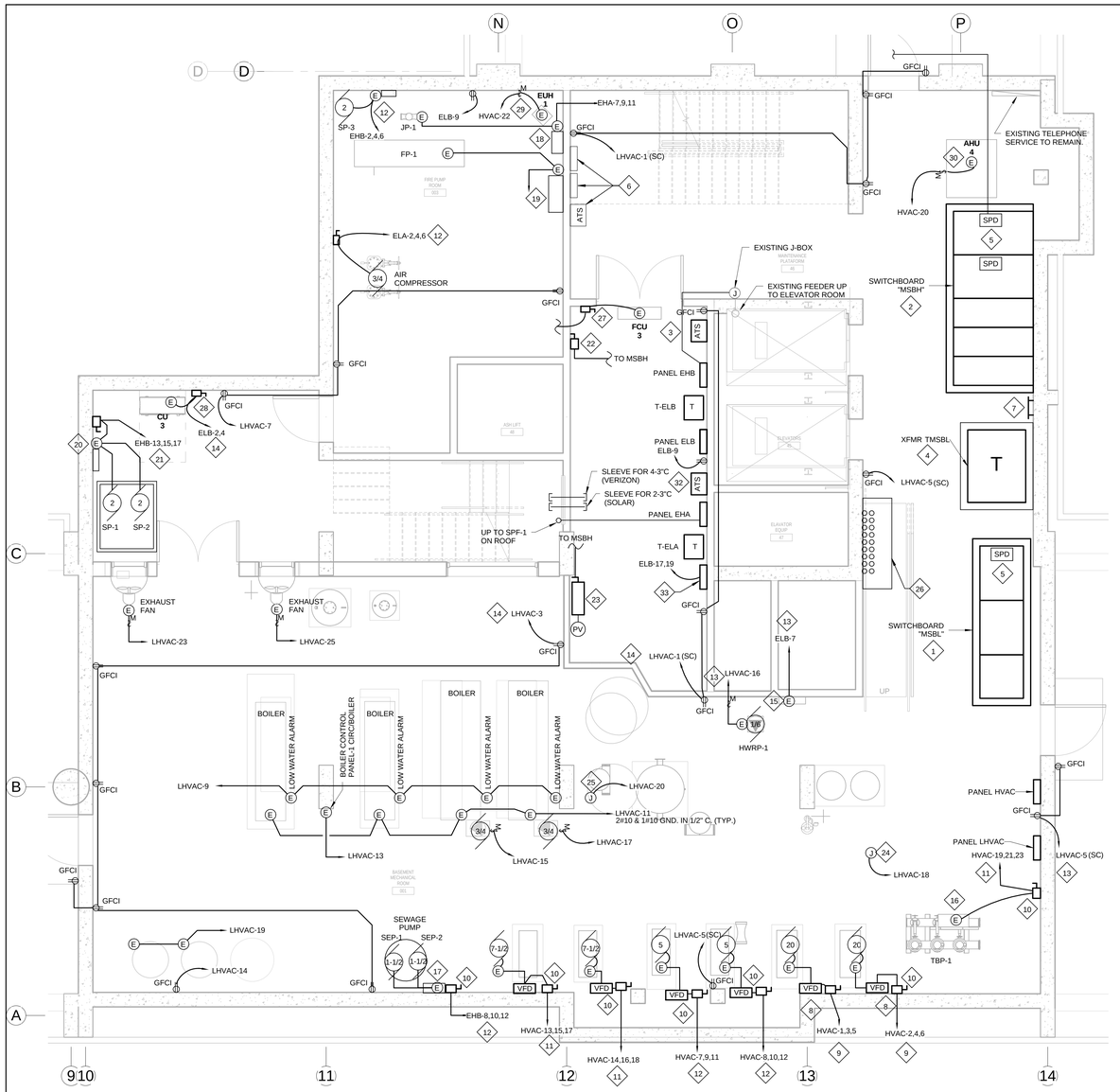
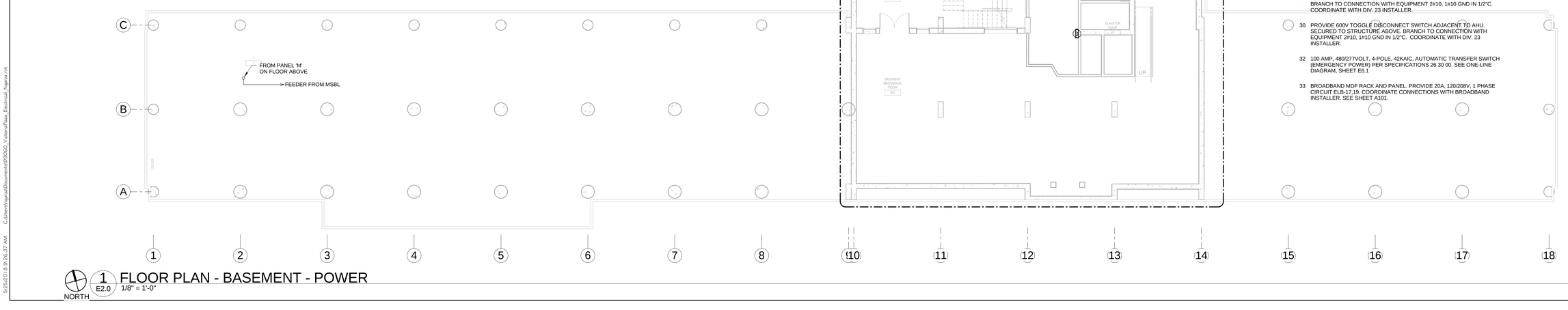
LEVEL 11 - LIGHTING

SHEET NUMBER
E1.11

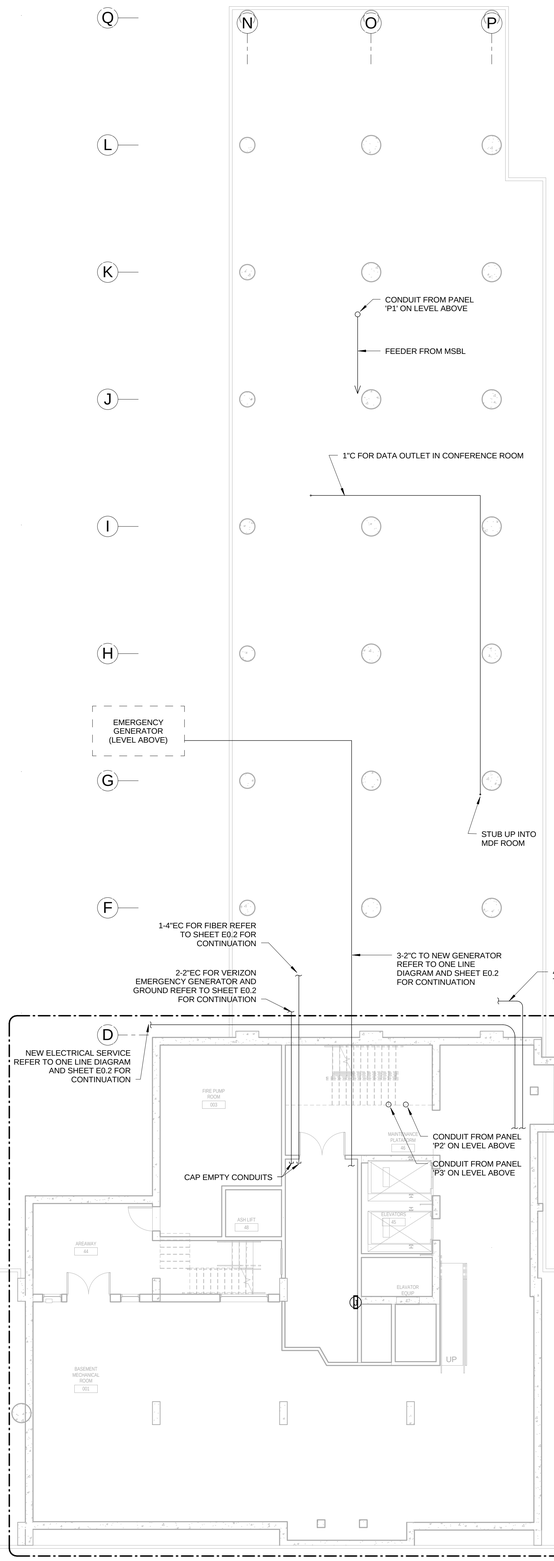


2 FLOOR PLAN - ENLARGED BASEMENT - POWER
E2.0 1/4" = 1'-0"



1 FLOOR PLAN - BASEMENT - POWER
E2.0 1/8" = 1'-0"

NORTH



GENERAL NOTES:

1. VERIFY EXACT LOCATION OF RECEPTACLES WITH ARCHITECT/ OWNER'S REPRESENTATIVE PRIOR TO ROUGH-IN.
2. DO NOT INSTALL BOXES BACK TO BACK IN DEMISING WALLS. SEE SPECIFICATIONS FOR OFFSET REQUIREMENTS.
3. COORDINATE PLACEMENT OF CEILING MOUNTED SIGNAL DEVICES WITH HVAC/SPRINKLER INSTALLERS.
4. COORDINATE CONNECTIONS TO ALL HVAC EQUIPMENT WITH DIV. 23 INSTALLER. REFER HVAC DRAWINGS.
5. REFER TO SHOP FIRE ALARM DRAWINGS FOR DEVICE CONDUIT, BOXES, AND ROUGH-IN REQUIREMENTS. CABLING SHALL BE BY FIRE ALARM SYSTEM INSTALLER, DIV 28.
6. ALL CONDUIT IN EXPOSED AREAS SHALL BE AS CLOSE TO STRUCTURAL MEMBERS OR CONCEALED. COORDINATE ROUTING OF CONDUIT WITH ARCHITECT PRIOR TO ROUGH-IN. WHERE UNABLE TO CONCEAL USE WIREMOLD 700 SERIES, FINISH BY ARCHITECT. IN CONDITIONS WHERE DEVICES CAN NOT BE MOUNTED IN STRUCTURAL MEMBERS IN EXPOSED AREAS. CONTRACTOR SHALL COORDINATE DEVICE SUPPORT DETAILS WITH ARCHITECT.
7. ALL GFCI OUTLETS TO BE MOUNTED AT 48" AFF.
8. GENERAL CONTRACTOR TO REVIEW EXISTING CONDITIONS. X-RAY PRIOR TO CORING FOR NEW CONDUIT. COORDINATE LOCATION IN FIELD. FIRE CAULK AND SEAL ALL PENETRATIONS WEATHERTIGHT.

KEYED NOTES - E2.0

1 PROVIDE 4,000 AMP, 208/120 VOLT, 3-PHASE, 4-WIRE, 65KAIC FREE STANDING DEAD FRONT SWITCHBOARD. MAIN CIRCUIT BREAKER AND ALL FEEDER BREAKER 800AF AND ABOVE SHALL BE EATON FIXED MOUNTED MAGNUM DS 30-CYCLE POWER BREAKER. REFER TO ELECTRICAL RISER DIAGRAM DWG E6.1.

2 PROVIDE 3,000 AMP, 480/277 VOLT, 3-PHASE, 4-WIRE, 100KAIC FREE STANDING DEAD FRONT SERVICE ENTRANCE DWITCHBOARD. MAIN CIRCUIT BREAKER AND ALL FEEDER BREAKER 800AF AND ABOVE SHALL BE EATON FIXED MOUNTED MAGNUM DS 30-CYCLE POWER BREAKER. REFER TO ELECTRICAL RISER DIAGRAM DWG E6.1.

3 150 AMP, 480/277VOLT, 4-POLE, 42KAIC, AUTOMATIC TRANSFER SWITCH (STANDBY POWER) PER SPECIFICATIONS 26 30 00. SEE ONE-LINE DIAGRAM, SHEET E6.1

4 1000 KVA 480Y PRIMARY TO 208Y/120 VOLT, SECONDARY DOE 2016 ENERGY EFFICENCY DRY TYPE TRANSFORMER (XFMR) REFER TO ELECTRICAL RISER DIAGRAM. MOUNT ON 6" HOUSEKEEPING CONCRETE PAD.

5 SERVICE ENTRANCE SURGE PROTECTION DEVICE (SPD) INTERNALLY MOUNTED TO SWITCHBOARD BY SWITCHBOARD MANUFACTURER.

6 EXISTING ELECTRICAL EQUIPMENT TO REMAIN. REFER TO SHEET E6.1.

7 MAIN GROUND BUS BAR. REFER TO 2/E5.1.

8 60 AMP, 3-POLE, 600 VAC HEAVY DUTY NEMA 1 ENCLOSURE NON-FUSED DISCONNECT SWITCH. COORDINATE MOUNTING WITH PUMP INSTALLER.

9 3#8 & 1#10 GND. IN 3/4" C.

10 30 AMP, 3-POLE, 600 VAC HEAVY DUTY NEMA 1 ENCLOSURE NON-FUSED DISCONNECT SWITCH. COORDINATE MOUNTING WITH PUMP INSTALLER.

11 3#10 & 1#10 GND. IN 1/2" C.

12 3#12 & 1#12 GND. IN 1/2" C.

13 2#12 & 1#12 GND. IN 1/2" C.

14 2#10 & 1#12 GND. IN 1/2" C.

15 ELECTRICAL CONNECTION TO DDC CONTROL PANEL, 120 VOLT.

16 ELECTRICAL CONNECTION TO DUPLEX DOMESTIC BOOSTER PUMPS CONTROL PANEL, (2) 5 HP, 480 VOLT, 3-PHASE. COORDINATE WITH PUMP INSTALLER.

17 ELECTRICAL CONNECTION TO DUPLEX SEWAGE EJECTOR PUMPS CONTROL PANEL, (2) 1-1/2 HP, 480 VOLT, 3-PHASE. ELECTRICAL CONNECTION TO DUPLEX SEWAGE EJECTOR PUMPS CONTROL PANEL, (2) 1-1/2 HP, 480 VOLT, 3-PHASE. COORDINATE WITH PUMP INSTALLER.

18 ELECTRICAL CONNECTION TO JOCKEY PUMP CONTROL PANEL, 2 HP, 480 VOLT, 3-PHASE. COORDINATE WITH PUMP INSTALLER.

19 ELECTRICAL CONNECTION TO FIRE PUMP CONTROLLER, 100 HP, 480 VOLT, 3-PHASE. REFER TO SHEET E6.1. COORDINATE WITH PUMP INSTALLER.

20 ELECTRICAL CONNECTIONS TO DUPLEX STORM WATER SUMP PUMP CONTROL PANEL, (2) 2HP, 480 VOLT, 3-PHASE. PROVIDE A 30 AMP, 3-POLE, 600VAC, HEAVY DUTY NEMA 3R ENCLOSURE, NON-FUSED DISCONNECT SWITCH. COORDINATE WITH PUMP INSTALLER.

21 3#12 & 1#12 GND IN 1/2" EC.

22 PROVIDE 100A, 3P, NEMA 1 DISCONNECT SWITCH, SECURED TO WALL FOR VERIZON COMMUNICATIONS. PROVIDE FEEDER FROM SWITCHBOARD MSBH PER E6.1.

23 PROVIDE 400A, 3P, NEMA 1 DISCONNECT SWITCH, SECURED TO WALL FOR PV SOLAR. SOLAR TO PROVIDE PV METER PER CPS REQUIREMENTS. PROVIDE 400 AMP FEEDER TO SWITCHBOARD MSBH

24 PROVIDE 120V CONNECTION TO FLOW METER. COORDINATE WITH DIV. 23 INSTALLER.

25 PROVIDE 120V CONNECTION TO MIXING VALVES. COORDINATE WITH DIV. 23 INSTALLER.

26 PROVIDE NEC SIZED PULL BOX FOR ROUTING OF 600AMP FEEDERS FROM MSBL TO THE PANEL SERVING UNIT FEEEDERS ON EACH FLOOR.

27 PROVIDE 30A, 2P, NF, NEMA 1 DISCONNECT SWITCH, ADJACENT TO INDOOR AIC UNIT. BRANCH TO CONNECTION WITH EQUIPMENT 2#12, 1#12 GND. AND CONTROLS. COORDINATE WITH DIV. 23 INSTALLER AND MANUFACTURER'S RECOMMENDED WIRING. CONTINUE BRANCH CIRCUIT TO CONDENSING UNIT CU-3

28 PROVIDE 30A, 2P NF, NEMA 3R DISCONNECT SWITCH, SECURED TO WALL. BRANCH TO CONNECTION WITH HVAC EQUIPMENT, 2#12, #12GND, 1/2" LIQUIDTIGHT FLEXIBLE CONDUIT. HOMERUN TO CIRCUIT INDICATED. EXTEND POWER (208V) AND CONTROL WIRING DOWN TO INDOOR UNIT, IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. COORDINATE WITH DIV. 23 INSTALLER.

29 PROVIDE 600V TOGGLE DISCONNECT SWITCH ADJACENT TO UNIT HEATER. BRANCH TO CONNECTION WITH EQUIPMENT 2#10, 1#10 GND IN 1/2"C. COORDINATE WITH DIV. 23 INSTALLER.

30 PROVIDE 600V TOGGLE DISCONNECT SWITCH ADJACENT TO AHU. SECURED TO STRUCTURE ABOVE. BRANCH TO CONNECTION WITH EQUIPMENT 2#10, 1#10 GND IN 1/2"C. COORDINATE WITH DIV. 23 INSTALLER.

32 100 AMP, 480/277VOLT, 4-POLE, 42KAIC, AUTOMATIC TRANSFER SWITCH (EMERGENCY POWER) PER SPECIFICATIONS 26 30 00. SEE ONE-LINE DIAGRAM, SHEET E6.1

33 BROADBAND MDF RACK AND PANEL. PROVIDE 20A, 120/208V, 1 PHASE CIRCUIT ELB-17,19. COORDINATE CONNECTIONS WITH BROADBAND INSTALLER. SEE SHEET A101.

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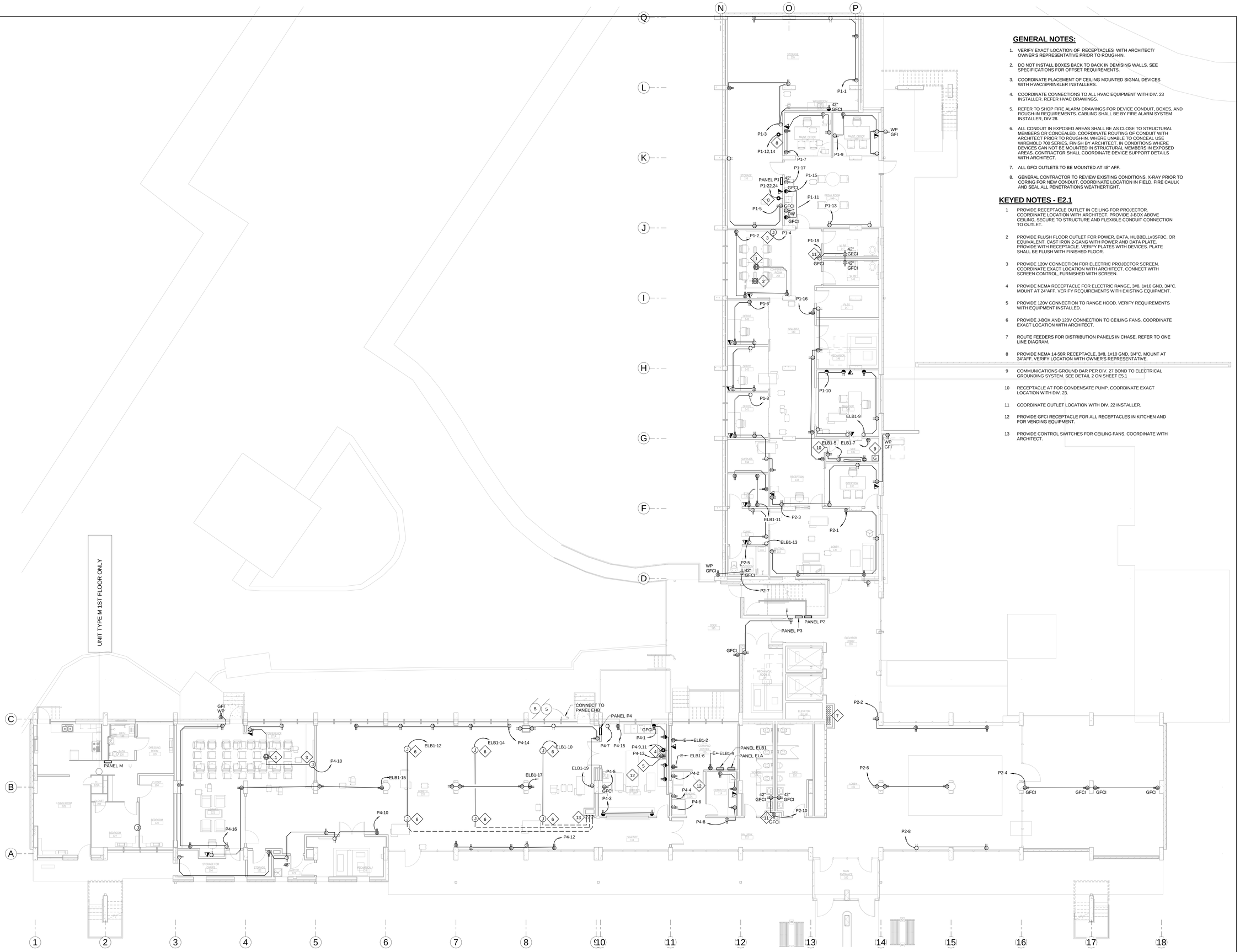
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

BASEMENT - POWER

SHEET NUMBER
E2.0



GENERAL NOTES:

1. VERIFY EXACT LOCATION OF RECEPTACLES WITH ARCHITECT/ OWNER'S REPRESENTATIVE PRIOR TO ROUGH-IN.
2. DO NOT INSTALL BOXES BACK TO BACK IN DEMISING WALLS. SEE SPECIFICATIONS FOR OFFSET REQUIREMENTS.
3. COORDINATE PLACEMENT OF CEILING MOUNTED SIGNAL DEVICES WITH HVAC/SPRINKLER INSTALLERS.
4. COORDINATE CONNECTIONS TO ALL HVAC EQUIPMENT WITH DIV. 23 INSTALLER. REFER HVAC DRAWINGS.
5. REFER TO SHOP FIRE ALARM DRAWINGS FOR DEVICE CONDUIT, BOXES, AND ROUGH-IN REQUIREMENTS. CABLING SHALL BE BY FIRE ALARM SYSTEM INSTALLER, DIV 28.
6. ALL CONDUIT IN EXPOSED AREAS SHALL BE AS CLOSE TO STRUCTURAL MEMBERS OR CONCEALED. COORDINATE ROUTING OF CONDUIT WITH ARCHITECT PRIOR TO ROUGH-IN. WHERE UNABLE TO CONCEAL USE WIREMOLD 700 SERIES, FINISH BY ARCHITECT. IN CONDITIONS WHERE DEVICES CAN NOT BE MOUNTED IN STRUCTURAL MEMBERS IN EXPOSED AREAS, CONTRACTOR SHALL COORDINATE DEVICE SUPPORT DETAILS WITH ARCHITECT.
7. ALL GFCI OUTLETS TO BE MOUNTED AT 48" AFF.
8. GENERAL CONTRACTOR TO REVIEW EXISTING CONDITIONS. X-RAY PRIOR TO CORING FOR NEW CONDUIT. COORDINATE LOCATION IN FIELD. FIRE CAULK AND SEAL ALL PENETRATIONS WEATHERTIGHT.

KEYED NOTES - E2.1

1 PROVIDE RECEPTACLE OUTLET IN CEILING FOR PROJECTOR. COORDINATE LOCATION WITH ARCHITECT. PROVIDE J-BOX ABOVE CEILING, SECURE TO STRUCTURE AND FLEXIBLE CONDUIT CONNECTION TO OUTLET.

2 PROVIDE FLUSH FLOOR OUTLET FOR POWER, DATA, HUBBELL#3SFBC, OR EQUIVALENT. CAST IRON 2-GANG WITH POWER AND DATA PLATE, PROVIDE WITH RECEPTACLE. VERIFY PLATES WITH DEVICES. PLATE SHALL BE FLUSH WITH FINISHED FLOOR.

3 PROVIDE 120V CONNECTION FOR ELECTRIC PROJECTOR SCREEN. COORDINATE EXACT LOCATION WITH ARCHITECT. CONNECT WITH SCREEN CONTROL, FURNISHED WITH SCREEN.

4 PROVIDE NEMA RECEPTACLE FOR ELECTRIC RANGE, 3#8, 1#10 GND, 3/4"C. MOUNT AT 24"AFF. VERIFY REQUIREMENTS WITH EXISTING EQUIPMENT.

5 PROVIDE 120V CONNECTION TO RANGE HOOD. VERIFY REQUIREMENTS WITH EQUIPMENT INSTALLED.

6 PROVIDE J-BOX AND 120V CONNECTION TO CEILING FANS. COORDINATE EXACT LOCATION WITH ARCHITECT.

7 ROUTE FEEDERS FOR DISTRIBUTION PANELS IN CHASE. REFER TO ONE LINE DIAGRAM.

8 PROVIDE NEMA 14-50R RECEPTACLE, 3#8, 1#10 GND, 3/4"C. MOUNT AT 24"AFF. VERIFY LOCATION WITH OWNER'S REPRESENTATIVE.

9 COMMUNICATIONS GROUND BAR PER DIV. 27 BOND TO ELECTRICAL GROUNDING SYSTEM. SEE DETAIL 2 ON SHEET E5.1

10 RECEPTACLE AT FOR CONDENSATE PUMP. COORDINATE EXACT LOCATION WITH DIV. 23.

11 COORDINATE OUTLET LOCATION WITH DIV. 22 INSTALLER.

12 PROVIDE GFCI RECEPTACLE FOR ALL RECEPTACLES IN KITCHEN AND FOR VENDING EQUIPMENT.

13 PROVIDE CONTROL SWITCHES FOR CEILING FANS. COORDINATE WITH ARCHITECT.

NORTH

1 E2.1 FLOOR PLAN - LEVEL 1 - POWER

1/8" = 1'-0"

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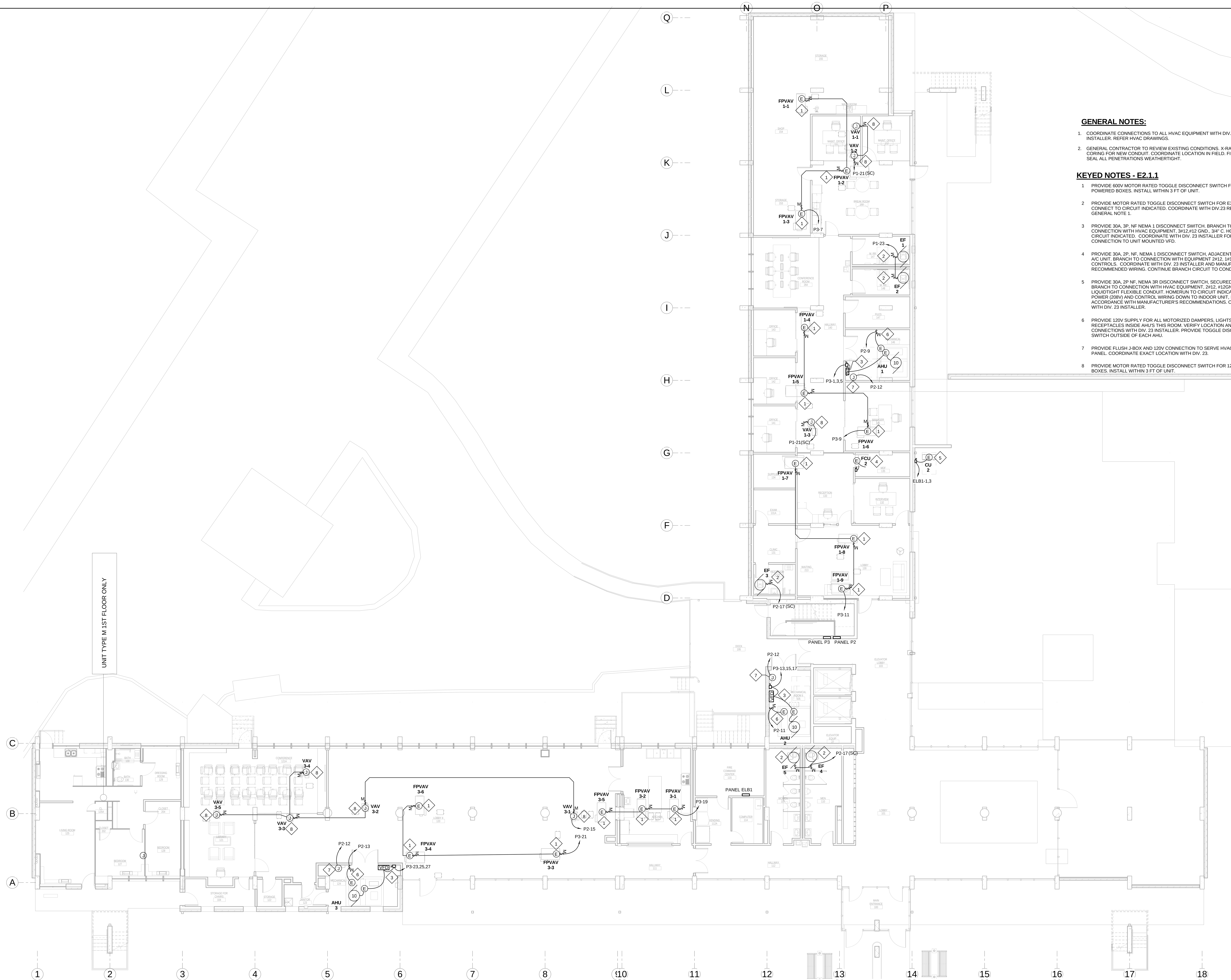
TEXAS LICENSE NO. 10-881

LEVEL 1 - POWER

SHEET NUMBER
E2.1



1 FLOOR PLAN - LEVEL 1 - HVAC POWER
E2.1.1
1/8" = 1'-0"

GENERAL NOTES:

1. COORDINATE CONNECTIONS TO ALL HVAC EQUIPMENT WITH DIV. 23 INSTALLER. REFER HVAC DRAWINGS.
2. GENERAL CONTRACTOR TO REVIEW EXISTING CONDITIONS. X-RAY PRIOR TO CORING FOR NEW CONDUIT. COORDINATE LOCATION IN FIELD. FIRE CAULK AND SEAL ALL PENETRATIONS WEATHERTIGHT.

KEYED NOTES - E2.1.1

1 PROVIDE 600V MOTOR RATED TOGGLE DISCONNECT SWITCH FOR 277V FAN POWERED BOXES. INSTALL WITHIN 3 FT OF UNIT.

2 PROVIDE MOTOR RATED TOGGLE DISCONNECT SWITCH FOR EXHAUST FAN. CONNECT TO CIRCUIT INDICATED. COORDINATE WITH DIV.23 REFER TO GENERAL NOTE 1.

3 PROVIDE 30A, 3P, NF NEMA 1 DISCONNECT SWITCH. BRANCH TO CONNECTION WITH HVAC EQUIPMENT, 3#12,#12 GND., 3/4" C. HOMERUN TO CIRCUIT INDICATED. COORDINATE WITH DIV. 23 INSTALLER FOR CONNECTION TO UNIT MOUNTED VFD.

4 PROVIDE 30A, 2P, NF, NEMA 1 DISCONNECT SWITCH, ADJACENT TO INDOOR A/C UNIT. BRANCH TO CONNECTION WITH EQUIPMENT 2#12, 1#12 GND. AND CONTROLS. COORDINATE WITH DIV. 23 INSTALLER AND MANUFACTURER'S RECOMMENDED WIRING. CONTINUE BRANCH CIRCUIT TO CONDENSING UNIT

5 PROVIDE 30A, 2P NF, NEMA 3R DISCONNECT SWITCH, SECURED TO WALL. BRANCH TO CONNECTION WITH HVAC EQUIPMENT, 2#12, #12GND, 1/2" LIQUIDTIGHT FLEXIBLE CONDUIT. HOMERUN TO CIRCUIT INDICATED. EXTEND POWER (208V) AND CONTROL WIRING DOWN TO INDOOR UNIT, IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. COORDINATE WITH DIV. 23 INSTALLER.

6 PROVIDE 120V SUPPLY FOR ALL MOTORIZED DAMPERS, LIGHTS AND RECEPTACLES INSIDE AHU'S THIS ROOM. VERIFY LOCATION AND CONNECTIONS WITH DIV. 23 INSTALLER. PROVIDE TOGGLE DISCONNECT SWITCH OUTSIDE OF EACH AHU.

7 PROVIDE FLUSH J-BOX AND 120V CONNECTION TO SERVE HVAC CONTROL PANEL. COORDINATE EXACT LOCATION WITH DIV. 23.

8 PROVIDE MOTOR RATED TOGGLE DISCONNECT SWITCH FOR 120V VAV BOXES. INSTALL WITHIN 3 FT OF UNIT.

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TEXAS LICENSE NO. 10–881

LEVEL 1 - HVAC POWER

SHEET NUMBER
E2.1.1

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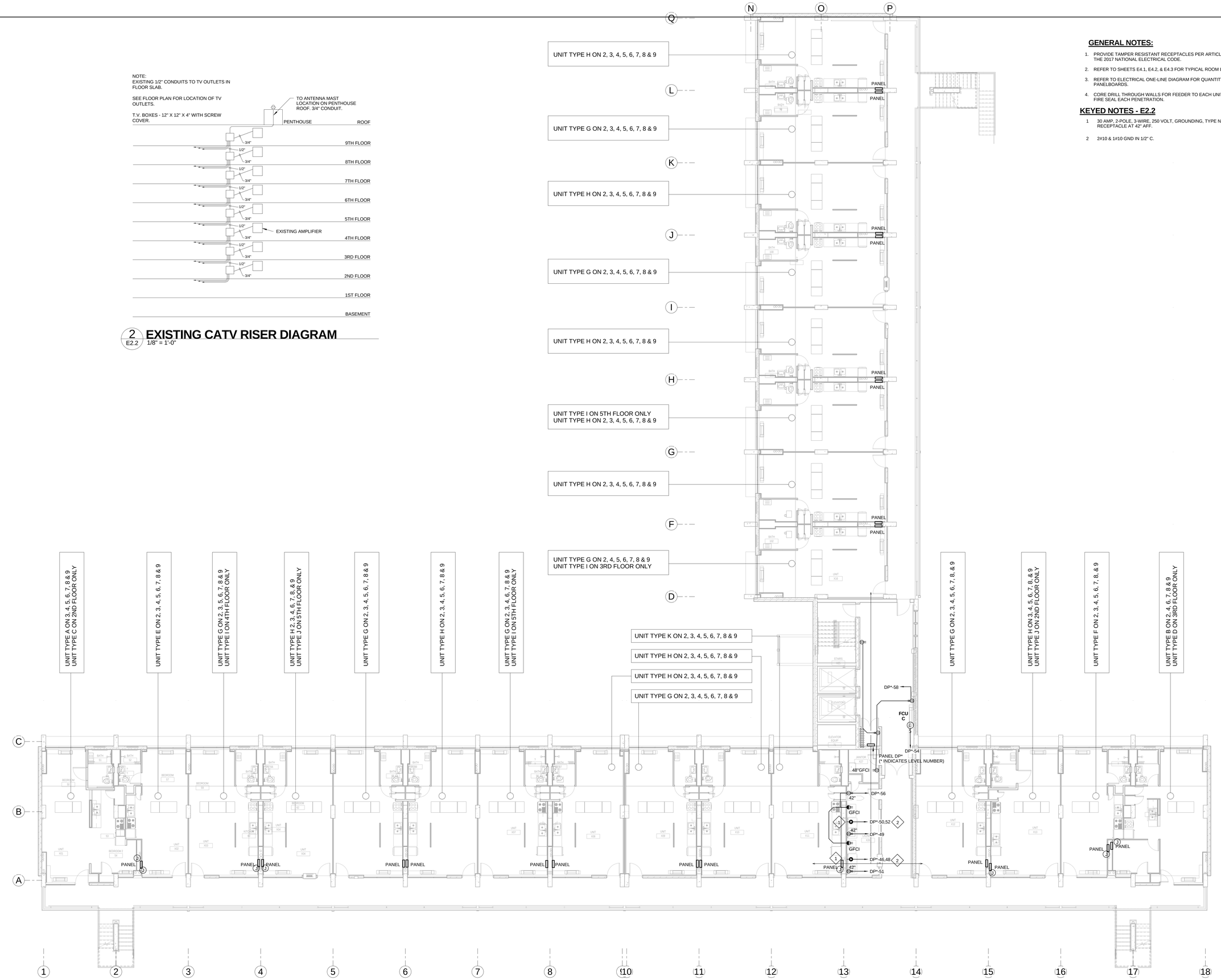
NOTE:
EXISTING 1/2" CONDUITS TO TV OUTLETS IN FLOOR SLAB.

SEE FLOOR PLAN FOR LOCATION OF TV OUTLETS.

T.V. BOXES - 12" X 12" X 4" WITH SCREW COVER.

2 E2.2 EXISTING CATV RISER DIAGRAM
1/8" = 1'-0"



1 E2.2 FLOOR PLAN - LEVEL 2 THRU 9 - POWER
1/8" = 1'-0"
NORTH

GENERAL NOTES:

1. PROVIDE TAMPER RESISTANT RECEPTACLES PER ARTICLE 406.12 OF THE 2017 NATIONAL ELECTRICAL CODE.
2. REFER TO SHEETS E4.1, E4.2, & E4.3 FOR TYPICAL ROOM LAYOUTS.
3. REFER TO ELECTRICAL ONE-LINE DIAGRAM FOR QUANTITY OF PANELBOARDS.
4. CORE DRILL THROUGH WALLS FOR FEEDER TO EACH UNIT PANEL. FIRE SEAL EACH PENETRATION.

KEYED NOTES - E2.2

1 30 AMP, 2-POLE, 3-WIRE, 250 VOLT, GROUNDING, TYPE NEMA 6-30R RECEPTACLE AT 42" AFF.

2 2#10 & 1#10 GND IN 1/2" C.

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28858
REGISTERED
PROFESSIONAL ENGINEER
05/25/18

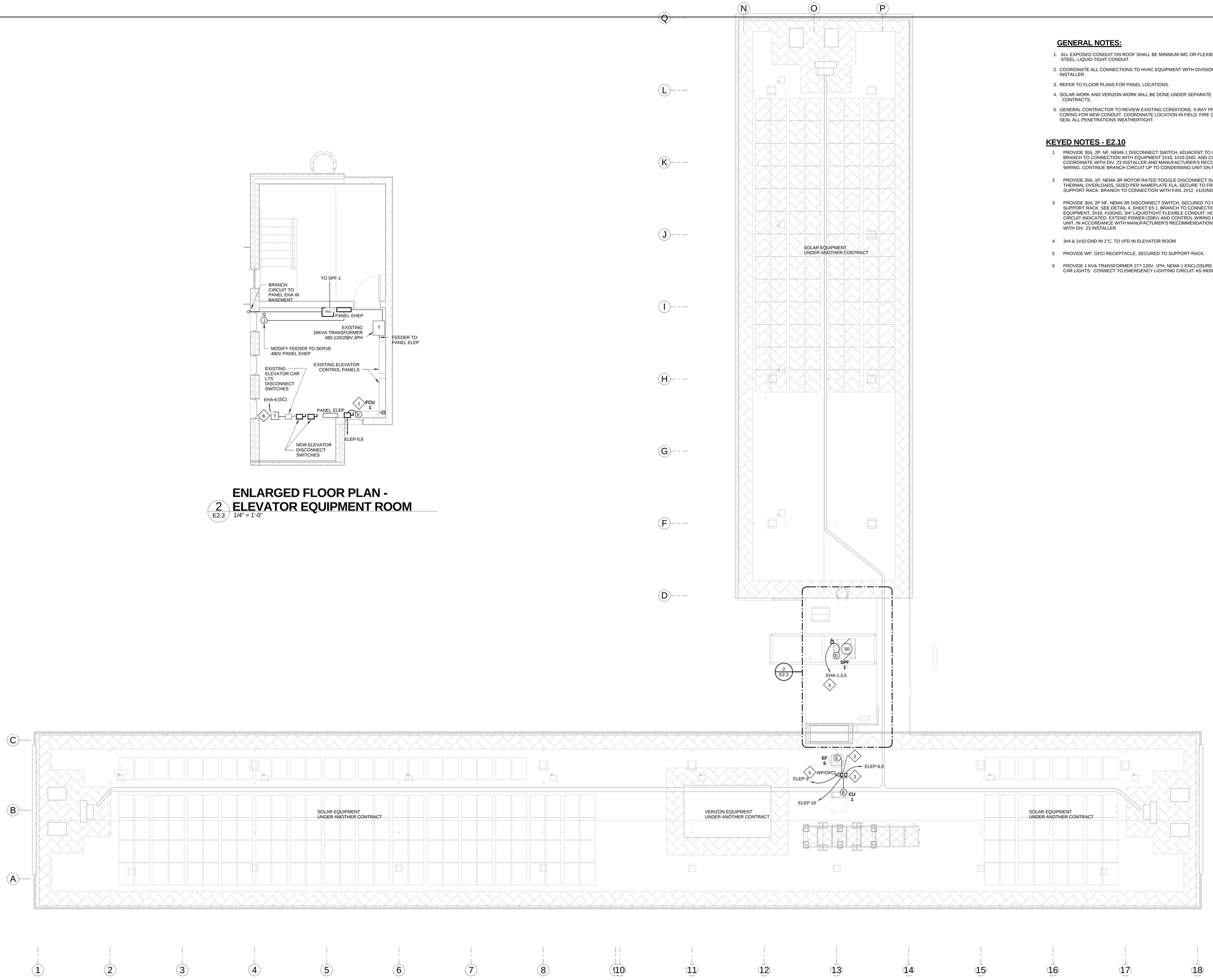
PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

LEVEL 2 THRU 9 - POWER

SHEET NUMBER
E2.2

ENLARGED FLOOR PLAN - ELEVATOR EQUIPMENT ROOM

2 / E2.3 — 1/4" = 1'-0"



FLOOR PLAN - ROOF - POWER

NORTH

1 / E2.3 — 1/8" = 1'-0"

GENERAL NOTES:

1. ALL EXPOSED CONDUIT ON ROOF SHALL BE MINIMUM IMC OR FLEXIBLE STEEL, LIQUID-TIGHT CONDUIT.
2. COORDINATE ALL CONNECTIONS TO HVAC EQUIPMENT WITH DIVISION 23 INSTALLER.
3. REFER TO FLOOR PLANS FOR PANEL LOCATIONS.
4. SOLAR WORK AND VERIZON WORK WILL BE DONE UNDER SEPARATE CONTRACTS.
5. GENERAL CONTRACTOR TO REVIEW EXISTING CONDITIONS. X-RAY PRIOR TO CORING FOR NEW CONDUIT. COORDINATE LOCATION IN FIELD. FIRE CAULK AND SEAL ALL PENETRATIONS WEATHERTIGHT.

KEYED NOTES - E2.10

1 PROVIDE 30A, 2P, NF, NEMA 1 DISCONNECT SWITCH, ADJACENT TO INDOOR A/C UNIT. BRANCH TO CONNECTION WITH EQUIPMENT 2#10, 1#10 GND. AND CONTROLS. COORDINATE WITH DIV. 23 INSTALLER AND MANUFACTURER'S RECOMMENDED WIRING. CONTINUE BRANCH CIRCUIT UP TO CONDENSING UNIT ON ROOF.

2 PROVIDE 20A, 1P, NEMA 3R MOTOR RATED TOGGLE DISCONNECT SWITCH WITH THERMAL OVERLOADS, SIZED PER NAMEPLATE FLA. SECURE TO FREESTANDING SUPPORT RACK. BRANCH TO CONNECTION WITH FAN, 2#12, #12GND, 1/2"C.

3 PROVIDE 30A, 2P NF, NEMA 3R DISCONNECT SWITCH, SECURED TO FREESTANDING SUPPORT RACK. SEE DETAIL 4, SHEET E5.1. BRANCH TO CONNECTION WITH HVAC EQUIPMENT, 2#10, #10GND, 3/4" LIQUIDTIGHT FLEXIBLE CONDUIT. HOMERUN TO CIRCUIT INDICATED. EXTEND POWER (208V) AND CONTROL WIRING DOWN TO INDOOR UNIT, IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. COORDINATE WITH DIV. 23 INSTALLER

4 3#4 & 1#10 GND IN 1"C. TO VFD IN ELEVATOR ROOM

5 PROVIDE WP, GFCI RECEPTACLE, SECURED TO SUPPORT RACK.

6 PROVIDE 1 KVA TRANSFORMER 277-120V, 1PH, NEMA 1 ENCLOSURE FOR ELEVATOR CAR LIGHTS. CONNECT TO EMERGENCY LIGHTING CIRCUIT AS INDICATED.

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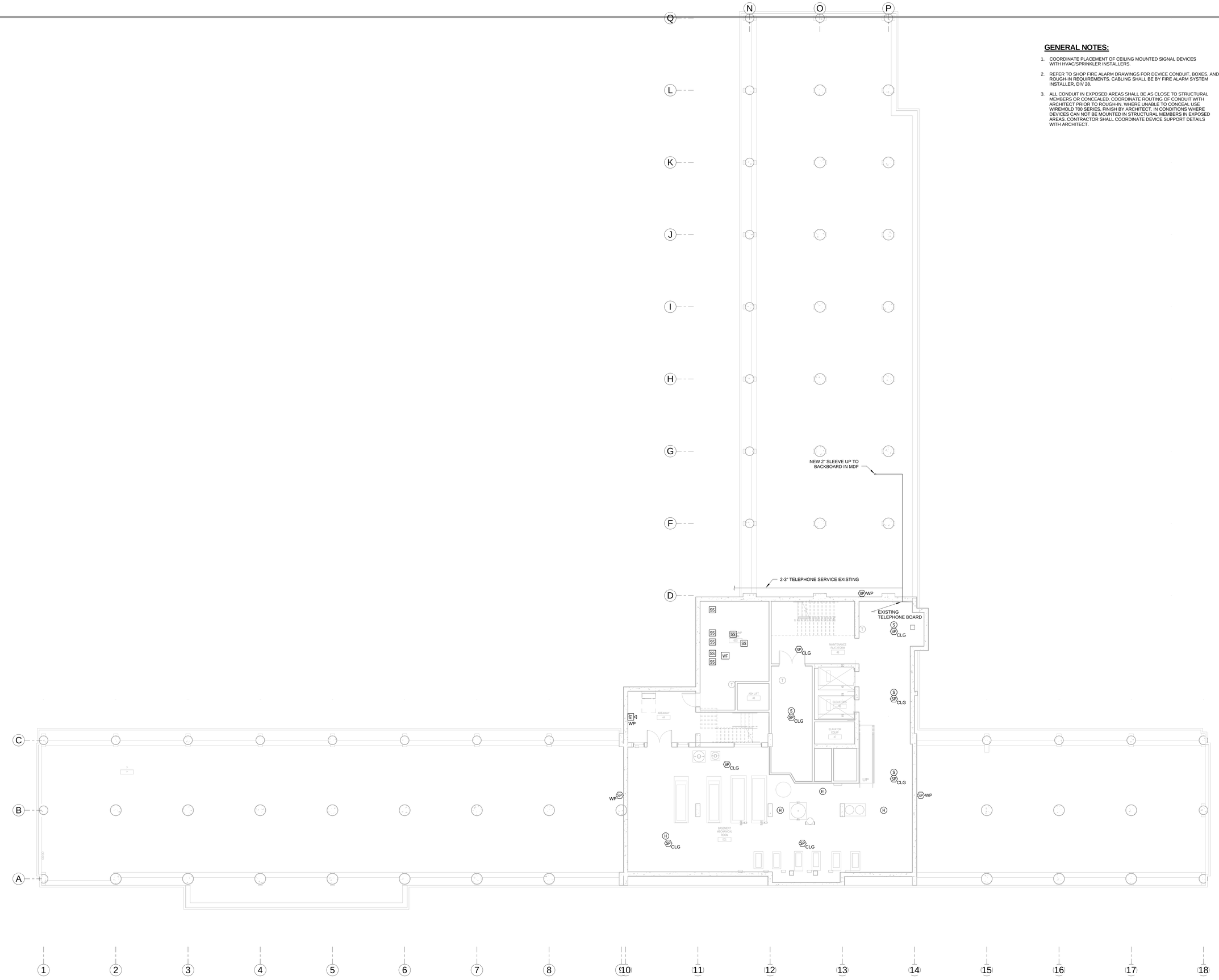
TEXAS LICENSE NO. 10-681

ROOF LEVEL - POWER

SHEET NUMBER
E2.3



GENERAL NOTES:

1. COORDINATE PLACEMENT OF CEILING MOUNTED SIGNAL DEVICES WITH HVAC/SPRINKLER INSTALLERS.
2. REFER TO SHOP FIRE ALARM DRAWINGS FOR DEVICE CONDUIT, BOXES, AND ROUGH-IN REQUIREMENTS. CABLING SHALL BE BY FIRE ALARM SYSTEM INSTALLER, DIV 28.
3. ALL CONDUIT IN EXPOSED AREAS SHALL BE AS CLOSE TO STRUCTURAL MEMBERS OR CONCEALED. COORDINATE ROUTING OF CONDUIT WITH ARCHITECT PRIOR TO ROUGH-IN. WHERE UNABLE TO CONCEAL USE WIREMOLD 700 SERIES, FINISH BY ARCHITECT. IN CONDITIONS WHERE DEVICES CAN NOT BE MOUNTED IN STRUCTURAL MEMBERS IN EXPOSED AREAS. CONTRACTOR SHALL COORDINATE DEVICE SUPPORT DETAILS WITH ARCHITECT.

1 E3.0 FLOOR PLAN - BASEMENT - SPECIAL SYSTEMS
1/8" = 1'-0"

NORTH

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GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

BASEMENT - SPECIAL SYSTEMS

SHEET NUMBER
E3.0

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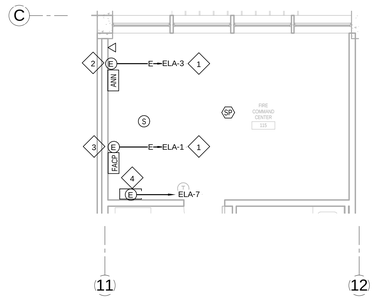
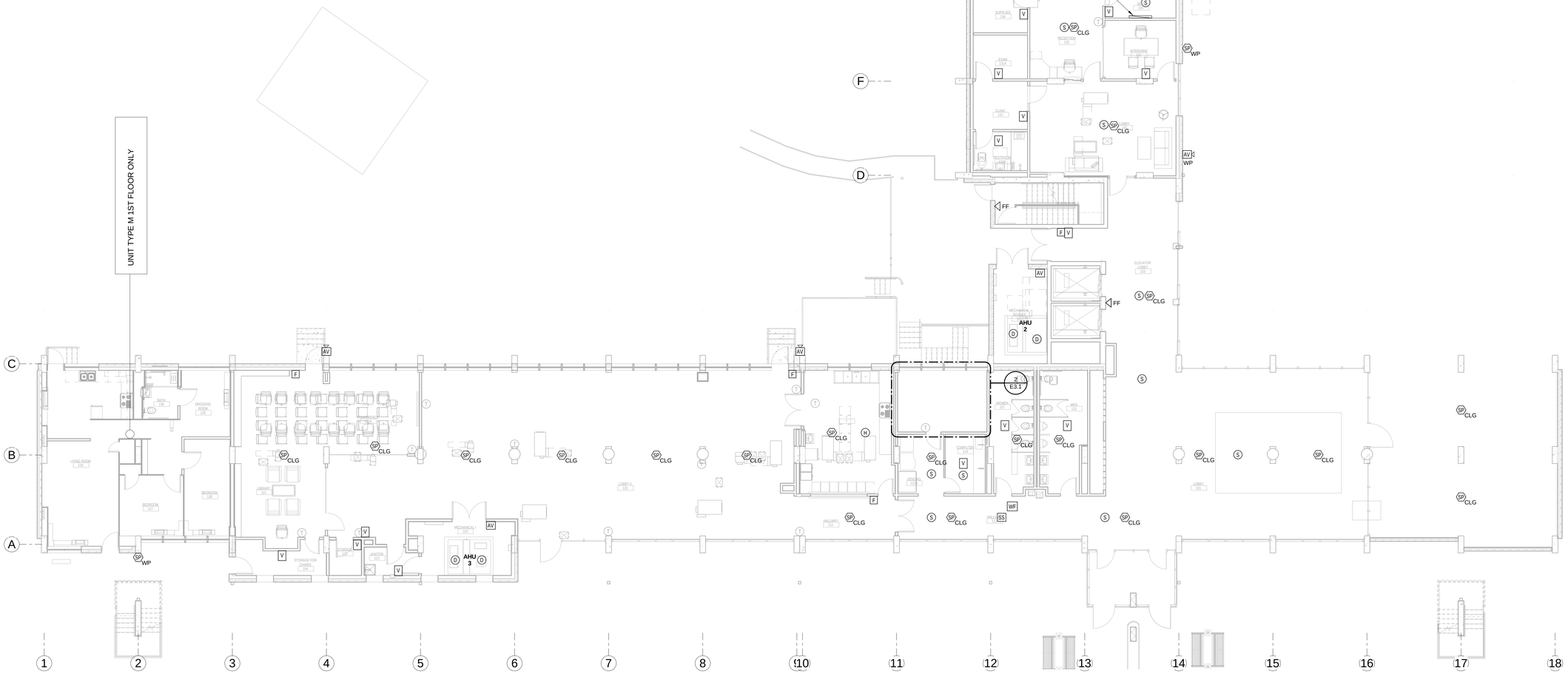


2 E3.1 **ENLARGED PLAN - FIRE COMMAND CENTER**
1/4" = 1'-0"



1 E3.1 **FLOOR PLAN - LEVEL 1 - SPECIAL SYSTEMS**
1/8" = 1'-0"
NORTH

GENERAL NOTES:

1. COORDINATE PLACEMENT OF CEILING MOUNTED SIGNAL DEVICES WITH HVAC/SPRINKLER INSTALLERS.
2. REFER TO SHOP FIRE ALARM DRAWINGS FOR DEVICE CONDUIT, BOXES, AND ROUGH-IN REQUIREMENTS. CABLING SHALL BE BY FIRE ALARM SYSTEM INSTALLER, DIV 28.
3. ALL CONDUIT IN EXPOSED AREAS SHALL BE AS CLOSE TO STRUCTURAL MEMBERS OR CONCEALED. COORDINATE ROUTING OF CONDUIT WITH ARCHITECT PRIOR TO ROUGH-IN. WHERE UNABLE TO CONCEAL USE WIREMOLD 700 SERIES, FINISH BY ARCHITECT. IN CONDITIONS WHERE DEVICES CAN NOT BE MOUNTED IN STRUCTURAL MEMBERS IN EXPOSED AREAS. CONTRACTOR SHALL COORDINATE DEVICE SUPPORT DETAILS WITH ARCHITECT.

KEYED NOTES - E3.1

1 2#10 & 1#10 GND IN 1/2" EC.

2 ELECTRICAL CONNECTION TO NEW EMERGENCY ANNUNCIATOR GENERATOR REMOTE CONTROL PANEL, 120 VOLT.

3 NEW EDWARDS EST3 FACP.

4 STAIRWELL SMOKE CONTROL PANEL PER DIV. 26

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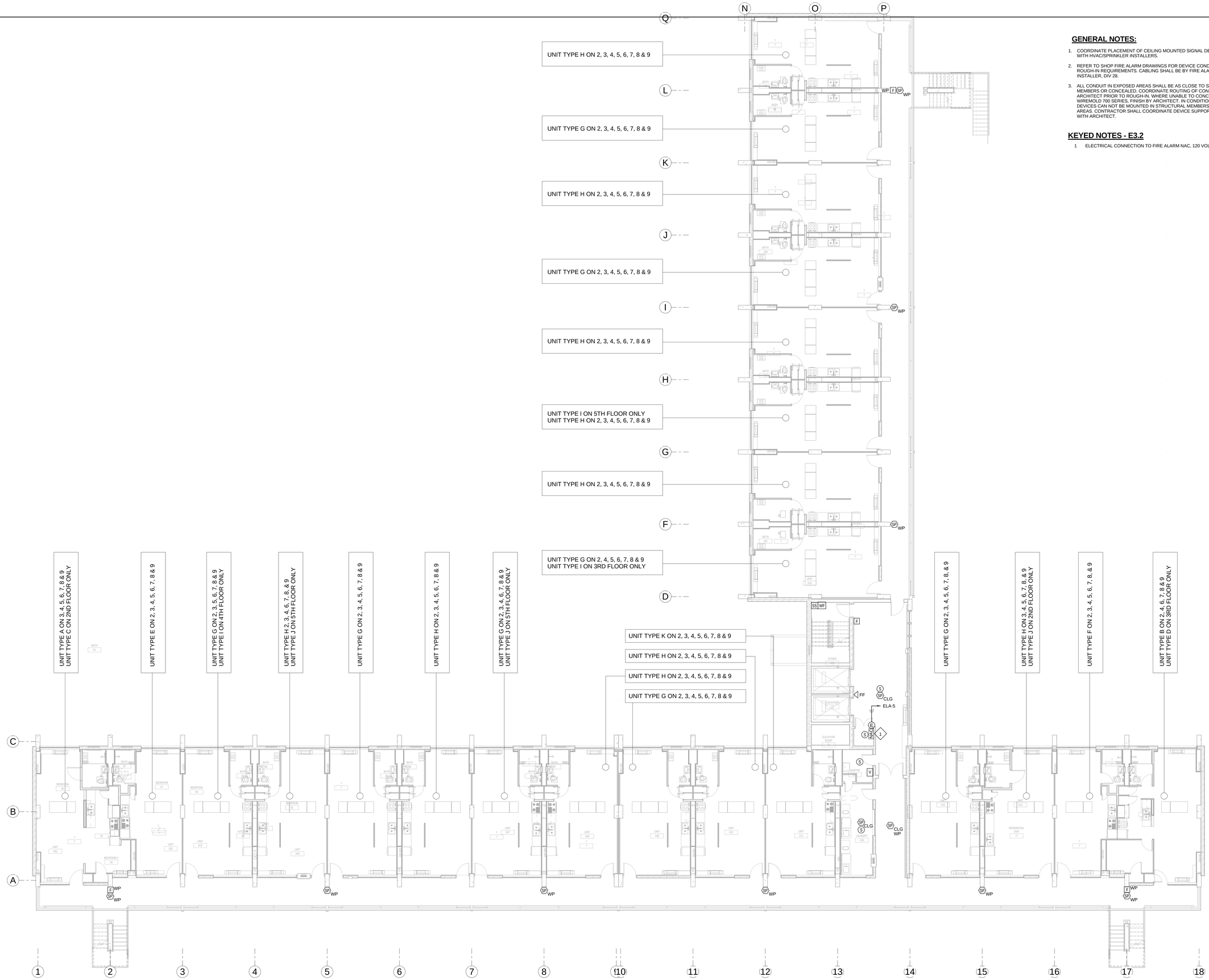
TEXAS LICENSE NO. 10-681

LEVEL 1 - SPECIAL SYSTEMS

SHEET NUMBER
E3.1



GENERAL NOTES:

1. COORDINATE PLACEMENT OF CEILING MOUNTED SIGNAL DEVICES WITH HVAC/SPRINKLER INSTALLERS.
2. REFER TO SHOP FIRE ALARM DRAWINGS FOR DEVICE CONDUIT, BOXES, AND ROUGH-IN REQUIREMENTS. CABLING SHALL BE BY FIRE ALARM SYSTEM INSTALLER, DIV 28.
3. ALL CONDUIT IN EXPOSED AREAS SHALL BE AS CLOSE TO STRUCTURAL MEMBERS OR CONCEALED. COORDINATE ROUTING OF CONDUIT WITH ARCHITECT PRIOR TO ROUGH-IN. WHERE UNABLE TO CONCEAL USE WIREMOLD 700 SERIES. FINISH BY ARCHITECT. IN CONDITIONS WHERE DEVICES CAN NOT BE MOUNTED IN STRUCTURAL MEMBERS IN EXPOSED AREAS. CONTRACTOR SHALL COORDINATE DEVICE SUPPORT DETAILS WITH ARCHITECT.

KEYED NOTES - E3.2

1 ELECTRICAL CONNECTION TO FIRE ALARM NAC, 120 VOLT.

NORTH

1 E3.2 FLOOR PLAN - LEVEL 2 - SPECIAL SYSTEMS

1/8" = 1'-0"

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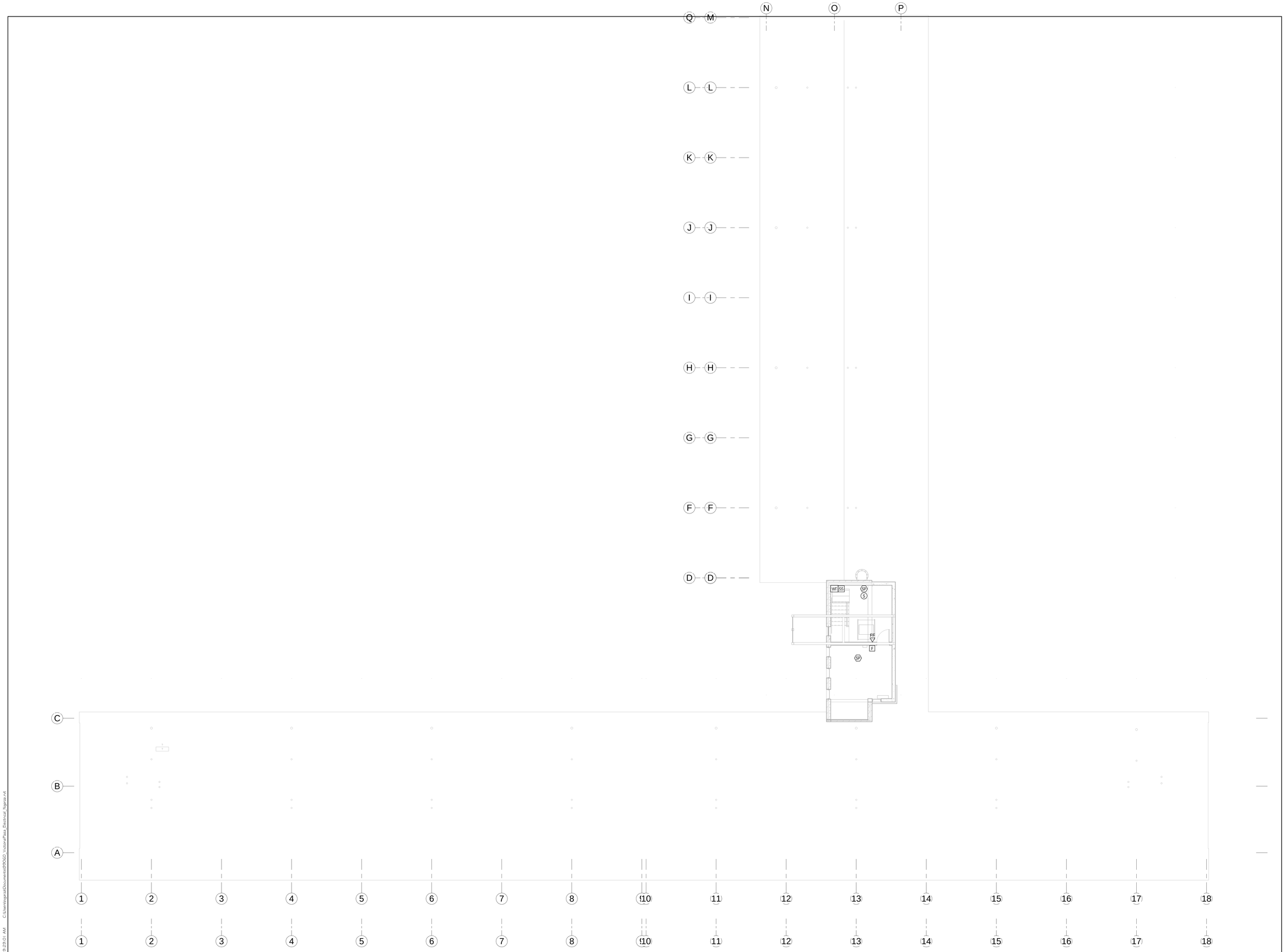
TEXAS LICENSE NO. 10–881

LEVEL 2 THRU 9 - SPECIAL SYSTEMS

SHEET NUMBER
E3.2



1 E3.3 FLOOR PLAN - ROOF - SPECIAL SYSTEMS
1/8" = 1'-0"

NORTH

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ROOF LEVEL - SPECIAL SYSTEMS

SHEET NUMBER
E3.3

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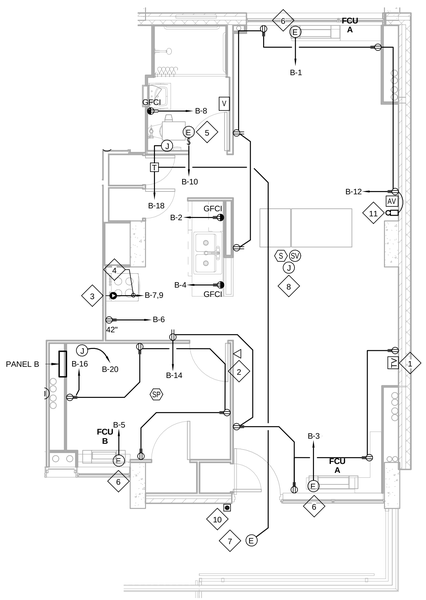
UNIT TYPE B

SCALE : 1/4" = 1'-0"



Loadcenter Panel: B

Location:
Supply From:
Mounting: Recessed
Enclosure: Type 1

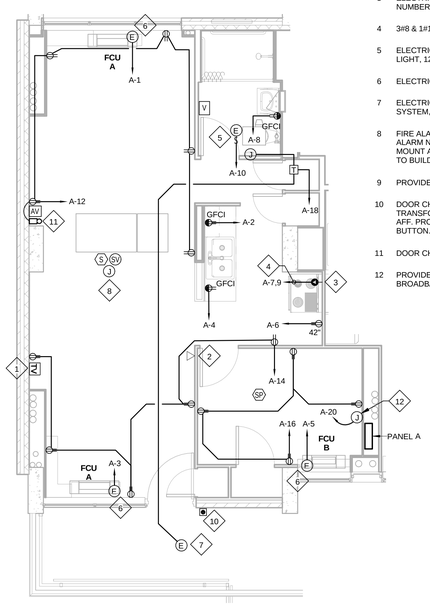
Volts: 120/208 Single Phase
Phases: 1
Wires: 3

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A

CKT	Circuit Description	Trip	Poles					Poles	Trip	Circuit Description	CKT
1	FCU-A	20 A	1	696 VA	1500 VA			1	20 A	KITCHEN RECEPT	2
3	FCU-A	20 A	1			696 VA	1500 VA	1	20 A	KITCHEN RECEPT	4
5	FCU-B	20 A	1	696 VA	1000 VA			1	20 A	REFRIGERATOR	6
7	RANGE	50 A	2			4000 VA	180 VA	1	20 A	BATHROOM RECEPT	8
9	--	--	--	4000 VA	500 VA			1	20 A	EXHAUST FAN	10
11	BATHROOM LIGHT/HEATER	20 A	1			1752 VA	900 VA	1	20 A	RECEPTS	12
13	LIGHTING	20 A	1	92 VA	900 VA			1	20 A	RECEPTS	14
15	SPARE	20 A	1			0 VA	720 VA	1	20 A	RECEPTS	16
17	SPARE	20 A	1	0 VA	500 VA			1	20 A	EMERGENCY CALL SYSTEM	18
19	SPACE	--	--			0 VA	300 VA	1	20 A	BROADBAND PANEL	20
21	SPACE	--	--	0 VA	0 VA			--	--	SPACE	22
23	SPACE	--	--			0 VA	0 VA	--	--	SPACE	24
25											26
27											28
29											30
31											32
33											34
35											36
37											38
39											40
41											42
			Total Load:	9884 VA		10048 VA					
			Total Amps:	95 A		96 A					

UNIT TYPE A

SCALE : 1/4" = 1'-0"



TYPICAL UNITS KEYED NOTES

1 EXISTING COAX OUTLET TO REMAIN.

2 EXISTING PHONE JACK TO REMAIN.

3 ELECTRICAL CONNECTION TO RANGE. VERIFY EXACT MAKE AND MODEL NUMBER WITH ARCHITECT.

4 3#8 & 1#10 GND. IN 3/4" C. FOR RANGE

5 ELECTRICAL CONNECTION TO BATHROOM FAN, HEATER, LIGHT AND NIGHT LIGHT, 120 VOLT.

6 ELECTRICAL CONNECTION TO FAN AND COIL UNITS, 120 VOLT.

7 ELECTRICAL CONNECTIONS TO APARTMENT EMERGENCY ASSISTANCE CALL SYSTEM, 120VOLT. REFER TO DETAIL 1/E5.1.

8 FIRE ALARM SYSEM J-BOX CAPABLE OF SUPPORTING A FUTURE VISUAL ALARM NOTIFICATION APPLIANCE. J-BOX SHALL BE SUITABLE TO SECURELY MOUNT A FIRE ALARM AUDIO/VISUAL DEVICE. J-BOX SHALL BE PRE-WIRED TO BUILDING FIRE ALARM SYSTEM.

9 PROVIDE ARC FAULT CIRCUIT INTERRUPTER PROTECTION PER NEC 210-12

10 DOOR CHIME, USE BROAN CHIME #CB100, BUTTON #RC816 AND TRANSFORMER #C905. MOUNT CHIME AT 84" AFF AND DOOR BUTTON AT 48" AFF. PROVIDE STANDARD BOX WITH SINGLE GANG PLATE FOR DOOR BUTTON.

11 DOOR CHIME, AUDIO/VISUAL ANNUNCIATOR KIT, EDWARDS #7005-G5.

12 PROVIDE 120V CONNECTION FOR BROADBAND PANEL. COORDINATE WITH BROADBAND INSTALLER. SEE SHEET A103.

GENERAL NOTES (TYPICAL):

1. VERIFY EXACT LOCATION OF RECEPTACLES WITH ARCHITECT/ OWNER'S REPRESENTATIVE PRIOR TO ROUGH-IN.
2. DO NOT INSTALL BOXES BACK TO BACK IN DEMISING WALLS. SEE SPECIFICATIONS FOR OFFSET REQUIREMENTS.
3. COORDINATE PLACEMENT OF CEILING MOUNTED SIGNAL DEVICES WITH HVAC/SPRINKLER INSTALLERS.
4. COORDINATE CONNECTIONS TO ALL HVAC EQUIPMENT WITH DIV. 23 INSTALLER. REFER HVAC DRAWINGS.
5. REFER TO SHOP FIRE ALARM DRAWINGS FOR DEVICE CONDUIT, BOXES, AND ROUGH-IN REQUIREMENTS. CABLING SHALL BE BY FIRE ALARM SYSTEM INSTALLER, DIV 28.
6. ALL CONDUIT IN EXPOSED AREAS SHALL BE AS CLOSE TO STRUCTURAL MEMBERS OR CONCEALED. COORDINATE ROUTING OF CONDUIT WITH ARCHITECT PRIOR TO ROUGH-IN. WHERE UNABLE TO CONCEAL USE WIREMOLD 700 SERIES, FINISH BY ARCHITECT. IN CONDITIONS WHERE DEVICES CAN NOT BE MOUNTED IN STRUCTURAL MEMBERS IN EXPOSED AREAS, CONTRACTOR SHALL COORDINATE DEVICE SUPPORT DETAILS WITH ARCHITECT.
8. GENERAL CONTRACTOR TO REVIEW EXISTING CONDITIONS. X-RAY PRIOR TO CORING FOR NEW CONDUIT. COORDINATE LOCATION IN FIELD. FIRE CAULK AND SEAL ALL PENETRATIONS WEATHERTIGHT.
9. PROVIDE TAMPER RESISTANT RECEPTACLES PER ARTICLE 406.12 OF THE 2017 NATIONAL ELECTRICAL CODE.
10. REFER TO SHEETS E4.1, E4.2, & E4.3 FOR TYPICAL ROOM LAYOUTS.
11. REFER TO ELECTRICAL ONE-LINE DIAGRAM FOR QUANTITY OF PANELBOARDS.

Loadcenter Panel: A

Location:
Supply From:
Mounting: Recessed
Enclosure: Type 1

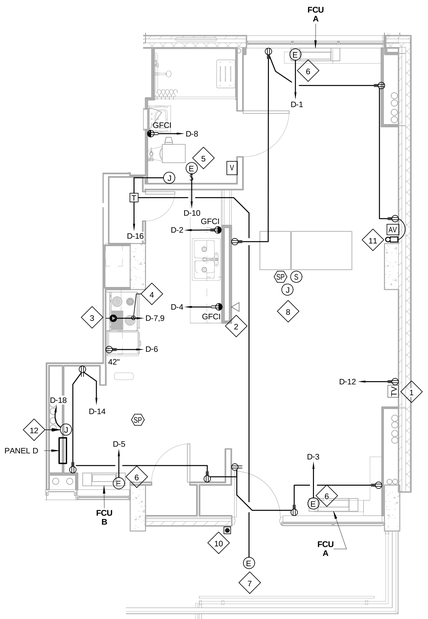
Volts: 120/208 Single Phase
Phases: 1
Wires: 3

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A

CKT	Circuit Description	Trip	Poles					Poles	Trip	Circuit Description	CKT
1	FCU-A	20 A	1	696 VA	1500 VA			1	20 A	KITCHEN RECEPT	2
3	FCU-A	20 A	1			696 VA	1500 VA	1	20 A	KITCHEN RECEPT	4
5	FCU-B	20 A	1	696 VA	1000 VA			1	20 A	REFRIGERATOR	6
7	RANGE	50 A	2			4000 VA	180 VA	1	20 A	BATHROOM RECEPT	8
9	--	--	--	4000 VA	1000 VA			1	20 A	EXHAUST FAN	10
11	BATHROOM LIGHT/HEATER	20 A	1			1752 VA	900 VA	1	20 A	RECEPTS	12
13	LIGHTING	20 A	1	71 VA	900 VA			1	20 A	RECEPTS	14
15	SPARE	20 A	1			0 VA	720 VA	1	20 A	RECEPTS	16
17	SPARE	20 A	1	0 VA	500 VA			1	20 A	EMERGENCY CALL SYSTEM	18
19	SPACE	--	--			0 VA	300 VA	1	20 A	BROADBAND PANEL	20
21	SPACE	--	--	0 VA	0 VA			--	--	SPACE	22
23	SPACE	--	--			0 VA	0 VA	--	--	SPACE	24
25											26
27											28
29											30
31											32
33											34
35											36
37											38
39											40
41											42
			Total Load:	10363 VA		10048 VA					
			Total Amps:	99 A		97 A					

UNIT TYPE D

SCALE : 1/4" = 1'-0"



Loadcenter Panel: D

Location:
Supply From:
Mounting: Recessed
Enclosure: Type 1

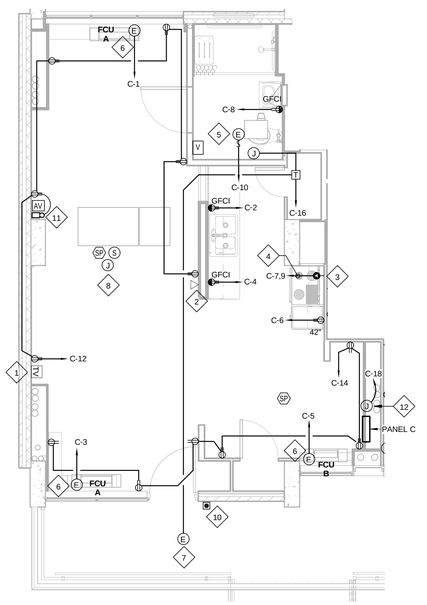
Volts: 120/208 Single Phase
Phases: 1
Wires: 3

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A

CKT	Circuit Description	Trip	Poles					Poles	Trip	Circuit Description	CKT
1	FCU-A	20 A	1	696 VA	1500 VA			1	20 A	KITCHEN RECEPT	2
3	FCU-A	20 A	1			696 VA	1500 VA	1	20 A	KITCHEN RECEPT	4
5	FCU-B	20 A	1	696 VA	1000 VA			1	20 A	REFRIGERATOR	6
7	RANGE	50 A	2			4000 VA	680 VA	1	20 A	BATHROOM RECEPT	8
9	--	--	--	4000 VA	500 VA			1	20 A	EXHAUST FAN	10
11	BATHROOM LIGHT/HEATER	20 A	1			1752 VA	900 VA	1	20 A	RECEPTS	12
13	LIGHTING	20 A	1	103 VA	1080 VA			1	20 A	RECEPTS	14
15	SPARE	20 A	1			0 VA	500 VA	1	20 A	EMERGENCY CALL SYSTEM	16
17	SPARE	20 A	1	0 VA	300 VA			1	20 A	BROADBAND PANEL	18
19	SPACE	--	--			0 VA	0 VA	--	--	SPACE	20
21	SPACE	--	--	0 VA	0 VA			--	--	SPACE	22
23	SPACE	--	--			0 VA	0 VA	--	--	SPACE	24
25											26
27											28
29											30
31											32
33											34
35											36
37											38
39											40
41											42
			Total Load:	9875 VA		10028 VA					
			Total Amps:	95 A		96 A					

UNIT TYPE C

SCALE : 1/4" = 1'-0"



Loadcenter Panel: C

Location:
Supply From:
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Single Phase
Phases: 1
Wires: 3

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A

CKT	Circuit Description	Trip	Poles					Poles	Trip	Circuit Description	CKT
1	FCU-A	20 A	1	696 VA	1500 VA			1	20 A	KITCHEN RECEPT	2
3	FCU-A	20 A	1			696 VA	1500 VA	1	20 A	KITCHEN RECEPT	4
5	FCU-B	20 A	1	696 VA	1000 VA			1	20 A	REFRIGERATOR	6
7	RANGE	50 A	2			4000 VA	180 VA	1	20 A	BATHROOM RECEPT	8
9	--	--	--	4000 VA	500 VA			1	20 A	EXHAUST FAN	10
11	BATHROOM LIGHT/HEATER	20 A	1			1752 VA	1080 VA	1	20 A	RECEPTS	12
13	LIGHTING	20 A	1	103 VA	1080 VA			1	20 A	RECEPTS	14
15	SPARE	20 A	1			0 VA	500 VA	1	20 A	EMERGENCY CALL SYSTEM	16
17	SPARE	20 A	1	0 VA	300 VA			1	20 A	BROADBAND PANEL	18
19	SPACE	--	--			0 VA	0 VA	--	--	SPACE	20
21	SPACE	--	--	0 VA	0 VA			--	--	SPACE	22
23	SPACE	--	--			0 VA	0 VA	--	--	SPACE	24
25											26
27											28
29											30
31											32
33											34
35											36
37											38
39											40
41											42
			Total Load:	9875 VA		9708 VA					
			Total Amps:	95 A		93 A					

DURAND–HOLLIS RUPE ARCHITECTS, INC.
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San Antonio, Texas 78230
Office: 210.525.0220
Fax: 210.525.0225
Texas Firm Registration #F-12003

LOCATION:
SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS

ISSUE	DESCRIPTION	DATE

05/25/18
PERMIT SET

STATE OF TEXAS
RALPH E. MARTIN, JR.
28858
REGISTERED
PROFESSIONAL ENGINEER
05/25/18

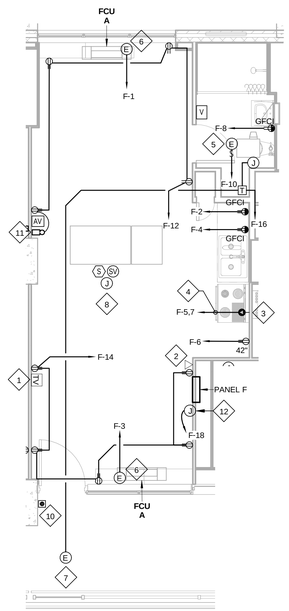
PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

ENLARGED FLOOR PLANS

SHEET NUMBER
E4.1

UNIT TYPE F

SCALE : 1/4" = 1'-0"



Loadcenter Panel: F

Location:
Supply From:
Mounting: Surface
Enclosure: Type 1

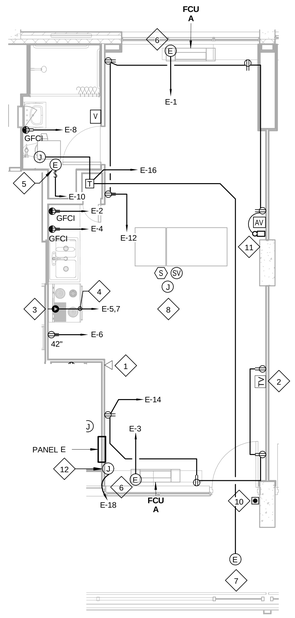
Volts: 120/208 Single Phase
Phases: 1
Wires: 3

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A

CKT	Circuit Description	Trip	Poles					Poles	Trip	Circuit Description	CKT
1	FCU-A	20 A	1	696 VA	1500 VA			1	20 A	KITCHEN RECEPT	2
3	FCU-A	20 A	1			696 VA	1500 VA	1	20 A	KITCHEN RECEPT	4
5	RANGE	50 A	2	4000 VA	180 VA			1	20 A	REFRIGERATOR	6
7	--	--	--			4000 VA	180 VA	1	20 A	BATHROOM RECEPT	8
9	LIGHTING	20 A	1	82 VA	500 VA			1	20 A	EXHAUST FAN	10
11	BATHROOM LIGHT/HEATER	20 A	1			1752 VA	720 VA	1	20 A	RECEPTS	12
13	SPARE	20 A	1	0 VA	900 VA			1	20 A	RECEPTS	14
15	SPARE	20 A	1			0 VA	500 VA	1	20 A	EMERGENCY CALL SYSTEM	16
17	SPACE	--	--	0 VA	300 VA			1	20 A	BROADBAND PANEL	18
19	SPACE	--	--			0 VA	0 VA	--	--	SPACE	20
21	SPACE	--	--	0 VA	0 VA			--	--	SPACE	22
23	SPACE	--	--			0 VA	0 VA	--	--	SPACE	24
25											26
27											28
29											30
31											32
33											34
35											36
37											38
39											40
41											42
			Total Load:	8158 VA		9348 VA					
			Total Amps:	78 A		88 A					

UNIT TYPE E

SCALE : 1/4" = 1'-0"



TYPICAL UNITS KEYED NOTES

1. EXISTING COAX OUTLET TO REMAIN.
2. EXISTING PHONE JACK TO REMAIN.
3. ELECTRICAL CONNECTION TO RANGE. VERIFY EXACT MAKE AND MODEL NUMBER WITH ARCHITECT.
4. 3#8 & 1#10 GND. IN 3/4" C. FOR RANGE
5. ELECTRICAL CONNECTION TO BATHROOM FAN, HEATER, LIGHT AND NIGHT LIGHT, 120 VOLT.
6. ELECTRICAL CONNECTION TO FAN AND COIL UNITS, 120 VOLT.
7. ELECTRICAL CONNECTIONS TO APARTMENT EMERGENCY ASSISTANCE CALL SYSTEM, 120VOLT. REFER TO DETAIL 1/E5.1.
8. FIRE ALARM SYSEM J-BOX CAPABLE OF SUPPORTING A FUTURE VISUAL ALARM NOTIFICATION APPLIANCE. J-BOX SHALL BE SUTABLE TO SECURELY MOUNT A FIRE ALARM AUDIO/VISUAL DEVICE. J-BOX SHALL BE PRE-WIRED TO BUILDING FIRE ALARM SYSTEM.
9. PROVIDE ARC FAULT CIRCUIT INTERRUPTER PROTECTION PER NEC 210-12
10. DOOR CHIME, USE BROAN CHIME #CB100, BUTTON #RCB16 AND TRANSFORMER #C905. MOUNT CHIME AT 84" AFF AND DOOR BUTTON AT 48" AFF. PROVIDE STANDARD BOX WITH SINGLE GANG PLATE FOR DOOR BUTTON.
11. DOOR CHIME, AUDIO/VISUAL ANNUNCIATOR KIT, EDWARDS #7005-G5.
12. PROVIDE 120V CONNECTION FOR BROADBAND PANEL. COORDINATE WITH BROADBAND INSTALLER. SEE SHEET A103.

GENERAL NOTES (TYPICAL):

1. VERIFY EXACT LOCATION OF RECEPTACLES WITH ARCHITECT/ OWNER'S REPRESENTATIVE PRIOR TO ROUGH-IN.
2. DO NOT INSTALL BOXES BACK TO BACK IN DEMISING WALLS. SEE SPECIFICATIONS FOR OFFSET REQUIREMENTS.
3. COORDINATE PLACEMENT OF CEILING MOUNTED SIGNAL DEVICES WITH HVAC/SPRINKLER INSTALLERS.
4. COORDINATE CONNECTIONS TO ALL HVAC EQUIPMENT WITH DIV. 23 INSTALLER. REFER HVAC DRAWINGS.
5. REFER TO SHOP FIRE ALARM DRAWINGS FOR DEVICE CONDUIT, BOXES, AND ROUGH-IN REQUIREMENTS. CABLING SHALL BE BY FIRE ALARM SYSTEM INSTALLER, DIV 28.
6. ALL CONDUIT IN EXPOSED AREAS SHALL BE AS CLOSE TO STRUCTURAL MEMBERS OR CONCEALED. COORDINATE ROUTING OF CONDUIT WITH ARCHITECT PRIOR TO ROUGH-IN. WHERE UNABLE TO CONCEAL USE WIREMOLD 700 SERIES, FINISH BY ARCHITECT. IN CONDITIONS WHERE DEVICES CAN NOT BE MOUNTED IN STRUCTURAL MEMBERS IN EXPOSED AREAS, CONTRACTOR SHALL COORDINATE DEVICE SUPPORT DETAILS WITH ARCHITECT.
8. GENERAL CONTRACTOR TO REVIEW EXISTING CONDITIONS. X-RAY PRIOR TO CORING FOR NEW CONDUIT. COORDINATE LOCATION IN FIELD. FIRE CAULK AND SEAL ALL PENETRATIONS WEATHERTIGHT.
9. PROVIDE TAMPER RESISTANT RECEPTACLES PER ARTICLE 406.12 OF THE 2017 NATIONAL ELECTRICAL CODE.
10. REFER TO SHEETS E4.1, E4.2, & E4.3 FOR TYPICAL ROOM LAYOUTS.
11. REFER TO ELECTRICAL ONE-LINE DIAGRAM FOR QUANTITY OF PANELBOARDS.

Loadcenter Panel: E

Location:
Supply From:
Mounting: Surface
Enclosure: Type 1

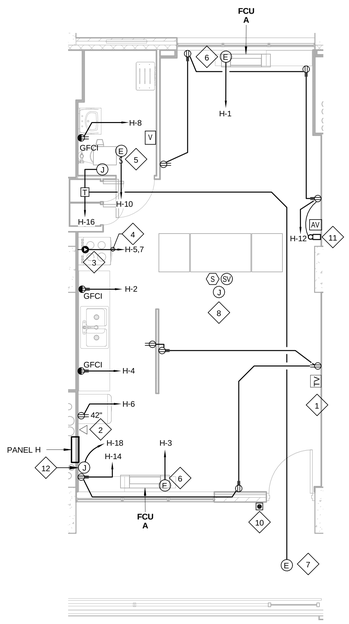
Volts: 120/208 Single Phase
Phases: 1
Wires: 3

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A

CKT	Circuit Description	Trip	Poles					Poles	Trip	Circuit Description	CKT
1	FCU-A	20 A	1	696 VA	1500 VA			1	20 A	KITCHEN RECEPT	2
3	FCU-A	20 A	1			696 VA	1500 VA	1	20 A	KITCHEN RECEPT	4
5	RANGE	50 A	2	4000 VA	1000 VA			1	20 A	REFRIGERATOR	6
7	--	--	--			4000 VA	180 VA	1	20 A	BATHROOM RECEPT	8
9	LIGHTING	20 A	1	82 VA	500 VA			1	20 A	EXHAUST FAN	10
11	BATHROOM LIGHT/HEATER	20 A	1			1752 VA	720 VA	1	20 A	RECEPTS	12
13	SPARE	20 A	1	0 VA	720 VA			1	20 A	RECEPTS	14
15	SPARE	20 A	1			0 VA	500 VA	1	20 A	EMERGENCY CALL SYSTEM	16
17	SPACE	--	--	0 VA	300 VA			1	20 A	BROADBAND PANEL	18
19	SPACE	--	--			0 VA	0 VA	--	--	SPACE	20
21	SPACE	--	--	0 VA	0 VA			--	--	SPACE	22
23	SPACE	--	--			0 VA	0 VA	--	--	SPACE	24
25											26
27											28
29											30
31											32
33											34
35											36
37											38
39											40
41											42
			Total Load:	8798 VA		9348 VA					
			Total Amps:	85 A		89 A					

UNIT TYPE H

SCALE : 1/4" = 1'-0"



Loadcenter Panel: H

Location:
Supply From:
Mounting: RECESSED
Enclosure: Type 1

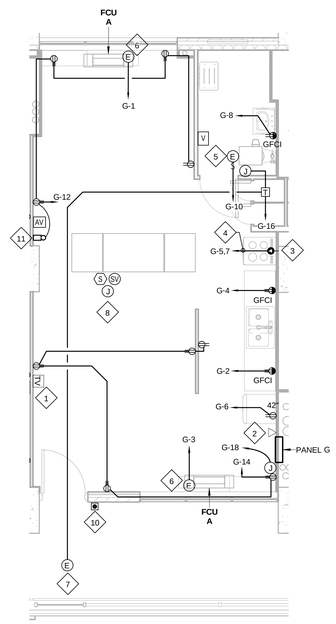
Volts: 120/208 Single Phase
Phases: 1
Wires: 3

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A

CKT	Circuit Description	Trip	Poles					Poles	Trip	Circuit Description	CKT
1	FCU-A	20 A	1	696 VA	1500 VA			1	20 A	KITCHEN RECEPT	2
3	FCU-A	20 A	1			696 VA	1500 VA	1	20 A	KITCHEN RECEPT	4
5	RANGE	50 A	2	4000 VA	180 VA			1	20 A	REFRIGERATOR	6
7	--	--	--			4000 VA	180 VA	1	20 A	BATHROOM RECEPT	8
9	LIGHTING	20 A	1	82 VA	500 VA			1	20 A	EXHAUST FAN	10
11	BATHROOM LIGHT/HEATER	20 A	1			1752 VA	720 VA	1	20 A	RECEPTS	12
13	SPARE	20 A	1	0 VA	900 VA			1	20 A	RECEPTS	14
15	SPARE	20 A	1			0 VA	500 VA	1	20 A	EMERGENCY CALL SYSTEM	16
17	SPACE	--	--	0 VA	300 VA			1	20 A	BROADBAND PANEL	18
19	SPACE	--	--			0 VA	0 VA	--	--	SPACE	20
21	SPACE	--	--	0 VA	0 VA			--	--	SPACE	22
23	SPACE	--	--			0 VA	0 VA	--	--	SPACE	24
25											26
27											28
29											30
31											32
33											34
35											36
37											38
39											40
41											42
			Total Load:	8158 VA		9348 VA					
			Total Amps:	78 A		88 A					

UNIT TYPE G

SCALE : 1/4" = 1'-0"



Loadcenter Panel: G

Location:
Supply From:
Mounting: RECESSED
Enclosure: Type 1

Volts: 120/208 Single Phase
Phases: 1
Wires: 3

A.I.C. Rating: 14 KAIC
Mains Type: MLO
Mains Rating: 150 A

CKT	Circuit Description	Trip	Poles					Poles	Trip	Circuit Description	CKT
1	FCU-A	20 A	1	696 VA	1500 VA			1	20 A	KITCHEN COUNTER RECPT	2
3	FCU-A	20 A	1			696 VA	1500 VA	1	20 A	KITCHEN COUNTER RECPT	4
5	RANGE	50 A	2	4000 VA	1000 VA			1	20 A	REFRIGERATOR	6
7	--	--	--			4000 VA	180 VA	1	20 A	BATHROOM RECEPT	8
9	LIGHTING	20 A	1	82 VA	500 VA			1	20 A	EXHAUST FAN	10
11	BATHROOM LIGHT/HEATER	20 A	1			1752 VA	720 VA	1	20 A	RECEPTS	12
13	SPARE	20 A	1	0 VA	900 VA			1	20 A	RECEPTS	14
15	SPARE	20 A	1			0 VA	500 VA	1	20 A	EMERGENCY CALL SYSTEM	16
17	SPACE	--	--	0 VA	300 VA			1	20 A	BROADBAND PANEL	18
19	SPACE	--	--			0 VA	0 VA	--	--	SPACE	20
21	SPACE	--	--	0 VA	0 VA			--	--	SPACE	22
23	SPACE	--	--			0 VA	0 VA	--	--	SPACE	24
25											26
27											28
29											30
31											32
33											34
35											36
37											38
39											40
41											42
			Total Load:	8978 VA		9348 VA					
			Total Amps:	86 A		89 A					

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San Antonio, Texas 78230
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Fax: 210.525.0225
Texas Firm Registration #F-12003

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

05/25/18

PERMIT SET

STATE OF TEXAS
RALPH E. MARTIN, JR.
28858
REGISTERED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

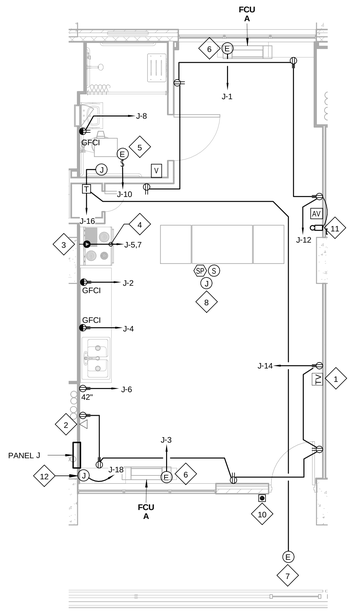
ENLARGED FLOOR PLANS

SHEET NUMBER
E4.2

5/25/2018 9:29:32 AM C:\Users\rgarza\Documents\82900_VictoriaPlaza_Electrical_Ngarza.rvt

UNIT TYPE J

SCALE : 1/4" = 1'-0"



Loadcenter Panel: J

Location:
Supply From:
Mounting: Recessed
Enclosure: Type 1

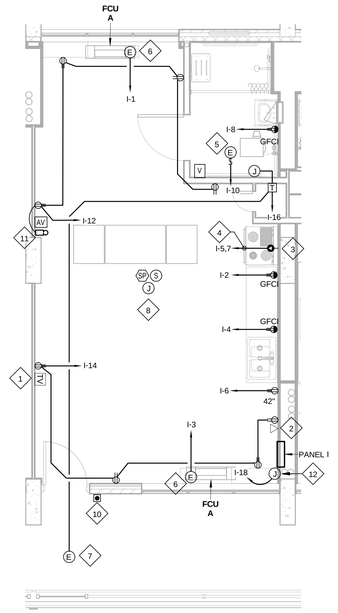
Volts: 120/208 Single Phase
Phases: 1
Wires: 3

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A

CKT	Circuit Description	Trip	Poles					Poles	Trip	Circuit Description	CKT
1	FCU-A	20 A	1	696 VA	1500 VA			1	20 A	KITCHEN RECEPT	2
3	FCU-A	20 A	1			696 VA	1500 VA	1	20 A	KITCHEN RECEPT	4
5	RANGE	50 A	2	4000 VA	1000 VA			1	20 A	REFRIGERATOR	6
7	--	--	--			4000 VA	180 VA	1	20 A	BATHROOM RECEPT	8
9	LIGHTING	20 A	1	82 VA	500 VA			1	20 A	EXHAUST FAN	10
11	BATHROOM LIGHT/HEATER	20 A	1			1752 VA	720 VA	1	20 A	RECEPTS	12
13	SPARE	20 A	1	0 VA	900 VA			1	20 A	RECEPTS	14
15	SPARE	20 A	1			0 VA	500 VA	1	20 A	EMERGENCY CALL SYSTEM	16
17	SPACE	--	--	0 VA	300 VA			1	20 A	BROADBAND PANEL	18
19	SPACE	--	--			0 VA	0 VA	--	--	SPACE	20
21	SPACE	--	--	0 VA	0 VA			--	--	SPACE	22
23	SPACE	--	--			0 VA	0 VA	--	--	SPACE	24
25											26
27											28
29											30
31											32
33											34
35											36
37											38
39											40
41											42
			Total Load:	8978 VA		9348 VA					
			Total Amps:	86 A		89 A					

UNIT TYPE I

SCALE : 1/4" = 1'-0"



TYPICAL UNITS KEYED NOTES

1. EXISTING COAX OUTLET TO REMAIN.
2. EXISTING PHONE JACK TO REMAIN.
3. ELECTRICAL CONNECTION TO RANGE. VERIFY EXACT MAKE AND MODEL NUMBER WITH ARCHITECT.
4. 3#8 & 1#10 GND. IN 3/4" C. FOR RANGE
5. ELECTRICAL CONNECTION TO BATHROOM FAN, HEATER, LIGHT AND NIGHT LIGHT, 120 VOLT.
6. ELECTRICAL CONNECTION TO FAN AND COIL UNITS, 120 VOLT.
7. ELECTRICAL CONNECTIONS TO APARTMENT EMERGENCY ASSISTANCE CALL SYSTEM, 120VOLT. REFER TO DETAIL 1/E5.1.
8. FIRE ALARM SYSEM J-BOX CAPABLE OF SUPPORTING A FUTURE VISUAL ALARM NOTIFICATION APPLIANCE. J-BOX SHALL BE SUTABLE TO SECURELY MOUNT A FIRE ALARM AUDIO/VISUAL DEVICE. J-BOX SHALL BE PRE-WIRED TO BUILDING FIRE ALARM SYSTEM.
9. PROVIDE ARC FAULT CIRCUIT INTERRUPTER PROTECTION PER NEC 210-12
10. DOOR CHIME, USE BROAN CHIME #CB100, BUTTON #RC816 AND TRANSFORMER #C905. MOUNT CHIME AT 84" AFF AND DOOR BUTTON AT 48" AFF. PROVIDE STANDARD BOX WITH SINGLE GANG PLATE FOR DOOR BUTTON.
11. DOOR CHIME, AUDIO/VISUAL ANNUNCIATOR KIT, EDWARDS #7005-G5.
12. PROVIDE 120V CONNECTION FOR BROADBAND PANEL. COORDINATE WITH BROADBAND INSTALLER. SEE SHEET A103.

GENERAL NOTES (TYPICAL):

1. VERIFY EXACT LOCATION OF RECEPTACLES WITH ARCHITECT/ OWNER'S REPRESENTATIVE PRIOR TO ROUGH-IN.
2. DO NOT INSTALL BOXES BACK TO BACK IN DEMISING WALLS. SEE SPECIFICATIONS FOR OFFSET REQUIREMENTS.
3. COORDINATE PLACEMENT OF CEILING MOUNTED SIGNAL DEVICES WITH HVAC/SPRINKLER INSTALLERS.
4. COORDINATE CONNECTIONS TO ALL HVAC EQUIPMENT WITH DIV. 23 INSTALLER. REFER HVAC DRAWINGS.
5. REFER TO SHOP FIRE ALARM DRAWINGS FOR DEVICE CONDUIT, BOXES, AND ROUGH-IN REQUIREMENTS. CABLING SHALL BE BY FIRE ALARM SYSTEM INSTALLER, DIV 28.
6. ALL CONDUIT IN EXPOSED AREAS SHALL BE AS CLOSE TO STRUCTURAL MEMBERS OR CONCEALED. COORDINATE ROUTING OF CONDUIT WITH ARCHITECT PRIOR TO ROUGH-IN. WHERE UNABLE TO CONCEAL USE WIREMOLD 700 SERIES, FINISH BY ARCHITECT. IN CONDITIONS WHERE DEVICES CAN NOT BE MOUNTED IN STRUCTURAL MEMBERS IN EXPOSED AREAS, CONTRACTOR SHALL COORDINATE DEVICE SUPPORT DETAILS WITH ARCHITECT.
8. GENERAL CONTRACTOR TO REVIEW EXISTING CONDITIONS. X-RAY PRIOR TO CORING FOR NEW CONDUIT. COORDINATE LOCATION IN FIELD. FIRE CAULK AND SEAL ALL PENETRATIONS WEATHERTIGHT.
9. PROVIDE TAMPER RESISTANT RECEPTACLES PER ARTICLE 406.12 OF THE 2017 NATIONAL ELECTRICAL CODE.
10. REFER TO SHEETS E4.1, E4.2, & E4.3 FOR TYPICAL ROOM LAYOUTS.
11. REFER TO ELECTRICAL ONE-LINE DIAGRAM FOR QUANTITY OF PANELBOARDS.

Loadcenter Panel: I

Location:
Supply From:
Mounting: Recessed
Enclosure: Type 1

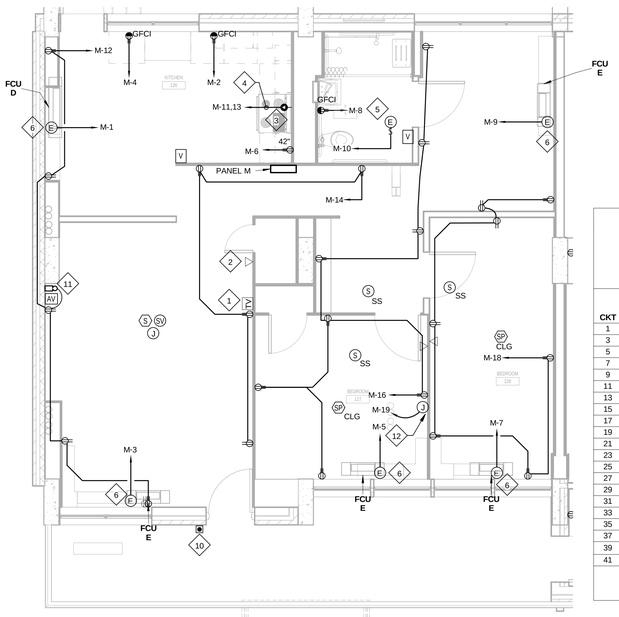
Volts: 120/208 Single Phase
Phases: 1
Wires: 3

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A

CKT	Circuit Description	Trip	Poles					Poles	Trip	Circuit Description	CKT
1	FCU-A	20 A	1	696 VA	1500 VA			1	20 A	KITCHEN RECEPT	2
3	FCU-A	20 A	1			696 VA	1500 VA	1	20 A	KITCHEN RECEPT	4
5	RANGE	50 A	2	4000 VA	1000 VA			1	20 A	REFRIGERATOR	6
7	--	--	--			4000 VA	180 VA	1	20 A	BATHROOM RECEPT	8
9	LIGHTING	20 A	1	82 VA	500 VA			1	20 A	EXHAUST FAN	10
11	BATHROOM LIGHT/HEATER	20 A	1			1752 VA	720 VA	1	20 A	RECEPTS	12
13	SPARE	0 A	1	0 VA	720 VA			1	20 A	RECEPTS	14
15	SPARE	0 A	1			0 VA	0 VA	1	20 A	EMERGENCY CALL SYSTEM	16
17	SPACE	--	--	0 VA	300 VA			1	20 A	BROADBAND PANEL	18
19	SPACE	--	--			0 VA	0 VA	--	--	SPACE	20
21	SPACE	--	--	0 VA	0 VA			--	--	SPACE	22
23	SPACE	--	--			0 VA	0 VA	--	--	SPACE	24
25											26
27											28
29											30
31											32
33											34
35											36
37											38
39											40
41											42
			Total Load:	8798 VA		8848 VA					
			Total Amps:	85 A		85 A					

UNIT TYPE M

SCALE : 1/4" = 1'-0"



Loadcenter Panel: M

Location:
Supply From:
Mounting: Recessed
Enclosure: Type 1

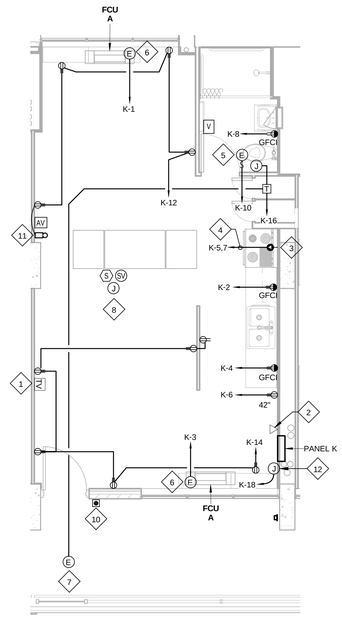
Volts: 120/208 Single Phase
Phases: 1
Wires: 3

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 150 A

CKT	Circuit Description	Trip	Poles					Poles	Trip	Circuit Description	CKT
1	FCU-E	20 A	1	696 VA	1500 VA			1	20 A	KITCHEN RECEPT	2
3	FCU-E	20 A	1			696 VA	1500 VA	1	20 A	KITCHEN RECEPT	4
5	FCU-E	20 A	1	696 VA	1000 VA			1	20 A	REFRIGERATOR	6
7	FCU-E	20 A	1			696 VA	180 VA	1	20 A	BATHROOM RECEPT	8
9	FCU-E	20 A	1	696 VA	500 VA			1	20 A	EXHAUST FAN	10
11	RANGE	50 A	2			4000 VA	900 VA	1	20 A	RECEPTS	12
13	--	--	--	4000 VA	720 VA			1	20 A	RECEPTS	14
15	BATHROOM LIGHT/HEATER	20 A	1			1752 VA	1440 VA	1	20 A	RECEPTS	16
17	LIGHTING	20 A	1	158 VA	1260 VA			1	20 A	RECEPTS	18
19	BROADBAND PANEL	20 A	1			300 VA	0 VA	--	--	SPACE	20
21	SPARE	20 A	1	0 VA	0 VA			--	--	SPACE	22
23	SPARE	0 A	1			0 VA	0 VA	--	--	SPACE	24
25											26
27											28
29											30
31											32
33											34
35											36
37											38
39											40
41											42
			Total Load:	11226 VA		11464 VA					
			Total Amps:	108 A		110 A					

UNIT TYPE K

SCALE : 1/4" = 1'-0"



Loadcenter Panel: K

Location:
Supply From:
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Single Phase
Phases: 1
Wires: 3

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A

CKT	Circuit Description	Trip	Poles					Poles	Trip	Circuit Description	CKT
1	FCU-A	20 A	1	696 VA	1500 VA			1	20 A	KITCHEN RECEPT	2
3	FCU-A	20 A	1			696 VA	1500 VA	1	20 A	KITCHEN RECEPT	4
5	RANGE	50 A	2	4000 VA	1000 VA			1	20 A	REFRIGERATOR	6
7	--	--	--			4000 VA	180 VA	1	20 A	BATHROOM RECEPT	8
9	LIGHTING	20 A	1	82 VA	500 VA			1	20 A	EXHAUST FAN	10
11	BATHROOM LIGHT/HEATER	20 A	1			1752 VA	720 VA	1	20 A	RECEPTS	12
13	SPARE	20 A	1	0 VA	1080 VA			1	20 A	RECEPTS	14
15	SPARE	20 A	1			0 VA	500 VA	1	20 A	EMERGENCY CALL SYSTEM	16
17	SPACE	--	--	0 VA	300 VA			1	20 A	BROADBAND PANEL	18
19	SPACE	--	--			0 VA	0 VA	--	--	SPACE	20
21	SPACE	--	--	0 VA	0 VA			--	--	SPACE	22
23	SPACE	--	--			0 VA	0 VA	--	--	SPACE	24
25											26
27											28
29											30
31											32
33											34
35											36
37											38
39											40
41											42
			Total Load:	9158 VA		9348 VA					
			Total Amps:	88 A		90 A					

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Texas Firm Registration #F-12003

LOCATION:

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REVISIONS

ISSUE	DESCRIPTION	DATE

05/25/18

PERMIT SET

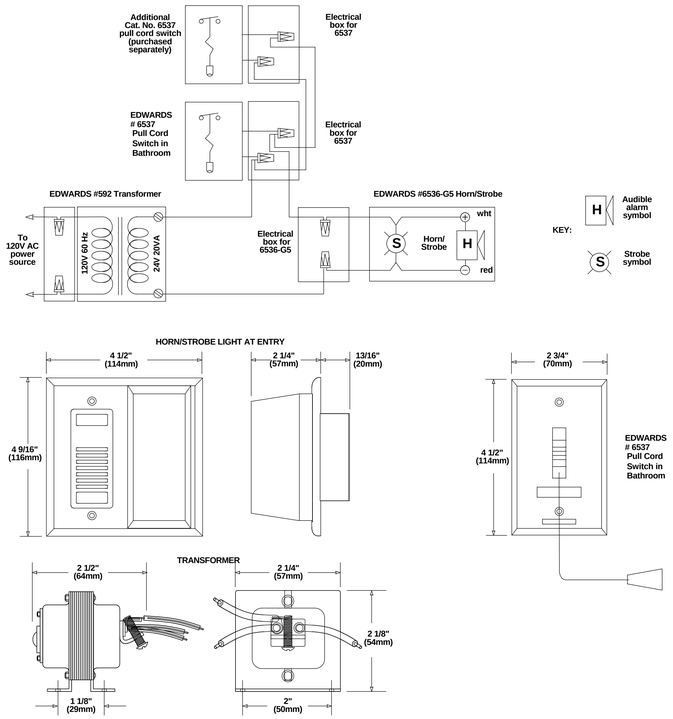
STATE OF TEXAS
RALPH E. MARTIN, JR.
28858
REGISTERED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

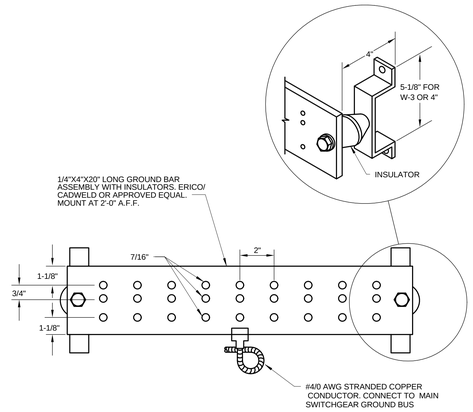
ENLARGED FLOOR PLANS

SHEET NUMBER

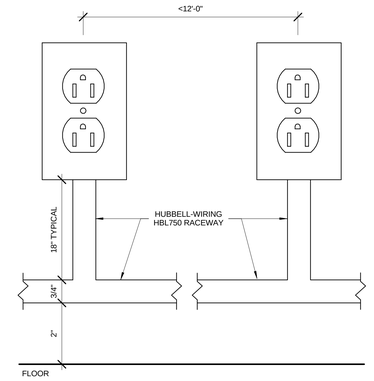
E4.3



1 E5.1 **APARTMENTS EMERGENCY ASSISTANCE CALL SYSTEM**
NOT TO SCALE



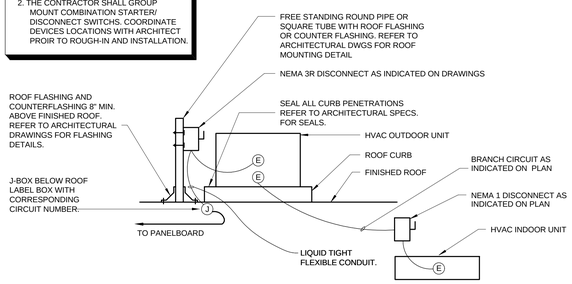
2 E5.1 **GROUND BUS BAR DETAIL**
NOT TO SCALE



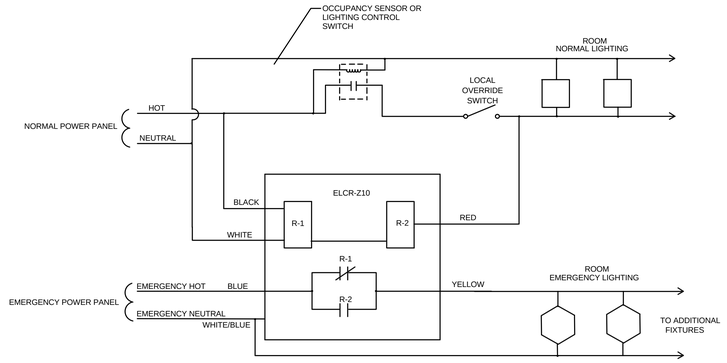
3 E5.1 **TYPICAL RACEWAY DETAIL**
NOT TO SCALE

NOTE:

1. ALL CURB PENETRATIONS SHALL BE COORDINATED WITH ROOFING INSTALLER.
2. THE CONTRACTOR SHALL GROUP MOUNT COMBINATION STARTER/ DISCONNECT SWITCHS. COORDINATE DEVICES LOCATIONS WITH ARCHITECT PROIR TO ROUGH-IN AND INSTALLATION.



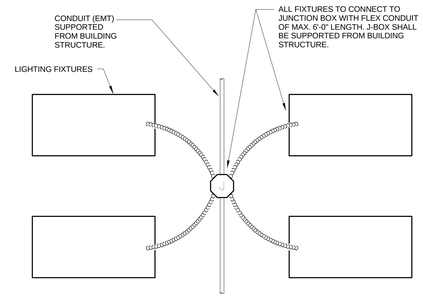
4 E5.1 **MINI-SPLIT WIRING DIAGRAM**
NOT TO SCALE



NOTES:
1. WHERE THE SYMBOL LCR IS SHOWN ON A LIGHTING PLAN THE INTENT IS TO CONNECT THE LIGHTING FIXTURES IN THE ROOM TO THE NORMAL CIRCUIT IN THE ROOM AND TO THE EMERGENCY CIRCUIT THROUGH THE RELAY AS INDICATED IN THIS DETAIL.

2. THE RELAY IS MANUFACTURED BY NINE 24, INC.

5 E5.1 **EMERGENCY LIGHTING RELAY**
NOT TO SCALE



6 E5.1 **TYPICAL LIGHTING BRANCH CIR. INSTALLATION**
NOT TO SCALE

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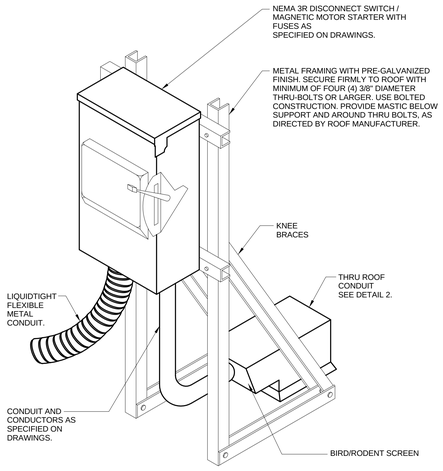
PROFESSIONAL ENGINEER
05/25/18

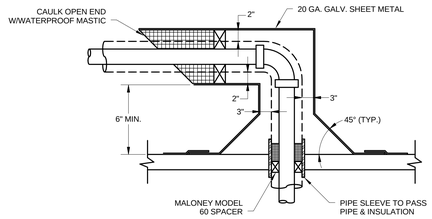
PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

ELECTRICAL DETAILS

SHEET NUMBER
E5.1



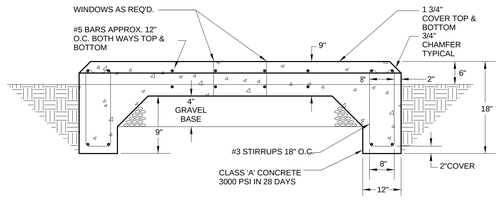
1 ROOFTOP MOUNTED DISCONNET SWITCH
E5.2 NOT TO SCALE



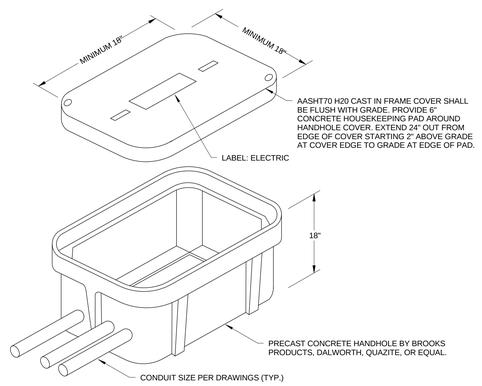
2 PIPE THRU ROOF DETAIL
E5.2 NOT TO SCALE

NOTES:

1. EARTH BELOW SLAB SHALL BE EITHER UNDISTURBED LEVEL SOIL, OR IF EXCAVATION IS REQUIRED CONTRACTOR SHALL PROVIDE PROPERLY COMPACTED SAND AND/OR 1/2" GRAVEL BACKFILL PREVENT SETTLING OF THE PAD.
2. ALL REINFORCING STEEL SHALL MEET A.S.T.M. SPECIFICATION A615 GRADE 40 MINIMUM REQUIREMENTS FOR DEFORMED STEEL BARS.
3. COORDINATE LOCATION OF INCOMING POWER CONDUIT, REQUIRED SLAB WINDOWS, GROUND RODS AND OTHER ITEMS.
4. TRANSFORMER AND SWITCHGEAR SLAB TO BE CONSTRUCTED BY GENERAL CONTRACTOR. EXACT DIMENSIONS TO BE DETERMINED BY EQUIPMENT INSTALLED.
5. THE FOLLOWING MIN. CLEARANCES FOR WORKING SPACE SHALL BE PROVIDED AROUND THE TRANSFORMER:
   A. FRONT - 8' FROM EDGE OF TRANSFORMER.
   B. BACK AND SIDES - 3' FROM EDGE OF TRANSFORMER.
6. UTILITY COMPANY MUST INSPECT TRANSFORMER PAD PRIOR TO POURING CONCRETE. TRANSFORMER:
7. COORDINATE WITH UTILITY COMPANY TO ASSURE CLEARANCE AND BOLLARD PROTECTION COMPLIES WITH THEIR REQUIREMENTS.

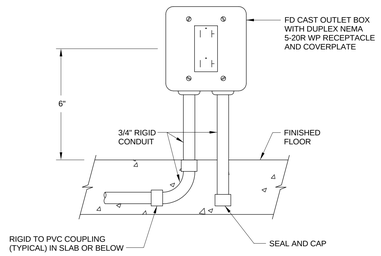


3 TRANSFORMER PAD DETAIL
E5.2 NOT TO SCALE

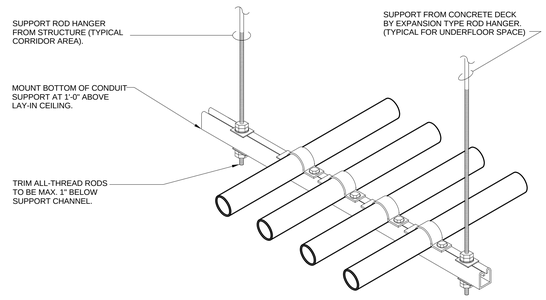


NOTE: CONDUITS SHALL ENTER FROM BELOW BOX AND STUB-UP TO 12" BELOW COVER. AFTER ALL WIRING IS COMPLETED, CONDUITS SHALL BE SEALED WITH SILICONE WATER RESISTANT SEALANT. PROVIDE CRIMP TYPE, WATER RESISTANT SPLICES.

4 PULL-BOX DETAIL
E5.2 1/8" = 1'-0"



5 FREE STANDING RECEPTACLE DETAIL
E5.2 NOT TO SCALE



6 CONDUIT SYSTEM SUPPORT
E5.2 NOT TO SCALE

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PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
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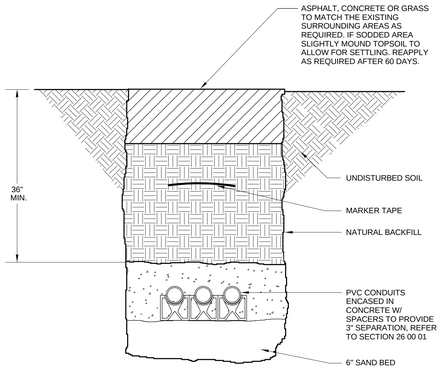
TEXAS LICENSE NO. 10–881

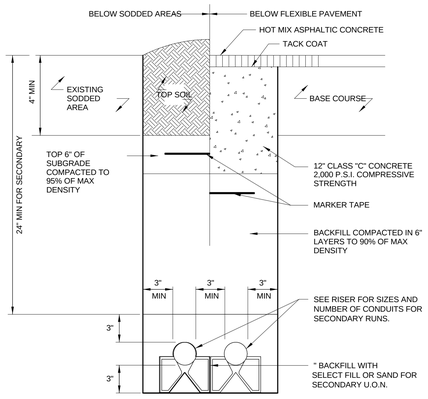
ELECTRICAL DETAILS

SHEET NUMBER
E5.2

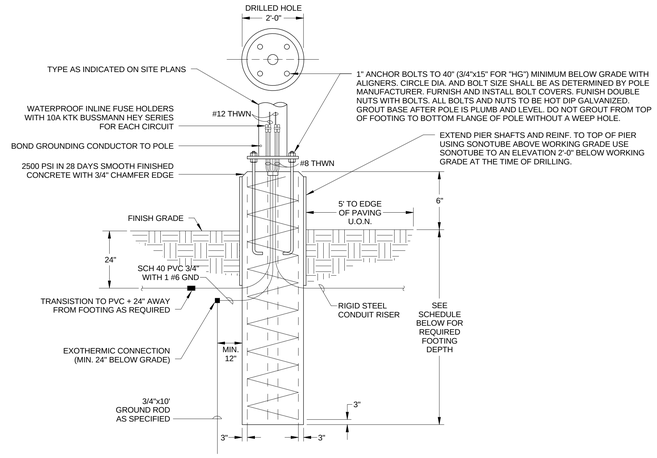


(SHALL COMPLY WITH CPS REQUIREMENTS)

1 E5.3 PRIMARY DUCTBANK DETAIL
NOT TO SCALE

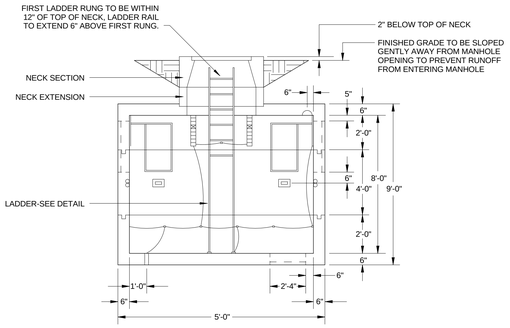


2 E5.3 TYP. ELEC. CONDUIT. BURIAL DETAIL
NOT TO SCALE



DRILLED PIER REINFORCING SCHEDULE				
MAX POLE HEIGHT	SHAFT DIAM.	PENETRATION INTO GRADE	VERTICAL REINF.	SPIRAL
12 FEET	24"	8 FEET	(8)#8	#3 @ 12"

3 E5.3 POLE FOOTING DETAIL
N.T.S.



NOTES:

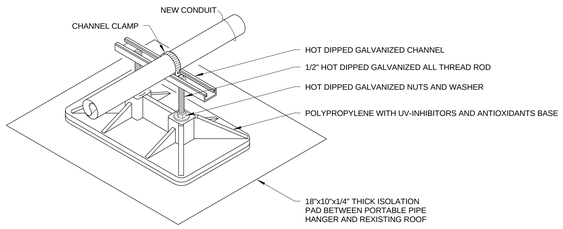
1. MANHOLE SHALL BE PRECAST OR POURED IN PLACE, CONCRETE RATED FOR H-20 LOADING.
2. SUBBASE FOR PLACEMENT OF MANHOLE SHALL BE STABILIZED WITH 6" OF CEMENT, STABILIZED SAND TO PROVIDE LEVEL SOLID BEARING SURFACE BEFORE INSTALLTION OF MANHOLE.
3. ALL WINDOWS SHALL BE FURNISHED WITH SMOOTH OUTSIDE WALLS PROVIDING ADDITIONAL STRENGTH TO RESIST BREAKOUT DURING INSTALLATION.
4. MANHOLE COVER SHALLBE MARKED 'ELECTRIC'.
5. MANHOLE SHALL BE INSTALLED TO PROMOTE NATURAL FLOW OF WATER TO THE SUMP. GROUT MAY BE USED TO CORRECT IRREGULARITIES IN FLOOR.
6. PROVIDE A 4 GROUND BUS. BOND ALLMETAL COMPONENTS TO THE GROUND BUS.

(SHALL COMPLY WITH CPS REQUIREMENTS)

4 E5.3 MANHOLE DETAIL
N.T.S

GENERAL NOTE FOR ROOF DETAILS:

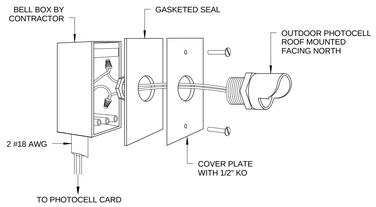
1. COORDINATE INSTALLATION WITH ROOFING SUBCONTRACTOR.



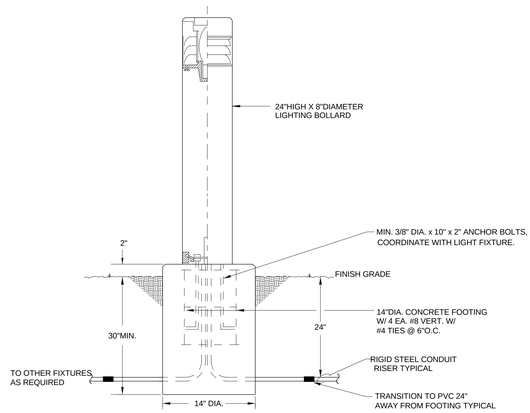
NOTES:

1. PLACE HANGERS OVER STRUCTURAL SUPPORTS WHERE POSSIBLE-MAX. DIST. 10' O.C. ATTACH ALL COMPONENTS IN ACCORDANCE WITH BID DOCUMENTS-EVEN WHERE OTHER MATERIAL (SUCH AS SCREWS, ETC.) ARE NOT SHOWN. USE ONLY COMPATIBLE MATERIALS. PIPE HANGER SHALL BE PORTABLE PIPE HANGER MODEL PP10-C.

5 E5.3 PIPE HANGERS/SUPPORT FOR ROOF DETAIL
1/8" = 1'-0"



6 E5.3 OUTDOOR PHOTOCELL DETAIL
N.T.S.



7 E5.3 BOLLARD MOUNTING DETAIL
1/8" = 1'-0"

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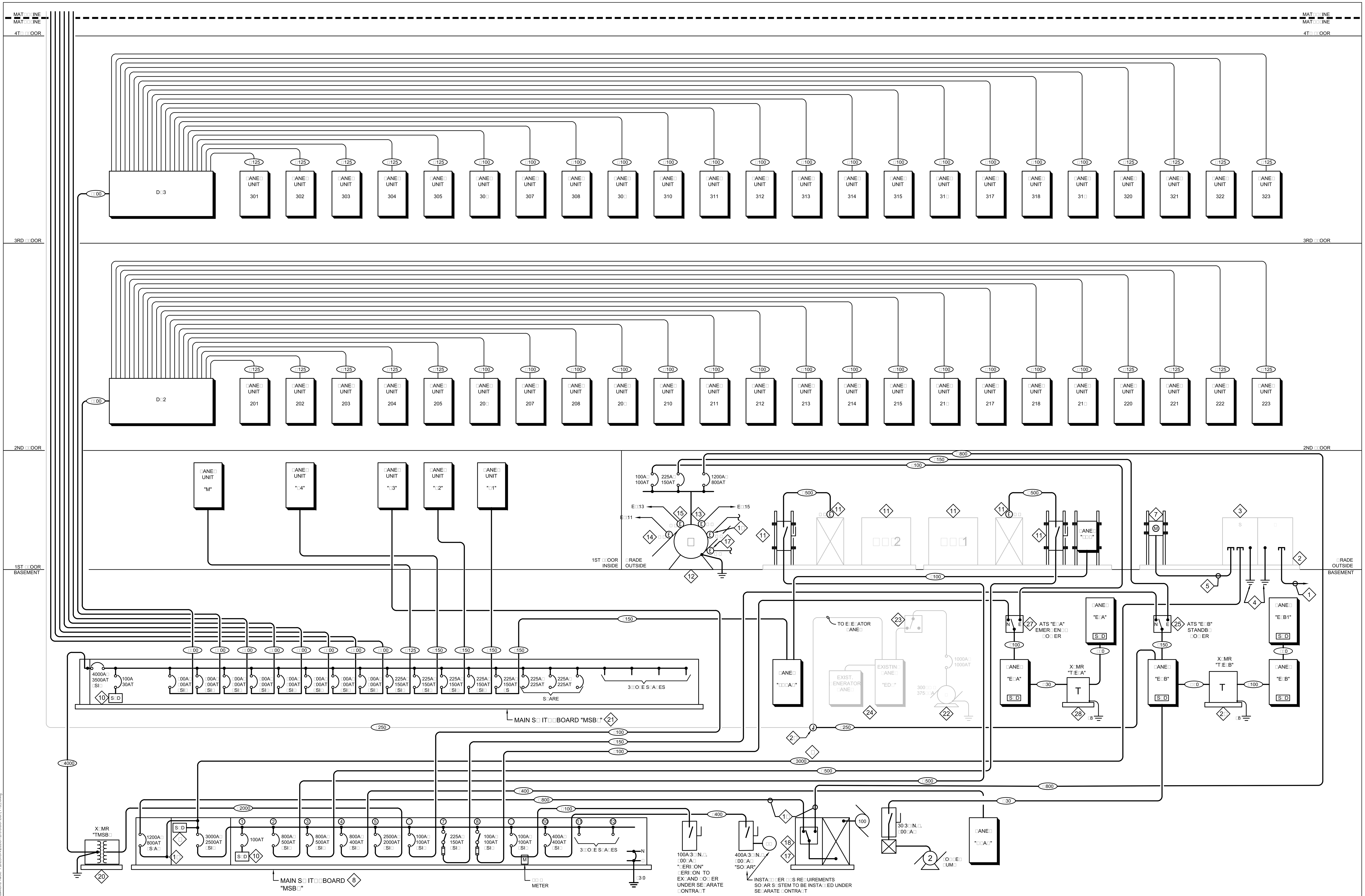
TEXAS LICENSE NO. 10–881

ELECTRICAL DETAILS

SHEET NUMBER
E5.3

5/25/2018 9:30:14 AM C:\Users\rtgarza\Documents\R20GO_VictoriaPlaza_Electrical_Ngarza.rvt



□E□ED NOTES □E□.1

1. □ON□RETE EN□ASED □RIMAR□ DU□TBAN□ □ER □□S ENER□□ E□E□TRI□ SER□I□E STANDARDS. RE□ER TO SITE □□AN S□EET E0.2.
2. E□E□TRI□A□ SER□I□E E□UI□MENT □ON□RETE □AD □ER □□S ENER□□ E□E□TRI□ SER□I□E STANDARDS. RE□ER TO SITE □□AN S□EET E0.2 □OR E□E□TRI□A□ SER□I□E E□UI□MENT □AD □O□ATION.
3. □□S ENER□□ E□E□TRI□A□ SER□I□E □AD MOUNTED TRANS□ORMER. RE□ER TO SITE □□AN S□EET E0.2 □OR □AD MOUNTED TRANS□ORMER □O□ATION.
4. PROVIDE TWO 5/8 INCH BY 8'-0" LONG PAD MOUNTED SERVICE TRANS□ORMER □O□□ER □ROUND RODS □ER □□S ENER□□ E□E□TRI□ SER□I□E STANDARDS.
5. 2 IN□□ □□□ S□□EDU□E 40 □ONDUIT □ROM SER□I□E TRANS□ORMER SE□ONDAR□ □OM□ARTMENT TO E□E□TRI□A□ SER□I□E METER □ER □□S ENER□□ E□E□TRI□ SER□I□E STANDARDS. RE□ER TO SITE □□AN S□EET E0.2 □OR E□E□TRI□A□ SER□I□E METER □O□ATION.

□. MODI□□ EXISTIN□ 120□208□ □EEDER TO ROO□ □OR NE□ 277□480□ □ANE□E□E□.

7. E□E□TRI□ SER□I□E METER AND METER E□UI□MENT RA□□ □ER □□S ENER□□ E□E□TRI□ SER□I□E STANDARDS. RE□ER TO SITE □□AN S□EET E0.2 □OR E□E□TRI□ SER□I□E METER AND METER E□UI□MENT RA□□ □O□ATIONS.
8. 3,000 AM□S, 480□277 □O□T, 3□□ASE, 4□□IRE SO□ID□□ □ROUNDED 100 □AI□, □REE STANDIN□ DEAD □RONT SER□I□E ENTRAN□E S□ IT□□BOARD. S□ IT□□BOARD MAIN □IR□UIT BREA□ER AND □EEDER □IR□UIT BREA□ERS S□A□□BE □IXED □ROU□ MOUNTED, 30 □□□□E MA□NUM DS ANSI □O□ ER □IR□UIT BREA□ERS, U□ 10□□ISTED.

□. SER□I□E ENTRAN□E T□□E 1 S□D INTERNA□□□ MOUNTED B□ S□ IT□□□EAR MANU□A□TURER.

10. T□□E 2 S□D INTERNA□□□ MOUNTED B□ S□ IT□□□EAR MANU□A□TURER.
11. E□E□TRI□A□ □ONNE□TION TO □□I□□ER □ONTRO□□ERS 480 □O□T, 3□□□ASE. □RO□IDE A RA□□ MOUNTED □00 AM□, 3□□□ASE, □00 □A□, □EA□□ DUT□, NEMA 3R EN□□OSURE NON□USED DIS□ONNE□T S□ IT□□. RE□ER TO S□EET E0.2 □OR □□I□□ER □O□ATION.
12. DIESE□ DRI□EN EMER□EN□□ □ENERATOR □ IT□ DOUB□E □ A□□ S□ID MOUNTED □UE□ TAN□ 430 □□A □350 □□ □ 0.80 □.□.□8 □OUR □UE□ TAN□. RE□ER TO S□E□I□I□ATIONS.
13. E□E□TRI□A□ □ONNE□TIONS TO EMER□EN□□ □ENERATOR □ONTRO□S.
14. E□E□TRI□A□ □ONNE□TIONS TO EMER□EN□□ □ENERATOR BATTER□ □□AR□ER.
15. E□E□TRI□A□ □ONNE□TIONS TO EMER□EN□□ □ENERATOR EN□INE B□O□□ □EATER.

1□. ROUTE 2" □. □ROM EMER□EN□□ □ENERATOR □ONTRO□ □ANE□ TO EMER□EN□□ □ENERATOR REMOTE ANNUN□IATOR □ANE□ □O□ATED IN T□E BUI□DIN□ □IRE □OMMAND □ENTER ROOM.

18. 100 □□ □IRE □UM□ S□STEM RE□ER TO □□UMBIN□ DRA□ IN□S AND DI□.21 S□E□I□I□ATIONS.

1□. □IRE □UM□ □EEDER S□A□□BE ROUTED IN AN EN□ASED □IRE RATED ASSEMB□□ □ISTED TO A□□IE□E A MINIMUM □IRE RATIN□ O□ 2 □OURS. U.□. □ISTED □IRE □UM□ S□ IT□□BOARD SE□TION □ONNE□T A□EAD O□ S□ IT□□BOARD MSB□ MAIN.

20. 1000 □□A 480 □O□T □RIMAR□ TO 208□□120 □O□T SE□ONDAR□ DOE 201□, ENER□□ E□□I□IENT □8.□□ E□□I□IEN□□□DR□ T□□E TRANS□ORMER, NEMA 1 ENCLOSURE, COPPER WINDINGS 150°C RISE.
21. 4,000 AM□, 208□120 □O□T, 3□□ASE, 4□□IRE, 100□AI□ □REE STANDIN□ DEAD □RONT S□ IT□□BOARD. S□ IT□□BOARD MAIN □IR□UIT BREA□ER AND A□□ □EEDER □IR□UIT BREA□ERS 800A□ AND ABO□E S□A□□BE EATON □IXED MOUNTED MA□NUM DS 30□□□□E □O□ ER □IR□UIT BREA□ERS.
22. EXISTIN□ 300 □□ □375 □□A 208□□120 □O□T 3□□ASE, DIESE□ DRI□EN EMER□EN□□ □ENERATOR TO REMAIN UNTI□ NE□ S□ IT□□□EAR IS READ□. RE□ER TO SITE □□AN S□EET E0.2, □E□ED NOTE 1 □OR □O□ATION.
23. EXISTIN□ 1000 AM□, 3□□O□E, 240 □A□ AUTOMATI□ TRANS□ER S□ IT□□ TO REMAIN UNTI□ NE□ S□ IT□□□EAR IS READ□.
24. REMO□E □ENERATOR □ANE□ AND □ANE□ ED□ □ □EN EXISTIN□ □ENERATOR IS REMO□ED.
25. 150AM□, 3□□O□E, □00□A□, 42□AI□ AUTOMATI□ TRANS□ER S□ IT□□ □OR STANDB□ □O□ ER

2□. 30□□A 480□O□T □RIMAR□ TO 208□□120□O□T SE□ONDAR□ DOE 201□, ENER□□ E□□I□IENT DR□ T□□E TRANS□ORMER, NEMA 1 EN□□OSURE COPPER WINDING 150° C RISE.

27. 100AM□, 3□□O□E, □00□A□, 42□AI□ AUTOMATI□ TRANS□ER S□ IT□□ □OR EMER□EN□□ □O□ ER.
28. EXISTIN□ 1□□□A 480□O□T □RIMAR□ TO 208□□120□O□T SE□ONDAR□ TRANS□ORMER.

2□. S□□I□E T□E NE□ STANDB□ □O□ ER □EEDER TO T□E EXISTIN□ E□E□ATOR □EEDER □ □EN T□E EXISTIN□ □ENERATOR S□STEM IS REMO□ED.

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411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS

ISSUE	DESCRIPTION	DATE

PERMIT SET 05/25/18

STATE OF TEXAS
RALPH E. MARTIN, JR.
28858
REGISTERED PROFESSIONAL ENGINEER
05.25.2018

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

ELECTRICAL ONE-LINE DIAGRAM

SHEET NUMBER
E6.1

6/12/2017 1:01:24 PM Z:\99060 - Victoria Plaza Modernization\Phase 1\DESIGN\ELECT\99060-E6.(1-3).dwg

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REVISIONS		
ISSUE	DESCRIPTION	DATE

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STATE OF TEXAS
RALPH E. MARTIN, JR.
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REGISTERED PROFESSIONAL ENGINEER
05.25.2018

PROJECT ARCHITECT
DARREL DURAND–HOLLIS, AIA
STATE LICENSE NO. 19,364

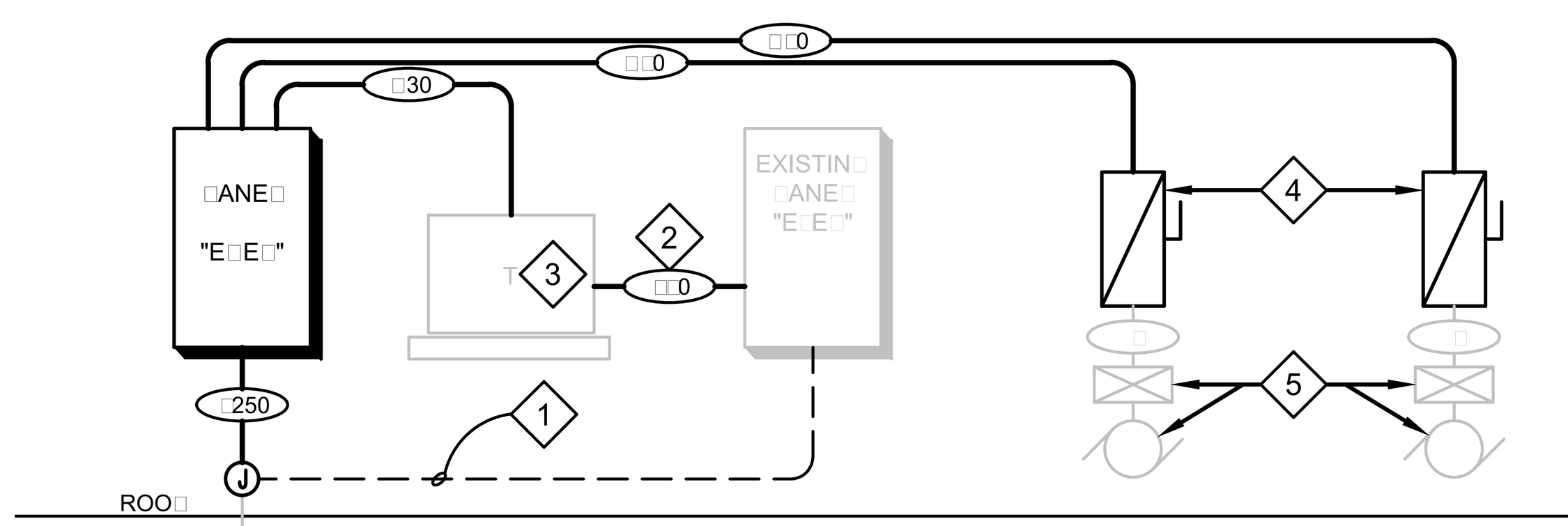
ELECTRICAL ONE-LINE DIAGRAM

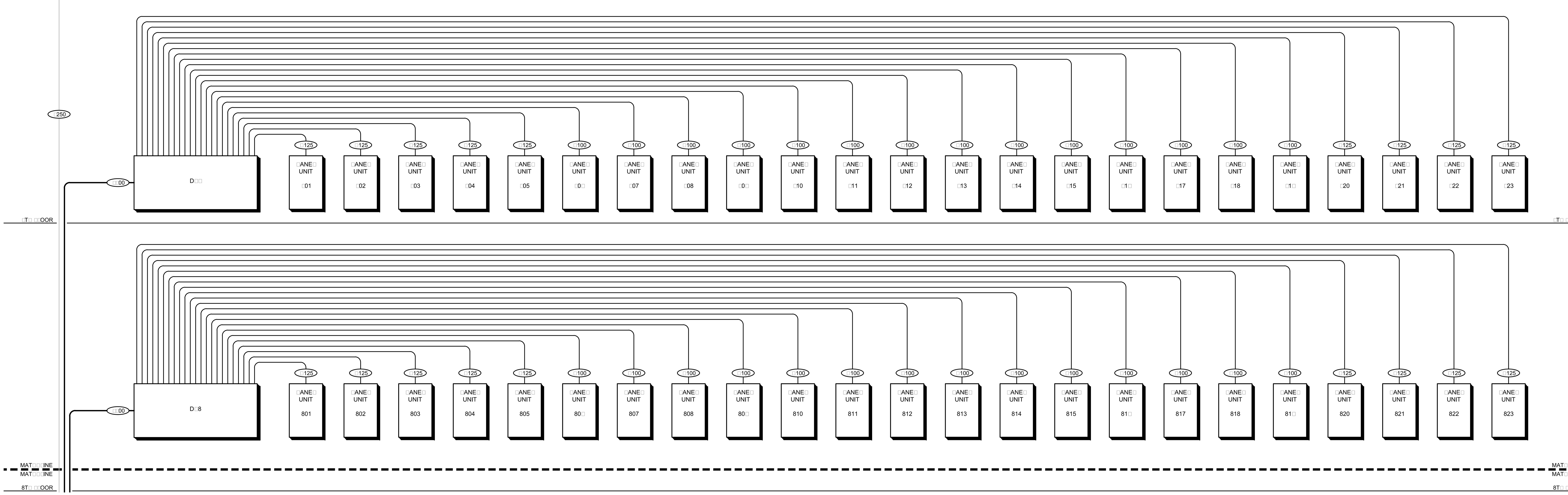
SHEET NUMBER
E6.2

6/1/2017 1:01:24 PM Z:\18\06\0 - Victoria Plaza Modernization\Phase 1\DESIGN\ELECTRICAL\E6.2 (1.3).dwg

□E□ED NOTES □E□.3

1. MODI□□ EXISTIN□ 208□ □EEDER □ROM EXISTIN□ BASEMENT □ANE□ ED□ TO EXISTIN□ □ANE□ E□E□ TO BE□OME 480□ □EEDER □ROM NE□ □ANE□ E□ IN BASEMENT TO NE□ □ANE□ E□E□.
2. EXISTIN□ □ANE□BOARD TO REMAIN. MODI□□ 208□ □EEDER □ROM 1□□□A TRANS□ORMER TO □ANE□ E□E□.
3. REUSE EXISTIN□ 1□□□A TRANS□ORMER. 480□□120□208□, 3□□, 4□. □RO□IDE NE□ □EEDERS.
4. □RO□IDE BUSSMAN □□S□□T48□RX□□□□N□□B□□1□U E□E□ATOR □O□ER MODU□E S□IT□□ □IT□ □0AM□ DUA□E□EMENT □USES □OR E□E□ATOR MA□□INE □O□ER. □RO□IDE 2 N.O. AND 2 N.□. □ONTA□TS INTER□O□□ □IT□ □A□□ □ER ANI 17.1.
5. UNDER A SE□ARATE □ONTRA□T, T□E 15□□, 480□O□T E□E□ATOR MOTORS AND E□E□ATOR □ONTRO□□ER □I□□ BE RE□□A□ED □IT□ NE□ 15□□, 480□O□T MOTORS. □ONNE□T NE□ E□E□ATOR □ONTRO□ MOTORS TO NE□ □ANE□ E□E□.





ELECTRICAL RISER DIAGRAM

1 / E6.3
SCALE: NOT TO SCALE

BUI□DIN□ E□E□TRI□A□ DESI□N □OAD SUMMAR□

Load Description		Connected Load (KVA)	Demand Factor %	Demand Load (KVA)
1. Lighting load:		22.6	100.00%	22.6
2. Building apartments load:		2925.5	23.00%	672.9
3. Laundry equipment load:				
	a. Dryers 18 x 5 KW = 90 KVA (NEC Table 220.54)	80.0	47.00%	37.6
	b. Washers 18 x 1.5 KW = 27 KVA	24.0	100.00%	24.0
4. HVAC equipment load:				
	a. Chillers 2 – 220 tons at 50% capacity each 440 tons x 1.2 KVA/ton:	528.0	50.00%	264.0
	b. Primary pumps (2) x 5 HP/ea	12.6	100.00%	12.6
	c. Secondary pumps 2-pumps (redundant) 2 x 20 HP/ea	42.8	50.00%	21.4
	d. Exhaust fan 1 x 1 ½ HP	2.4	100.00%	2.4
	e. Existing hot water pumps (2) x 20 HP/ea	42.8	60.00%	25.7
	f. New AHU's 3 x 10 HP = 34.9 KVA	34.9	100.00%	34.9
5. Plumbing equipment load:				
	a. Booster pumps (2) x 5 HP/ea	12.6	100.00%	12.6
	b. Existing pumps: (1) x 5 HP = 6.0 (1) x 10 HP = 11.1 (1) x 1 ½ HP = 2.4 19.5 KVA	19.5	100.00%	19.5
	c. Existing sumps (2) x 1 ½ HP	2.4	50.00%	1.2
	d. Existing lift station (1) x 5 HP	6.0	100.00%	6.0
6. Existing elevators (2) x 15 HP/ea		34.9	75.00%	26.2
7. Fire protection (*) note				
	a. Fire pump 1 x 100 HP = 98.3 KVA b. Jockey pump 1 x 2 HP = 2.8 101.1	101.1	100.00%	101.1
8. Misc. Future Loads		250.0	60.00%	150.0
9. 25% largest motor 100 HP = 98.3 KVA x 0.25		24.6	100.00%	24.6
Totals		4166.7 KVA	35.00%	1459.2 KVA

* NOTE: FIRE PUMP WILL BE CONNECTED AHEAD OF THE MAIN.

I SWITCHBOARD = 1,545 KVA / (480 V X √3) = 1859 AMP

THEREFORE PROVIDE A 2,500 AMP, 480Y/277 VOLT, 3-PHASE, 4-WIRE SOLIDLY GROUNDED SWITCHBOARD.

BUI□DIN□ A□ARTMENTS E□E□TRI□A□ DESI□N □OAD SUMMAR□

Electrical Design Load Summary

Note: Approximate area per apt. unit = 400 ft2

Load Description:		Connected Load (KVA)
1. Lighting and receptacle loads (per NEC Table 220.12 and 220.14d)		
400 ft2 x 3.0 watt/ft2 =	1,200 watt	1.2 KVA
2. Small appliances load (per NEC 210.52.(B)(1))		
2 appliances x 1,500 watt/appliance =	3,000 watt	3.0 KVA
3. Bathroom branch circuit (heat lamp)		
1 ckt x 1,500 watt/ckt =	1,500 watt	1.5 KVA
4. Kitchen range		
1 range x 8,000 watt/range =	8,000 watt	8.0 KVA
5. HVAC equipment load (3) - FCU @ 5.8 amp/ea @120V		
(3) (5.8A) x 120 Volt =	2,088 watt	2.10 KVA
Total Connected Load / Apt Unit		15.80 KVA
I Service / Apt = 15.8 KVA/208 V, 1-Phase =		75.96 amp

Therefore provide a 100 amp, 120/208 volt, 1-phase, 3-wire electrical panelboard per apartment.

Notes:
There are no dishwashers, disposals, laundry equipment, or water heaters in any of the apartment units.

First Floor 2 Bedroom Apartment

Electrical Design Load Summary

Note: Approximate area per apt. unit = 990 ft2

Load Description:		Connected Load (KVA)
1. Lighting and receptacle loads (per NEC Table 220.12 and 220.14d)		
990 ft2 x 3.0 watt/ft2 =	2,970 watt	2.97 KVA
2. Small appliances load (per NEC 210.52.(B)(1))		
2 appliances x 1,500 watt/appliance =	3,000 watt	3.0 KVA
3. Bathroom branch circuit (heat lamp)		
1 ckt x 1,500 watt/ckt =	1,500 watt	1.5 KVA
4. Kitchen range		
1 range x 8,000 watt/range =	8,000 watt	8.0 KVA
5. HVAC equipment load (4) - FCU @ 5.8 amp/ea @120 V		
(4) 5.8 amp x 120 V =	2,784 watt	2.8 KVA
Total Connected Load / Apt Unit		18.27 KVA
I Service / Apt = 18.27 KVA / 208 V, 1-Phase =		87.4 amps

Therefore provide a 100 amp, 120/208 volt, 1-phase, 3-wire electrical panelboard per apartment.

Building Apartment Loads

184 apartment units x 15.80 KVA / apt =	2,907.20 KVA
(1) first floor 2 bedroom apt x 18.27 KVA =	18.27 KVA
Total Connected Load Apartment Load =	2,925.47 KVA
Total Building Apartment Demand Load (per NEC Table 220.84)	
2,928.47 KVA x 23% =	672.86 KVA
Total Building Apartment Demand Load =	672.86 KVA

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REVISIONS

ISSUE	DESCRIPTION	DATE

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RALPH E. MARTIN, JR. 28856 05.25.2018

PROJECT ARCHITECT

ELECTRICAL ONE-LINE DIAGRAM AND LOAD ANALYSIS

SHEET NUMBER
E6.3

□O□□ER □EEDER S□□EDU□E

AM□ERE RATIN□	□EEDER ID	3□□ IRE □ IT□ □ROUND	□EEDER ID	4□□ IRE □ IT□ □ROUND
30A	H30	3#10, 1#10 GND IN 1/2" C.	L30	4#10, 1#10 GND IN 1/2" C.
40A	H40	3#8, 1#10 GND IN 3/4" C.	L40	4#8, 1#10 GND IN 3/4" C.
60A	H60	3#4, 1#10 GND IN 1" C.	L60	4#4, 1#10 GND IN 1-1/4" C.
70A	H70	3#4, 1#8 GND IN 1" C.	L70	4#4, 1#8 GND IN 1-1/4" C.
80A	H80	3#3, 1#8 GND IN 1-1/4" C.	L80	4#3, 1#8 GND IN 1-1/4" C.
100A	H100	3#1, 1#8 GND IN 1-1/2" C.	L100	4#1, 1#8 GND IN 1-1/2" C.
125A	H125	3#1, 1#6 GND IN 1-1/2" C.	L125	4#1, 1#6 GND IN 2" C.
150A	H150	3#1/0, 1#6 GND IN 2" C.	L150	4#1/0, 1#6 GND IN 2" C.
175A	H175	3#2/0, 1#6 GND IN 2" C.	L175	4#2/0, 1#6 GND IN 2" C.
200A	H200	3#3/0, 1#6 GND IN 2" C.	L200	4#3/0, 1#6 GND IN 2" C.
225A	H225	3#4/0, 1#4 GND IN 2-1/2" C.	L225	4#4/0, 1#4 GND IN 2-1/2" C.
250A	H250	3#250KCMIL, 1#4 GND IN 2-1/2" C.	L250	4#250KCMIL, 1#4 GND IN 3" C.
300A	H300	3#350KCMIL, 1#4 GND IN 3" C.	L300	4#350KCMIL, 1#4 GND IN 3-1/2" C.
350A	H350	2-SETS OF 3#2/0, 1#3 GND IN 2" C. EACH	L350	2-SETS OF 4#2/0, 1#3 GND IN 2-1/2" C. EACH
400A	H400	2-SETS OF 3#3/0, 1#3 GND IN 2" C. EACH	L400	2-SETS OF 4#3/0, 1#3 GND IN 2-1/2" C. EACH
500A	H500	2-SETS OF 3#250KCMIL, 1#2 GND IN 2-1/2" C. EACH	L500	2-SETS OF 4#250KCMIL, 1#2 GND IN 3" C. EACH
600A	H600	2-SETS OF 3#350KCMIL, 1#1 GND IN 3-1/2" C. EACH	L600	2-SETS OF 4#350KCMIL, 1#1 GND IN 3-1/2" C. EACH
700A	H700	3-SETS OF 3#250KCMIL, 1#1/0 GND IN 3" C. EACH	L700	3-SETS OF 4#250KCMIL, 1#1/0 GND IN 3-1/2" C. EACH
800A	H800	3-SETS OF 3#300KCMIL, 1#1/0 GND IN 3" C. EACH	L800	3-SETS OF 4#300KCMIL, 1#1/0 GND IN 3-1/2" C. EACH
1000A	H1000	3-SETS OF 3#400KCMIL, 1#2/0 GND IN 3-1/2" C. EACH	L1000	3-SETS OF 4#400KCMIL, 1#2/0 GND IN 3-1/2" C. EACH
1200A	H1200	4-SETS OF 3#350KCMIL, 1#3/0 GND IN 3-1/2" C. EACH	L1200	4-SETS OF 4#350KCMIL, 1#3/0 GND IN 3-1/2" C. EACH
1600A	H1600	5-SETS OF 3#400KCMIL, 1#4/0 GND IN 3-1/2" C. EACH	L1600	5-SETS OF 4#400KCMIL, 1#4/0 GND IN 3-1/2" C. EACH
2000A	H2000	6-SETS OF 3#400KCMIL, 1#250KCMIL GND IN 3-1/2" C. EACH	L2000	6-SETS OF 4#400KCMIL, 1#250KCMIL GND IN 4" C. EACH
			L3000	8-SETS OF 4#500KCMIL, IN 4" C. EACH
			L4000	10 SETS: 4 #600 KCMIL, 1 #500 KCMIL GND. EACH IN 5"C.

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LOCATION:

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PERMIT SET 05/25/18

STATE OF TEXAS
RALPH E. MARTIN, JR.
28858
REGISTERED PROFESSIONAL ENGINEER
05.25.2018

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-881

ELECTRICAL ONE-LINE DIAGRAM

SHEET NUMBER
E6.4

Branch Panel: DP2

Location: ELECT. RM. **Supply From:** MSBL **Mounting:** Surface **Enclosure:** Type 1
Volts: 120/208 Wye **Phases:** 3 **Wires:** 4
A.I.C. Rating: 35KAIC **Mains Type:** MCB **Mains Rating:** 600 A **MCB Rating:** 600 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	UNIT 201	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 202	2
3	--	--	--			7900 VA	7900 VA			--	--	--	4
5	UNIT 203	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 204	6
7	--	--	--	7900 VA	7900 VA					--	--	--	8
9	UNIT 205	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 206	10
11	--	--	--					7900 VA	7900 VA	--	--	--	12
13	UNIT 207	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 208	14
15	--	--	--			7900 VA	7900 VA			--	--	--	16
17	UNIT 209	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 210	18
19	--	--	--	7900 VA	7900 VA					--	--	--	20
21	UNIT 211	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 212	22
23	--	--	--					7900 VA	7900 VA	--	--	--	24
25	UNIT 213	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 214	26
27	--	--	--			7900 VA	7900 VA			--	--	--	28
29	UNIT 215	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 216	30
31	--	--	--	7900 VA	7900 VA					--	--	--	32
33	UNIT 217	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 218	34
35	--	--	--					7900 VA	7900 VA	--	--	--	36
37	UNIT 219	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 220	38
39	--	--	--			7900 VA	7900 VA			--	--	--	40
41	UNIT 221	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 222	42
43	--	--	--	7900 VA	7900 VA					--	--	--	44
45	UNIT 223	100 A	2			7900 VA	5000 VA			2	30 A	DRYER	46
47	--	--	--					7900 VA	5000 VA	--	--	--	48
49	WASHER	20 A	1	1500 VA	5000 VA					2	30 A	DRYER	50
51	WASHER	20 A	1			1500 VA	5000 VA			--	--	--	52
53	UNIT 141	100 A	2					7900 VA	460 VA	1	20 A	ELEVATOR LOBBY FCU "C"	54
55	--	--	--	7900 VA	540 VA					1	20 A	3-RECEPTS	56
57	SPARE	20 A	1			0 VA	360 VA			1	20 A	2-RECEPTS	58
59	SPARE	20 A	1					0 VA	0 VA	1	20 A	SPARE	60
61	SPARE	20 A	1	0 VA	0 VA					1	20 A	SPARE	62
63	SPARE	20 A	1			0 VA	0 VA			1	20 A	SPARE	64
65	SPARE	20 A	1					0 VA	0 VA	1	20 A	SPARE	66
67	SPACE	--	--	0 VA	0 VA					--	--	SPACE	68
69	SPACE	--	--			0 VA	0 VA			--	--	SPACE	70
71	SPACE	--	--					0 VA	0 VA	--	--	SPACE	72
73	SPACE	--	--	0 VA	0 VA					--	--	SPACE	74
75	SPACE	--	--			0 VA	0 VA			--	--	SPACE	76
77	SPACE	--	--					0 VA	0 VA	--	--	SPACE	78
79	SPACE	--	--	0 VA	0 VA					--	--	SPACE	80
81	SPACE	--	--			0 VA	0 VA			--	--	SPACE	82
83	SPACE	--	--					0 VA	0 VA	--	--	SPACE	84
			Total Load:	141.3 kVA		130.4 kVA		131.9 kVA					
			Total Amps:	1180 A		1086 A		1101 A					

PANEL LOAD SUMMARY
NEC 220.84 (24) APT. UNITS (24 x 15.8 KVA) x 36% = 136.5 KVA
NEC 220.54 (3) DRYERS (3 x 5 KVA) x 100% = 15 KVA
NEC 220.52 (3) WASHERS (3 x 1.5 KVA) x 100% = 4.5 KVA
156.0 KVA

∴ 156.0 KVA / 208 x √3 = 433.33 AMPS.
USE A 600 AMP PANELBOARD.

Branch Panel: DP3

Location: ELECT. RM. **Supply From:** MSBL **Mounting:** Surface **Enclosure:** Type 1
Volts: 120/208 Wye **Phases:** 3 **Wires:** 4
A.I.C. Rating: 35KAIC **Mains Type:** MCB **Mains Rating:** 600 A **MCB Rating:** 600 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	UNIT 301	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 302	2
3	--	--	--			7900 VA	7900 VA			--	--	--	4
5	UNIT 303	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 304	6
7	--	--	--	7900 VA	7900 VA					--	--	--	8
9	UNIT 305	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 306	10
11	--	--	--					7900 VA	7900 VA	--	--	--	12
13	UNIT 307	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 308	14
15	--	--	--			7900 VA	7900 VA			--	--	--	16
17	UNIT 309	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 310	18
19	--	--	--	7900 VA	7900 VA					--	--	--	20
21	UNIT 311	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 312	22
23	--	--	--					7900 VA	7900 VA	--	--	--	24
25	UNIT 313	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 314	26
27	--	--	--			7900 VA	7900 VA			--	--	--	28
29	UNIT 315	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 316	30
31	--	--	--	7900 VA	7900 VA					--	--	--	32
33	UNIT 317	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 318	34
35	--	--	--					7900 VA	7900 VA	--	--	--	36
37	UNIT 319	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 320	38
39	--	--	--			7900 VA	7900 VA			--	--	--	40
41	UNIT 321	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 322	42
43	--	--	--	7900 VA	7900 VA					--	--	--	44
45	UNIT 323	100 A	2			7900 VA	5000 VA			2	100 A	DRYER	46
47	--	--	--					7900 VA	5000 VA	--	--	--	48
49	WASHER	20 A	1	1500 VA	5000 VA					2	100 A	DRYER	50
51	WASNER	20 A	1			1500 VA	5000 VA			--	--	--	52
53	SPARE	20 A	1					0 VA	460 VA	1	15 A	ELEVATOR LOBBY FCU "C"	54
55	SPARE	20 A	1	0 VA	540 VA					1	20 A	3-RECEPTS	56
57	SPARE	20 A	1			0 VA	360 VA			1	20 A	2-RECEPTS	58
59	SPARE	20 A	1					0 VA	0 VA	1	20 A	SPARE	60
61	SPARE	20 A	1	0 VA	0 VA					1	20 A	SPARE	62
63	SPARE	20 A	1			0 VA	0 VA			1	20 A	SPARE	64
65	SPARE	20 A	1					0 VA	0 VA	1	20 A	SPARE	66
67	SPACE	--	--	0 VA	0 VA					--	--	SPACE	68
69	SPACE	--	--			0 VA	0 VA			--	--	SPACE	70
71	SPACE	--	--					0 VA	0 VA	--	--	SPACE	72
73	SPACE	--	--	0 VA	0 VA					--	--	SPACE	74
75	SPACE	--	--			0 VA	0 VA			--	--	SPACE	76
77	SPACE	--	--					0 VA	0 VA	--	--	SPACE	78
79	SPACE	--	--	0 VA	0 VA					--	--	SPACE	80
81	SPACE	--	--			0 VA	0 VA			--	--	SPACE	82
83	SPACE	--	--					0 VA	0 VA	--	--	SPACE	84
			Total Load:	133.4 kVA		130.4 kVA		124.0 kVA					
			Total Amps:	1120 A		1095 A		1033 A					

PANEL LOAD SUMMARY
NEC 220.84 (23) APT. UNITS (23 x 15.8 KVA) x 36% = 130.8 KVA
NEC 220.54 (2) DRYERS (2 x 5 KVA) x 100% = 10 KVA
NEC 220.52 (2) WASHERS (2 x 1.5 KVA) x 100% = 3.0 KVA
143.8 KVA

∴ 143.8 KVA / 208 x √3 = 399.51 AMPS.
USE A 600 AMP PANELBOARD.

Branch Panel: DP4

Location: ELECT. RM. **Supply From:** MSBL **Mounting:** Surface **Enclosure:** Type 1
Volts: 120/208 Wye **Phases:** 3 **Wires:** 4
A.I.C. Rating: 35KAIC **Mains Type:** MCB **Mains Rating:** 600 A **MCB Rating:** 400 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	UNIT 401	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 402	2
3	--	--	--			7900 VA	7900 VA			--	--	--	4
5	UNIT 403	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 404	6
7	--	--	--	7900 VA	7900 VA					--	--	--	8
9	UNIT 405	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 406	10
11	--	--	--					7900 VA	7900 VA	--	--	--	12
13	UNIT 407	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 408	14
15	--	--	--			7900 VA	7900 VA			--	--	--	16
17	UNIT 409	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 410	18
19	--	--	--	7900 VA	7900 VA					--	--	--	20
21	UNIT 411	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 412	22
23	--	--	--					7900 VA	7900 VA	--	--	--	24
25	UNIT 413	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 414	26
27	--	--	--			7900 VA	7900 VA			--	--	--	28
29	UNIT 415	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 416	30
31	--	--	--	7900 VA	7900 VA					--	--	--	32
33	UNIT 417	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 418	34
35	--	--	--					7900 VA	7900 VA	--	--	--	36
37	UNIT 419	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 420	38
39	--	--	--			7900 VA	7900 VA			--	--	--	40
41	UNIT 421	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 422	42
43	--	--	--	7900 VA	7900 VA					--	--	--	44
45	UNIT 423	100 A	2			7900 VA	5000 VA			2	30 A	DRYER	46
47	--	--	--					7900 VA	5000 VA	--	--	--	48
49	WASHER	20 A	1	1500 VA	5000 VA					2	30 A	DRYER	50
51	WASHER	20 A	1			1500 VA	5000 VA			--	--	--	52
53	SPARE	20 A	1					0 VA	460 VA	1	15 A	ELEVATOR LOBBY FCU "C"	54
55	SPARE	20 A	1	0 VA	540 VA					1	20 A	3-RECEPTS	56
57	SPARE	20 A	1			0 VA	360 VA			1	20 A	2-RECEPTS	58
59	SPARE	20 A	1					0 VA	0 VA	1	20 A	SPARE	60
61	SPARE	20 A	1	0 VA	0 VA					1	20 A	SPARE	62
63	SPARE	20 A	1			0 VA	0 VA			1	20 A	SPARE	64
65	SPARE	20 A	1					0 VA	0 VA	1	20 A	SPARE	66
67	SPACE	--	--	0 VA	0 VA					--	--	SPACE	68
69	SPACE	--	--			0 VA	0 VA			--	--	SPACE	70
71	SPACE	--	--					0 VA	0 VA	--	--	SPACE	72
73	SPACE	--	--	0 VA	0 VA					--	--	SPACE	74
75	SPACE	--	--			0 VA	0 VA			--	--	SPACE	76
77	SPACE	--	--					0 VA	0 VA	--	--	SPACE	78
79	SPACE	--	--	0 VA	0 VA					--	--	SPACE	80
81	SPACE	--	--			0 VA	0 VA			--	--	SPACE	82
83	SPACE	--	--					0 VA	0 VA	--	--	SPACE	84
			Total Load:	133.4 kVA		130.4 kVA		124.0 kVA					
			Total Amps:	1120 A		1095 A		1033 A					

PANEL LOAD SUMMARY
NEC 220.84 (23) APT. UNITS (23 x 15.8 KVA) x 36% = 130.8 KVA
NEC 220.54 (2) DRYERS (2 x 5 KVA) x 100% = 10 KVA
NEC 220.52 (2) WASHERS (2 x 1.5 KVA) x 100% = 3.0 KVA
143.8 KVA

∴ 143.8 KVA / 208 x √3 = 399.51 AMPS.
USE A 600 AMP PANELBOARD.

Branch Panel: DP5

Location: ELECT. RM. **Supply From:** MSBL **Mounting:** Surface **Enclosure:** Type 1
Volts: 120/208 Wye **Phases:** 3 **Wires:** 4
A.I.C. Rating: 35KAIC **Mains Type:** MCB **Mains Rating:** 600 A **MCB Rating:** 600 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	UNIT 501	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 502	2
3	--	--	--			7900 VA	7900 VA			--	--	--	4
5	UNIT 503	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 504	6
7	--	--	--	7900 VA	7900 VA					--	--	--	8
9	UNIT 505	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 506	10
11	--	--	--					7900 VA	7900 VA	--	--	--	12
13	UNIT 507	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 508	14
15	--	--	--			7900 VA	7900 VA			--	--	--	16
17	UNIT 509	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 510	18
19	--	--	--	7900 VA	7900 VA					--	--	--	20
21	UNIT 511	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 512	22
23	--	--	--					7900 VA	7900 VA	--	--	--	24
25	UNIT 513	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 514	26
27	--	--	--			7900 VA	7900 VA			--	--	--	28
29	UNIT 515	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 516	30
31	--	--	--	7900 VA	7900 VA					--	--	--	32
33	UNIT 517	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 518	34
35	--	--	--					7900 VA	7900 VA	--	--	--	36
37	UNIT 519	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 520	38
39	--	--	--			7900 VA	7900 VA			--	--	--	40
41	UNIT 521	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 522	42
43	--	--	--	7900 VA	7900 VA					--	--	--	44
45	UNIT 523	100 A	2			7900 VA	5000 VA			2	30 A	DRYER	46
47	--	--	--					7900 VA	5000 VA	--	--	--	48
49	WASHER	20 A	1	1500 VA	5000 VA					2	30 A	DRYER	50
51	WASHER	20 A	1			1500 VA	5000 VA			--	--	--	52
53	LEVEL 2 - LIGHTING	20 A	1					148 VA	460 VA	1	15 A	ELEVATOR LOBBY FCU "C"	54
55	LEVEL 3 - LIGHTING	20 A	1	50 VA	540 VA					1	20 A	3-RECEPTS	56
57	LEVEL 4 - LIGHTING	20 A	1			148 VA	360 VA			1	20 A	2-RECEPTS	58
59	LEVEL 5 - LIGHTING	20 A	1					148 VA	0 VA	1	20 A	SPARE	60
61	LEVEL 6 - LIGHTING	20 A	1	148 VA	0 VA					1	20 A	SPARE	62
63	LEVEL 7 - LIGHTING	20 A	1			148 VA	0 VA			1	20 A	SPARE	64
65	LEVEL 8 - LIGHTING	20 A	1					148 VA	0 VA	1	20 A	SPARE	66
67	LEVEL 9 - LIGHTING	20 A	1	148 VA	0 VA					--	--	SPACE	68
69	SPARE	20 A	1			0 VA	0 VA			--	--	SPACE	70
71	SPACE	--	--					0 VA	0 VA	--	--	SPACE	72
73	SPACE	--	--	0 VA	0 VA					--	--	SPACE	74
75	SPACE	--	--			0 VA	0 VA			--	--	SPACE	76
77	SPACE	--	--					0 VA	0 VA	--	--	SPACE	78
79	SPACE	--	--	0 VA	0 VA					--	--	SPACE	80
81	SPACE	--	--			0 VA	0 VA			--	--	SPACE	82
83	SPACE	--	--					0 VA	0 VA	--	--	SPACE	84
			Total Load:	133.8 kVA		130.7 kVA		124.4 kVA					
			Total Amps:	1123 A		1097 A		1037 A					

PANEL LOAD SUMMARY
NEC 220.84 (23) APT. UNITS (23 x 15.8 KVA) x 36% = 130.8 KVA
NEC 220.54 (2) DRYERS (2 x 5 KVA) x 100% = 10 KVA
NEC 220.52 (2) WASHERS (2 x 1.5 KVA) x 100% = 3.0 KVA
143.8 KVA

∴ 143.8 KVA / 208 x √3 = 399.51 AMPS.
USE A 600 AMP PANELBOARD.

Branch Panel: DP6

Location: ELECT. RM. **Supply From:** MSBL **Mounting:** Surface **Enclosure:** Type 1
Volts: 120/208 Wye **Phases:** 3 **Wires:** 4
A.I.C. Rating: 35KAIC **Mains Type:** MCB **Mains Rating:** 600 A **MCB Rating:** 600 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	UNIT 601	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 602	2
3	--	--	--			7900 VA	7900 VA			--	--	--	4
5	UNIT 603	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 604	6
7	--	--	--	7900 VA	7900 VA					--	--	--	8
9	UNIT 605	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 606	10
11	--	--	--					7900 VA	7900 VA	--	--	--	12
13	UNIT 607	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 608	14
15	--	--	--			7900 VA	7900 VA			--	--	--	16
17	UNIT 609	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 610	18
19	--	--	--	7900 VA	7900 VA					--	--	--	20
21	UNIT 611	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 612	22
23	--	--	--					7900 VA	7900 VA	--	--	--	24
25	UNIT 613	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 614	26
27	--	--	--			7900 VA	7900 VA			--	--	--	28
29	UNIT 615	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 616	30
31	--	--	--	7900 VA	7900 VA					--	--	--	32
33	UNIT 617	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 618	34
35	--	--	--					7900 VA	7900 VA	--	--	--	36
37	UNIT 619	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 620	38
39	--	--	--			7900 VA	7900 VA			--	--	--	40
41	UNIT 621	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 622	42
43	--	--	--	7900 VA	7900 VA					--	--	--	44
45	UNIT 623	100 A	2			7900 VA	5000 VA			2	30 A	DRYER	46
47	--	--	--					7900 VA	5000 VA	--	--	--	48
49	WASHER	20 A	1	1500 VA	5000 VA					2	30 A	DRYER	50
51	WASHER	20 A	1			1500 VA	5000 VA			--	--	--	52
53	SPARE	20 A	1					0 VA	460 VA	1	15 A	ELEVATOR LOBBY FCU "C"	54
55	SPARE	20 A	1	0 VA	540 VA					1	20 A	3-RECEPTS	56
57	SPARE	20 A	1			0 VA	360 VA			1	20 A	2-RECEPTS	58
59	SPARE	20 A	1					0 VA	0 VA	1	20 A	SPARE	60
61	SPARE	20 A	1	0 VA	0 VA					1	20 A	SPARE	62
63	SPARE	20 A	1			0 VA	0 VA			1	20 A	SPARE	64
65	SPARE	20 A	1					0 VA	0 VA	1	20 A	SPARE	66
67	SPACE	--	--	0 VA	0 VA					--	--	SPACE	68
69	SPACE	--	--			0 VA	0 VA			--	--	SPACE	70
71	SPACE	--	--					0 VA	0 VA	--	--	SPACE	72
73	SPACE	--	--	0 VA	0 VA					--	--	SPACE	74
75	SPACE	--	--			0 VA	0 VA			--	--	SPACE	76
77	SPACE	--	--					0 VA	0 VA	--	--	SPACE	78
79	SPACE	--	--	0 VA	0 VA					--	--	SPACE	80
81	SPACE	--	--			0 VA	0 VA			--	--	SPACE	82
83	SPACE	--	--					0 VA	0 VA	--	--	SPACE	84
			Total Load:	133.4 kVA		130.4 kVA		124.0 kVA					
			Total Amps:	1120 A		1095 A		1033 A					

PANEL LOAD SUMMARY
NEC 220.84 (23) APT. UNITS (23 x 15.8 KVA) x 36% = 130.8 KVA
NEC 220.54 (2) DRYERS (2 x 5 KVA) x 100% = 10 KVA
NEC 220.52 (2) WASHERS (2 x 1.5 KVA) x 100% = 3.0 KVA
143.8 KVA

∴ 143.8 KVA / 208 x √3 = 399.51 AMPS.
USE A 600 AMP PANELBOARD.

Branch Panel: DP7

Location: ELEC. RM. **Supply From:** MSBL **Mounting:** Surface **Enclosure:** Type 1
Volts: 120/208 Wye **Phases:** 3 **Wires:** 4
A.I.C. Rating: 35KAIC **Mains Type:** MCB **Mains Rating:** 600 A **MCB Rating:** 600 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	UNIT 701	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 702	2
3	--	--	--			7900 VA	7900 VA			--	--	--	4
5	UNIT 703	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 704	6
7	--	--	--	7900 VA	7900 VA					--	--	--	8
9	UNIT 705	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 706	10
11	--	--	--					7900 VA	7900 VA	--	--	--	12
13	UNIT 707	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 708	14
15	--	--	--			7900 VA	7900 VA			--	--	--	16
17	UNIT 709	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 710	18
19	--	--	--	7900 VA	7900 VA					--	--	--	20
21	UNIT 711	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 712	22
23	--	--	--					7900 VA	7900 VA	--	--	--	24
25	UNIT 713	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 714	26
27	--	--	--			7900 VA	7900 VA			--	--	--	28
29	UNIT 715	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 716	30
31	--	--	--	7900 VA	7900 VA					--	--	--	32
33	UNIT 717	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 718	34
35	--	--	--					7900 VA	7900 VA	--	--	--	36
37	UNIT 719	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 720	38
39	--	--	--			7900 VA	7900 VA			--	--	--	40
41	UNIT 721	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 722	42
43	--	--	--	7900 VA	7900 VA					--	--	--	44
45	UNIT 723	100 A	2			7900 VA	5000 VA			2	30 A	DRYER	46
47	--	--	--					7900 VA	5000 VA	--	--	--	48
49	WASHER	20 A	1	1500 VA	5000 VA					2	30 A	DRYER	50
51	WASHER	20 A	1			1500 VA	5000 VA			--	--	--	52
53	SPARE	20 A	1					0 VA	460 VA	1	15 A	ELEVATOR LOBBY FCU "C"	54
55	SPARE	20 A	1	0 VA	540 VA					1	20 A	3-RECEPTS	56
57	SPARE	20 A	1			0 VA	360 VA			1	20 A	2-RECEPTS	58
59	SPARE	20 A	1					0 VA	0 VA	1	20 A	SPARE	60
61	SPARE	20 A	1	0 VA	0 VA					1	20 A	SPARE	62
63	SPARE	20 A	1			0 VA	0 VA			1	20 A	SPARE	64
65	SPARE	20 A	1					0 VA	0 VA	1	20 A	SPARE	66
67	SPACE	--	--	0 VA	0 VA					--	--	SPACE	68
69	SPACE	--	--			0 VA	0 VA			--	--	SPACE	70
71	SPACE	--	--					0 VA	0 VA	--	--	SPACE	72
73	SPACE	--	--	0 VA	0 VA					--	--	SPACE	74
75	SPACE	--	--			0 VA	0 VA			--	--	SPACE	76
77	SPACE	--	--					0 VA	0 VA	--	--	SPACE	78
79	SPACE	--	--	0 VA	0 VA					--	--	SPACE	80
81	SPACE	--	--			0 VA	0 VA			--	--	SPACE	82
83	SPACE	--	--					0 VA	0 VA	--	--	SPACE	84
			Total Load:	133.4 kVA		130.4 kVA		124.0 kVA					
			Total Amps:	1120 A		1095 A		1033 A					

PANEL LOAD SUMMARY
NEC 220.84 (23) APT. UNITS (23 x 15.8 KVA) x 36% = 130.8 KVA
NEC 220.54 (2) DRYERS (2 x 5 KVA) x 100% = 10 KVA
NEC 220.52 (2) WASHERS (2 x 1.5 KVA) x 100% = 3.0 KVA
143.8 KVA

∴ 143.8 KVA / 208 x √3 = 399.51 AMPS.
USE A 600 AMP PANELBOARD.

GENERAL PANELBOARD SCHEDULE NOTES:

1. REFER TO SPECIFICATIONS 26 2416 FOR ADDITIONAL PANELBOARD REQUIREMENTS RELATED TO DIRECTORIES AND IDENTIFICATION.
2. SECURE ALL NAMEPLATES WITH SCREWS. PROVIDE WHITE ON BLACK FOR NORMAL POWER AND WHITE ON RED FOR EMERGENCY POWER PANELS.
3. ALL PANELBOARD SUBMITTED SHALL MATCH SUBMITTED AND APPROVED ROOM SIGNAGE.

DP2	DP3	DP4
DP5	DP6	DP7

DHR ARCHITECTS
DURAND–HOLLIS RUPE ARCHITECTS, INC.
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Texas Firm Registration #F-12003

LOCATION:
SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS

ISSUE	DESCRIPTION	DATE

05/25/18
PERMIT SET

STATE OF TEXAS
RALPH E. MARTIN, JR.
28858
REGISTERED PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

PANELBOARD SCHEDULES

SHEET NUMBER
E7.1

5/25/2018 9:30:30 AM C:\Users\ngarza\Documents\99060_VictoriaPlaza_Electrical_Ngarza.rvt

Branch Panel: DP8

Location: ELEC. RM.
Supply From: MSBL
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 35KAIC
Mains Type: MCB
Mains Rating: 600 A
MCB Rating: 600 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	UNIT 801	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 802	2
3	--	--	--			7900 VA	7900 VA			--	--	--	4
5	UNIT 803	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 804	6
7	--	--	--	7900 VA	7900 VA					--	--	--	8
9	UNIT 805	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 806	10
11	--	--	--					7900 VA	7900 VA	--	--	--	12
13	UNIT 807	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 808	14
15	--	--	--			7900 VA	7900 VA			--	--	--	16
17	UNIT 809	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 810	18
19	--	--	--	7900 VA	7900 VA					--	--	--	20
21	UNIT 811	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 812	22
23	--	--	--					7900 VA	7900 VA	--	--	--	24
25	UNIT 813	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 814	26
27	--	--	--			7900 VA	7900 VA			--	--	--	28
29	UNIT 815	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 816	30
31	--	--	--	7900 VA	7900 VA					--	--	--	32
33	UNIT 817	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 818	34
35	--	--	--					7900 VA	7900 VA	--	--	--	36
37	UNIT 819	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 820	38
39	--	--	--			7900 VA	7900 VA			--	--	--	40
41	UNIT 821	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 822	42
43	--	--	--	7900 VA	7900 VA					--	--	--	44
45	UNIT 823	100 A	2			7900 VA	5000 VA			2	30 A	DRYER	46
47	--	--	--					7900 VA	5000 VA	--	--	--	48
49	WASHER	20 A	1	1500 VA	5000 VA					2	30 A	DRYER	50
51	WASHER	20 A	1			1500 VA	5000 VA			--	--	--	52
53	SPARE	20 A	1					0 VA	460 VA	1	15 A	ELEVATOR LOBBY FCU "C"	54
55	SPARE	20 A	1	0 VA	540 VA					1	20 A	3-RECEPTS	56
57	SPARE	20 A	1			0 VA	360 VA			1	20 A	2-RECEPTS	58
59	SPARE	20 A	1					0 VA	300 VA	1	20 A	BROADBAND PANEL	60
61	SPARE	20 A	1	0 VA	0 VA					1	20 A	SPARE	62
63	SPARE	20 A	1			0 VA	0 VA			1	20 A	SPARE	64
65	SPARE	20 A	1					0 VA	0 VA	1	20 A	SPARE	66
67	SPACE	--	--	0 VA	0 VA					--	--	SPACE	68
69	SPACE	--	--			0 VA	0 VA			--	--	SPACE	70
71	SPACE	--	--					0 VA	0 VA	--	--	SPACE	72
73	SPACE	--	--	0 VA	0 VA					--	--	SPACE	74
75	SPACE	--	--			0 VA	0 VA			--	--	SPACE	76
77	SPACE	--	--					0 VA	0 VA	--	--	SPACE	78
79	SPACE	--	--	0 VA	0 VA					--	--	SPACE	80
81	SPACE	--	--			0 VA	0 VA			--	--	SPACE	82
83	SPACE	--	--					0 VA	0 VA	--	--	SPACE	84
			Total Load:	133.4 kVA		130.4 kVA		124.3 kVA					
			Total Amps:	1120 A		1094 A		1036 A					

PANEL LOAD SUMMARY
NEC 220.84 (23) APT. UNITS (23 x 15.8 KVA) x 36% = 130.8 KVA
NEC 220.54 (2) DRYERS (2 x 5 KVA) x 100% = 10 KVA
NEC 220.52 (2) WASHERS (2 x 1.5 KVA) x 100% = 3.0 KVA
143.8 KVA

∴ 143.8 KVA / 208 x √3 = 399.51 AMPS.
USE A 600 AMP PANELBOARD.

Branch Panel: DP9

Location: ELEC. RM.
Supply From: MSBL
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 35KAIC
Mains Type: MCB
Mains Rating: 600 A
MCB Rating: 600 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	UNIT 901	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 902	2
3	--	--	--			7900 VA	7900 VA			--	--	--	4
5	UNIT 903	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 904	6
7	--	--	--	7900 VA	7900 VA					--	--	--	8
9	UNIT 905	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 906	10
11	--	--	--					7900 VA	7900 VA	--	--	--	12
13	UNIT 907	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 908	14
15	--	--	--			7900 VA	7900 VA			--	--	--	16
17	UNIT 909	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 910	18
19	--	--	--	7900 VA	7900 VA					--	--	--	20
21	UNIT 911	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 912	22
23	--	--	--					7900 VA	7900 VA	--	--	--	24
25	UNIT 913	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 914	26
27	--	--	--			7900 VA	7900 VA			--	--	--	28
29	UNIT 915	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 916	30
31	--	--	--	7900 VA	7900 VA					--	--	--	32
33	UNIT 917	100 A	2			7900 VA	7900 VA			2	100 A	UNIT 918	34
35	--	--	--					7900 VA	7900 VA	--	--	--	36
37	UNIT 919	100 A	2	7900 VA	7900 VA					2	100 A	UNIT 920	38
39	--	--	--			7900 VA	7900 VA			--	--	--	40
41	UNIT 920	100 A	2					7900 VA	7900 VA	2	100 A	UNIT 922	42
43	--	--	--	7900 VA	7900 VA					--	--	--	44
45	UNIT 922	100 A	2			7900 VA	5000 VA			2	30 A	DRYER	46
47	--	--	--					7900 VA	5000 VA	--	--	--	48
49	WASHER	20 A	1	1500 VA	5000 VA					2	30 A	DRYER	50
51	WASHER	20 A	1			1500 VA	5000 VA			--	--	--	52
53	SPARE	20 A	1					0 VA	460 VA	1	15 A	ELEVATOR LOBBY FCU "C"	54
55	SPARE	20 A	1	0 VA	540 VA					1	20 A	3-RECEPTS	56
57	SPARE	20 A	1			0 VA	360 VA			1	20 A	2-RECEPTS	58
59	SPARE	20 A	1					0 VA	300 VA	1	0 A	BROADBAND PANEL	60
61	SPARE	20 A	1	0 VA	0 VA					1	20 A	SPARE	62
63	SPARE	20 A	1			0 VA	0 VA			1	20 A	SPARE	64
65	SPARE	20 A	1					0 VA	0 VA	1	20 A	SPARE	66
67	SPACE	--	--	0 VA	0 VA					--	--	SPACE	68
69	SPACE	--	--			0 VA	0 VA			--	--	SPACE	70
71	SPACE	--	--					0 VA	0 VA	--	--	SPACE	72
73	SPACE	--	--	0 VA	0 VA					--	--	SPACE	74
75	SPACE	--	--			0 VA	0 VA			--	--	SPACE	76
77	SPACE	--	--					0 VA	0 VA	--	--	SPACE	78
79	SPACE	--	--	0 VA	0 VA					--	--	SPACE	80
81	SPACE	--	--			0 VA	0 VA			--	--	SPACE	82
83	SPACE	--	--					0 VA	0 VA	--	--	SPACE	84
			Total Load:	133.4 kVA		130.4 kVA		124.3 kVA					
			Total Amps:	1120 A		1094 A		1036 A					

PANEL LOAD SUMMARY
NEC 220.84 (23) APT. UNITS (23 x 15.8 KVA) x 36% = 130.8 KVA
NEC 220.54 (2) DRYERS (2 x 5 KVA) x 100% = 10 KVA
NEC 220.52 (2) WASHERS (2 x 1.5 KVA) x 100% = 3.0 KVA
143.8 KVA

∴ 143.8 KVA / 208 x √3 = 399.51 AMPS.
USE A 600 AMP PANELBOARD.

Branch Panel: P1

Location: 1ST FLOOR STORAGE
Supply From: MSBL
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 14 KAIC
Mains Type: MCB
Mains Rating: 225 A
MCB Rating: 150 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	RCPT. STORAGE	20 A	1	720 VA	1260...					1	20 A	RCPT. CONFERENCE RM	2
3	RCPT. STORAGE	20 A	1			720 VA	500 VA			1	20 A	MOTORIZED SCREEN	4
5	RCPT. STORAGE	20 A	1					540 VA	1080...	1	20 A	RCPT. OFFICES	6
7	RCPT. MAINT. OFFICE	20 A	1	720 VA	900 VA					1	20 A	RCPT. OFFICES	8
9	RCPT. MAINT. OFFICE	20 A	1			900 VA	720 VA			1	20 A	RCPT. MANAGER	10
11	DISHWASHER BREAK ROOM	20 A	1					180 VA	4000...	2	50 A	RCPT. STORAGE	12
13	RCPT. BREAK ROOM	20 A	1	360 VA	4000...					--	--	--	14
15	RCPT. GFCI BREAK ROOM	20 A	1			360 VA	1080...			1	20 A	RCPT. HALLWAY	16
17	REFRIGERATOR BREAK ROOM	20 A	1					180 VA	0 VA	1	20 A	SPARE	18
19	RCPT. GFCI RR	20 A	1	540 VA	0 VA					1	20 A	SPARE	20
21	VAV-BOXES OFFICE	20 A	1			150 VA	4000...			2	50 A	RCPT. STORAGE	22
23	EXHAUST FANS EF-1 & EF-2	20 A	1					256 VA	4000...	--	--	--	24
25	SPARE	20 A	1	0 VA	0 VA					--	--	SPACE	26
27	SPARE	20 A	1			0 VA	0 VA			--	--	SPACE	28
29	SPARE	20 A	1					0 VA	0 VA	--	--	SPACE	30
31	SPACE	--	--	0 VA	0 VA					--	--	SPACE	32
33	SPACE	--	--			0 VA	0 VA			--	--	SPACE	34
35	SPACE	--	--					0 VA	0 VA	--	--	SPACE	36
37	SPACE	--	--	0 VA	0 VA					--	--	SPACE	38
39	SPACE	--	--			0 VA	0 VA			--	--	SPACE	40
41	SPACE	--	--					0 VA	0 VA	--	--	SPACE	42
			Total Load:	8500 VA		8430 VA		10236 VA					
			Total Amps:	71 A		70 A		85 A					

Branch Panel: P2

Location: LOBBY
Supply From: MSBL
Mounting: RECESSED
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 14 KAIC
Mains Type: MCB
Mains Rating: 225 A
MCB Rating: 150 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	RCPT. LOBBY	20 A	1	1080...	540 VA					1	20 A	RCPT. LOBBY	2
3	RCPT. RECEPTION AND INTERVIEW	20 A	1			1080...	720 VA			1	20 A	RCPT. LOBBY	4
5	RCPT. EXAM & CLINIC	20 A	1					1080...	540 VA	1	20 A	RCPT. LOBBY	6
7	RCPT. RR	20 A	1	360 VA	360 VA					1	20 A	RCPT. LOBBY	8
9	AHU-1 RCPT, LGT & MOTORIZED DAMPERS	20 A	1			500 VA	540 VA			1	20 A	RCPT. RR	10
11	AHU-2 RCPT, LGT & MOTORIZED DAMPERS	20 A	1					500 VA	1500...	1	20 A	AHU's CONTROL PANELS	12
13	AHU-3 RCPT, LGT & MOTORIZED DAMPERS	20 A	1	500 VA	0 VA					1	20 A	SPARE	14
15	VAV BOXES	20 A	1			250 VA	0 VA			1	20 A	SPARE	16
17	EXHAUST FANS EF-3, EF-4, EF-5	20 A	1					384 VA	0 VA	1	20 A	SPARE	18
19	SPACE	--	--	0 VA	0 VA					1	20 A	SPARE	20
21	SPACE	--	--			0 VA	0 VA			1	20 A	SPARE	22
23	SPACE	--	--					0 VA	0 VA	1	20 A	SPARE	24
25	SPACE	--	--	0 VA	0 VA					1	20 A	SPARE	26
27	SPACE	--	--			0 VA	0 VA			1	20 A	SPARE	28
29	SPACE	--	--					0 VA	0 VA	1	20 A	SPARE	30
31													32
33													34
35													36
37													38
39													40
41													42
			Total Load:	2840 VA		3090 VA		4004 VA					
			Total Amps:	24 A		26 A		34 A					

Branch Panel: P3

Location: LOBBY
Supply From: MSBH
Mounting: RECESSED
Enclosure: Type 1

Volts: 480/277 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 100 A
MCB Rating: 100 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	AHU-1 (10HP)	25 A	3	3878...	960 VA					1	20 A	LTG BASEMENT	2
3	--	--	--			3878...	1935...			1	20 A	LTG 1ST FLOOR OFFICES	4
5	--	--	--					3878...	1869...	1	20 A	LTG 1ST FLOOR LOBBY	6
7	FAN POWERED BOXES 1-1,1-2,1-3	20 A	1	2826...	1039...					1	20 A	LTG 1ST FLOOR LOBBY II	8
9	FAN POWERED BOXES 1-4,1-5,1-6	20 A	1			2300...	784 VA			1	20 A	LVL 2 THRU 9 - ELEV. LOBBY	10
11	FAN POWERED BOXES 1-7,1-8,1-9	20 A	1					2743...	1470...	1	20 A	LEVEL 2 & 3 CORRIDOR LIGHTING	12
13	AHU-2 (10 HP)	25 A	3	3878...	1470...					1	20 A	LEVEL 4 & 5 CORRIDOR LIGHTING	14
15	--	--	--			3878...	1470...			1	20 A	LEVEL 6 & 7 CORRIDOR LIGHTING	16
17	--	--	--					3878...	1470...	1	20 A	LEVEL 8 & 9 CORRIDOR LIGHTING	18
19	FAN POWERED BOXES 3-1, 3-2, 3-5	20 A	1	1995...	17 VA					1	20 A	RELAY PANELS	20
21	FAN POWERED BOXES 3-3, 3-4, 3-6	20 A	1			2605...	0 VA			1	20 A	SPARE	22
23	AHU-3 (10 HP)	25 A	3					3878...	317 VA	1	20 A	LTG 1ST CANOPY	24
25	--	--	--	3878...	450 VA					1	20 A	POLE LTG SITE	26
27	--	--	--			3878...	300 VA			1	20 A	POLE LTG SITE	28
29	SPACE	--	--					0 VA	0 VA	1	20 A	BOLLARD LTG SITE	30
31	SPACE	--	--	0 VA	940 VA					1	20 A	BOLLARD LTG SITE	32
33	SPACE	--	--			0 VA	102 VA			1	20 A	FLAG POLE LTG	34
35	SPACE	--	--					0 VA	20 VA	1	20 A	SIGN LTG	36
37	SPACE	--	--	0 VA	0 VA					--	--	SPACE	38
39	SPACE	--	--			0 VA	0 VA			--	--	SPACE	40
41	SPACE	--	--					0 VA	0 VA	--	--	SPACE	42
			Total Load:	21331 VA		21130 VA		19523 VA					
			Total Amps:	78 A		77 A		70 A					

Branch Panel: P4

Location: KITCHEN
Supply From: MSBL
Mounting: RECESSED
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 225 A
MCB Rating: 150 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	RCPT. GFCI KITCHEN	20 A	1	720 VA	180 VA					1	20 A	VENDING MACHINE	2
3	RCPT. GFCI KITCHEN	20 A	1			360 VA	180 VA			1	20 A	VENDING MACHINE	4
5	REFRIGERATOR	20 A	1					180 VA	180 VA	1	20 A	VENDING MACHINE	6
7	RCPT. GFCI KITCHEN	20 A	1	180 VA	720 VA					1	20 A	RCPT. COMPUTER RM	8
9	STOVE KITCHEN	50 A	2			4000...	1080...			1	20 A	RCPT. JANITORS, STOR. MECH.RM	10
11	--	--	--					4000...	900 VA	1	20 A	RCPT. LOBBY II	12
13	EXH. FAN	20 A	1	180 VA	900 VA					1	20 A	RCPT LOBBY II	14
15	FREEZE	20 A	1			180 VA	900 VA			1	20 A	RCPT. LIBRARY	16
17	SPACE	--	--					0 VA	1040...	1	20 A	PROJECTOR&SCREEN CONFERENCE	18
19	SPACE	--	--	0 VA	300 VA					1	20 A	BROADBAND PANEL - COMPUTER	20
21	SPACE	--	--			0 VA	300 VA			1	20 A	BROADBAND PANEL - LIBRARY	22
23	SPACE	--	--					0 VA	0 VA	1	20 A	SPARE	24
25	SPACE	--	--	0 VA	0 VA					1	20 A	SPARE	26
27	SPACE	--	--			0 VA	0 VA			1	20 A	SPARE	28
29	SPACE	--	--					0 VA	0 VA	1	20 A	SPARE	30
31													32
33													34
35													36
37													38
39													40
41													42
			Total Load:	3180 VA		7000 VA		6300 VA					
			Total Amps:	27 A		62 A		57 A					

GENERAL PANELBOARD SCHEDULE NOTES:

1. REFER TO SPECIFICATIONS 26 2416 FOR ADDITIONAL PANELBOARD REQUIREMENTS RELATED TO DIRECTORIES AND IDENTIFICATION.
2. SECURE ALL NAMEPLATES WITH SCREWS. PROVIDE WHITE ON BLACK FOR NORMAL POWER AND WHITE ON RED FOR EMERGENCY POWER PANELS.
3. ALL PANELBOARD SUBMITTED SHALL MATCH SUBMITTED AND APPROVED ROOM SIGNAGE.

DP8	DP9	
P1	P2	P3
P4		

DURAND–HOLLIS RUPE ARCHITECTS, INC.
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SAN ANTONIO, TEXAS 78230
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Texas Firm Registration #F-12003

LOCATION:
SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
ISSUE	DESCRIPTION	DATE

05/25/18
PERMIT SET

STATE OF TEXAS
RALPH E. MARTIN, JR.
28858
REGISTERED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

PANELBOARD SCHEDULES

SHEET NUMBER
E7.2

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Branch Panel: HVAC

Location: BASEMENT
Supply From: MSBH
Mounting: Surface
Enclosure: Type 1

Volts: 480/277 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 50KAIC
Mains Type: MLO
Mains Rating: 400 A
MCB Rating: 400 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	SCHWP-1 (20HP)	60 A	3	7171...	7171...					3	60 A	SCHWP-2 (20HP)	2
3	--	--	--			7171...	7171...			--	--	--	4
5	--	--	--					7171...	7171...	--	--	--	6
7	PCHWP-1 (5HP)	20 A	3	3718...	3718...					3	20 A	PCHWP-2 (5HP)	8
9	--	--	--			3718...	3718...			--	--	--	10
11	--	--	--					3718...	3718...	--	--	--	12
13	SHWP-1 (7-1/2HP)	20 A	3	2921...	2921...					3	20 A	SHWP-2 (7-1/2HP)	14
15	--	--	--			2921...	2921...			--	--	--	16
17	--	--	--					2921...	2921...	--	--	--	18
19	TRIPLEX DOMESTIC PUMPS DBP-1 (5 HP EA)	45 A	3	5817...	1191...					1	15 A	AHU-4 (1.5HP)	20
21	--	--	--			5817...	7500...			1	35 A	EUH-1 (7.5KW)	22
23	--	--	--					5817...	0 VA	--	--	SPACE	24
25	SPACE	--	--	0 VA	0 VA					--	--	SPACE	26
27	SPACE	--	--			0 VA	0 VA			--	--	SPACE	28
29	SPACE	--	--					0 VA	0 VA	--	--	SPACE	30
31	SPACE	--	--	0 VA	0 VA					--	--	SPACE	32
33	SPACE	--	--			0 VA	0 VA			--	--	SPACE	34
35	SPACE	--	--					0 VA	0 VA	--	--	SPACE	36
37	SPACE	--	--	0 VA	0 VA					--	--	SPACE	38
39	SPACE	--	--			0 VA	0 VA			--	--	SPACE	40
41	SPACE	--	--					0 VA	0 VA	--	--	SPACE	42
		Total Load:		34628 VA		40937 VA		33437 VA					
		Total Amps:		126 A		148 A		121 A					

Branch Panel: LHVAC

Location: BASEMENT
Supply From: MSBL
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 22KAIC
Mains Type: MCB
Mains Rating: 225 A
MCB Rating: 150 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	RCPT BASEMENT PLATFORM	20 A	1	1260...	360 VA					1	20 A	RCPT, SITE	2
3	RCPT BASEMENT MECH.RM	20 A	1			1080...	540 VA			1	20 A	RCPT SITE	4
5	RCPT BASEMENT MECH.RM	20 A	1					720 VA	1080...	1	20 A	RCPT SITE	6
7	RCPT FIRE PUMP	20 A	1	540 VA	500 VA					1	20 A	EXISTING IRRIGATION CONTROLLER	8
9	BOILERS ALARM	20 A	1			2000...	0 VA			1	20 A	EXISTING GATE	10
11	BOILERS	20 A	1					2000...	0 VA	1	20 A	EXISTING GATE	12
13	BOILER CONTROL PANEL	20 A	1	500 VA	180 VA					1	20 A	WATER SOFTENER	14
15	EXISTING HWRP 3/4HP	30 A	1			500 VA	264 VA			1	20 A	HWRP-1	16
17	EXISTING HWRP 3/4HP	30 A	1					500 VA	500 VA	1	20 A	FLOW METER DIV.23	18
19	WATER SOFTENERS	20 A	1	1000...	500 VA					1	20 A	MIXING VALVES DIV.23	20
21	SPARE	20 A	1			0 VA	0 VA			1	20 A	SPARE	22
23	EXISTING EXH FAN WALL MOUNTED	20 A	1					500 VA	0 VA	1	20 A	SPARE	24
25	EXISTING EXH FAN WALL MOUNTED	20 A	1	500 VA	0 VA					1	20 A	SPARE	26
27	SPARE	20 A	1			0 VA	0 VA			1	20 A	SPARE	28
29	PANEL LHC	100 A	3					2540...	0 VA	--	--	SPACE	30
31	--	--	--	3100...	0 VA					--	--	SPACE	32
33	--	--	--			2560...	0 VA			--	--	SPACE	34
35	SPACE	--	--					0 VA	0 VA	--	--	SPACE	36
37	SPACE	--	--	0 VA	0 VA					--	--	SPACE	38
39	SPACE	--	--			0 VA	0 VA			--	--	SPACE	40
41	SPACE	--	--					0 VA	0 VA	--	--	SPACE	42
		Total Load:		8440 VA		6944 VA		7840 VA					
		Total Amps:		71 A		58 A		66 A					

Branch Panel: LHC

Location: CHILER YARD
Supply From: LHVAC
Mounting: Surface
Enclosure: Type 3R

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 14 KAIC
Mains Type: MCB
Mains Rating: 100 A
MCB Rating: 100 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	CH-1 PIPING CONTROL VALVES	20 A	1	500 VA	500 VA					1	20 A	CH-2 PIPING CONTROL VALVES	2
3	CH-1 CONTROLS	20 A	1			500 VA	500 VA			1	20 A	CH-2 CONTROLS	4
5	CH-1 CONTROLS	20 A	1					500 VA	500 VA	1	20 A	CH-2 CONTROLS	6
7	CH-1 FLOW METER	20 A	1	500 VA	500 VA					1	20 A	CH-2 FLOW METER	8
9	CH-1 HEAT TRACE ◇1	20 A	1			1200...	180 VA			1	20 A	RCPT. CPS TRANSFORMER	10
11	--	--	--					0 VA	1200...	1	20 A	CH-HEAT TRACE	12
13	RCPT. CHILLER YARD	20 A	1	540 VA	0 VA					--	--	--	14
15	RCPT. STORAGE BLDG 1	20 A	1			360 VA	360 VA			1	20 A	RCPT. STORAGE BLDG 2	16
17	LTG STORAGE BLDG 1	20 A	1					180 VA	180 VA	1	20 A	LTG STORAGE BLDG 2	18
19	SPACE	--	--	0 VA	0 VA					--	--	SPACE	20
21	SPACE	--	--			0 VA	0 VA			--	--	SPACE	22
23	SPACE	--	--					0 VA	0 VA	--	--	SPACE	24
25													26
27													28
29													30
31													32
33													34
35													36
37													38
39													40
41													42
		Total Load:		2540 VA		3100 VA		2560 VA					
		Total Amps:		21 A		26 A		21 A					

Branch Panel: EHA (EMERGENCY POWER)

Location: BASEMENT
Supply From:
Mounting: Surface
Enclosure: Type 1

Volts: 480/277 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 225 A
MCB Rating: 100 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	SPF (50HP)	125 A	3	18005...	0 VA					1	20 A	EXIT AND NL LTG	2
3	--	--	--			18005...	688 VA			1	20 A	EMERGENCY LTG BASEMENT	4
5	--	--	--					18005...	1300...	1	20 A	STAIRS LIGHTING	6
7	JOCKEY PUMP (2 HP)	15 A	3	903 VA	366 VA					1	20 A	EMERGENCY LTG 1ST FLOOR OFFICES	8
9	--	--	--			903 VA	827 VA			1	20 A	EMERGENCY LTG 1ST FLOOR	10
11	--	--	--					903 VA	452 VA	1	20 A	EMERGENCY CANOPY LIGHTING	12
13	T-ELA 16KVA	30 A	3	1443...	2082...					1	20 A	EMERGENCY LVL 2 THRU 5	14
15	--	--	--			943 VA	2298...			1	20 A	EMERGENCY LVL 6 THRU 9	16
17	--	--	--					943 VA	0 VA	1	20 A	SPARE	18
19	SPACE	--	--	0 VA	0 VA					--	--	SPACE	20
21	SPACE	--	--			0 VA	0 VA			--	--	SPACE	22
23	SPACE	--	--					0 VA	0 VA	--	--	SPACE	24
25	SPACE	--	--	0 VA	0 VA					3	60 A	SPD	26
27	SPACE	--	--			0 VA	0 VA			--	--	--	28
29	SPACE	--	--					0 VA	0 VA	--	--	--	30
31													32
33													34
35													36
37													38
39													40
41													42
		Total Load:		22800 VA		23665 VA		21604 VA					
		Total Amps:		83 A		86 A		78 A					

Branch Panel: ELA (EMERGENCY POWER)

Location: COMMAND CENTER
Supply From: T-ELA (16KVA)
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 100 A
MCB Rating: 60 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	FACP	20 A	1	500 VA	443 VA					3	15 A	FIRE RISER COMPRESSOR (3/4HP)	2
3	FIRE ALARM REMOTE ANNUNCIATOR	20 A	1			500 VA	443 VA			--	--	--	4
5	FIRE ALARM NAC	20 A	1					500 VA	443 VA	--	--	--	6
7	STAIRWELL SMOKE CONTROL PANEL	20 A	1	500 VA	0 VA					--	--	SPACE	8
9	SPACE	--	--			0 VA	0 VA			--	--	SPACE	10
11	SPACE	--	--					0 VA	0 VA	--	--	SPACE	12
13	SPACE	--	--	0 VA	0 VA					3	30 A	SPD	14
15	SPACE	--	--			0 VA	0 VA			--	--	--	16
17	SPACE	--	--					0 VA	0 VA	--	--	--	18
19													20
21													22
23													24
25													26
27													28
29													30
31													32
33													34
35													36
37													38
39													40
41													42
		Total Load:		1443 VA		943 VA		943 VA					
		Total Amps:		12 A		8 A		8 A					

Branch Panel: EHB (STANDBY POWER)

Location: BASEMENT
Supply From:
Mounting: Surface
Enclosure: Type 1

Volts: 480/277 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 50KAIC
Mains Type: MCB
Mains Rating: 225 A
MCB Rating: 150 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	PANEL EHEP	100 A	3	14026...	942 VA					3	15 A	SP-3 (2HP)	2
3	--	--	--			12990...	942 VA			--	--	--	4
5	--	--	--					14026...	942 VA	--	--	--	6
7	T-ELB 30 kVA	60 A	3	6712...	1594...					3	15 A	DUPLEX PUMPS SEP-1 & SEP-2 (1.5HP EA)	8
9	--	--	--			5931...	1594...			--	--	--	10
11	--	--	--					3660...	1594...	--	--	--	12
13	SP-1 & SP-2 (2HP EA)	20 A	3	1805...	0 VA					1	20 A	SITE LIGHTING	14
15	--	--	--			1805...	0 VA			1	20 A	SPARE	16
17	--	--	--					1805...	0 VA	--	--	SPACE	18
19	EXISTING STORM PUMP (5HP)	20 A	3	2105...	0 VA					--	--	SPACE	20
21	--	--	--			2105...	0 VA			--	--	SPACE	22
23	--	--	--					2105...	0 VA	--	--	SPACE	24
25	EXISTING STORM PUMP (5HP)	20 A	3	2105...	0 VA					--	--	SPACE	26
27	--	--	--			2105...	0 VA			--	--	SPACE	28
29	--	--	--					2105...	0 VA	--	--	SPACE	30
31	SPACE	--	--	0 VA	0 VA					--	--	SPACE	32
33	SPACE	--	--			0 VA	0 VA			--	--	SPACE	34
35	SPACE	--	--					0 VA	0 VA	--	--	SPACE	36
37	SPACE	--	--	0 VA	0 VA					3	60 A	SPD	38
39	SPACE	--	--			0 VA	0 VA			--	--	--	40
41	SPACE	--	--					0 VA	0 VA	--	--	--	42
		Total Load:		29289 VA		27472 VA		26237 VA					
		Total Amps:		106 A		100 A		95 A					

Branch Panel: ELB (STANDBY POWER)

Location: BASEMENT
Supply From: T-ELB (30KVA)
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 100 A
MCB Rating: 100 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	PANEL ELB1	60 A	3	4464...	1248...					2	15 A	FCU-3/ CU-3	2
3	--	--	--			4404...	1248...			--	--	--	4
5	--	--	--					3160...	0 VA	1	20 A	SPARE	6
7	DDC CONTROL PANEL	20 A	1	500 VA	0 VA					1	20 A	SPARE	8
9	RCPT BASEMENT	20 A	1			360 VA	0 VA			1	20 A	SPARE	10
11	HEATER GENSET	25 A	1					2400...	0 VA	--	--	SPACE	12
13	BATTERY CHARGER GENSET	20 A	1	500 VA	0 VA					--	--	SPACE	14
15	CONTROLS GENSET	20 A	1			180 VA	0 VA			--	--	SPACE	16
17	BROADBAND PANEL	20 A	2					500 VA	0 VA	--	--	SPACE	18
19	--	--	--	500 VA	0 VA					--	--	SPACE	20
21	SPACE	--	--			0 VA	0 VA			--	--	SPACE	22
23	SPACE	--	--					0 VA	0 VA	--	--	SPACE	24
25	SPACE	--	--	0 VA	0 VA					3	30 A	SPD	26
27	SPACE	--	--			0 VA	0 VA			--	--	--	28
29									0 VA	--	--	--	30
31													32
33													34
35													36
37													38
39													40
41													42
		Total Load:		7212 VA		6192 VA		6060 VA					
		Total Amps:		60 A		52 A		51 A					

Branch Panel: ELB1 (STANDBY POWER)

Location: COMMAND CENTER
Supply From: PANEL ELB
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 100 A
MCB Rating: 60 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	FCU-2/CU-2	25 A	2	1664...	360 VA					1	20 A	QUAD RECEPT COMMAND CENTER	2
3	--	--	--			1664...	360 VA			1	20 A	QUAD RECEPT COMMAND CENTER	4
5	RCPT MDF RM	20 A	1					720 VA	360 VA	1	20 A	QUAD RECEPT COMMAND CENTER	6
7	QUAD MDF RM	20 A	1	360 VA	0 VA					1	20 A	SPARE	8
9	RCPT. MANAGER OFFICE	20 A	1			540 VA	1000...			1	20 A	CEILING FAN LOBBY II	10
11	RCPT EXAM RM	20 A	1					360 VA	1000...	1	20 A	CEILING FAN LOBBY II	12
13	RCPT CLINIC	20 A	1	180 VA	1000...					1	20 A	CEILING FAN LOBBY II	14
15	RCPT LOBBY II	20 A	1			540 VA	300 VA			1	20 A	BROADBAND PANEL	16
17	RCPT LOBBY II	20 A	1					720 VA	0 VA	1	20 A	SPARE	18
19	RCPT LOBBY II	20 A	1	900 VA	0 VA					--	--	SPACE	20
21	SPARE	20 A	1			0 VA	0 VA			--	--	SPACE	22
23	SPARE	20 A	1					0 VA	0 VA	--	--	SPACE	24
25	SPACE	--	--	0 VA	0 VA					3	30 A	SPD	26
27	SPACE	--	--			0 VA	0 VA			--	--	--	28
29	SPACE	--	--					0 VA	0 VA	--	--	--	30
31													32
33													34
35													36
37													38
39													40
41													42
		Total Load:		4464 VA		4404 VA		3160 VA					
		Total Amps:		39 A		38 A		26 A					

Branch Panel: EHEP (STANDBY POWER)

Location: ELEVATOR EQUIP. RM
Supply From: PANEL EHB
Mounting: Surface
Enclosure: Type 1

Volts: 480/277 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 100 A
MCB Rating: 100 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	XFMR T-ELEP (16KVA)	30 A	3	2392...									2
3	--	--	--			1356...	0 VA			1	20 A	SPARE	4
5	--	--	--					2392...	0 VA	--	--	SPACE	6
7	ELEVATOR (15HP)	45 A	3	5817...	5817...					3	45 A	ELEVATOR (15HP)	8
9	--	--	--			5817...	5817...			--	--	--	10
11	--	--	--					5817...	5817...	--	--	--	12
13	SPACE	--	--	0 VA	0 VA					--	--	SPACE	14
15	SPACE	--	--			0 VA	0 VA			--	--	SPACE	16
17	SPACE	--	--					0 VA	0 VA	--	--	SPACE	18
19	SPACE	--	--	0 VA	0 VA					--	--	SPACE	20
21	SPACE	--	--			0 VA	0 VA			--	--	SPACE	22
23	SPACE	--	--					0 VA	0 VA	--	--	SPACE	24
25	SPACE	--	--	0 VA	0 VA					3	60 A	SPD	26
27	SPACE	--	--			0 VA	0 VA			--	--	--	28
29	SPACE	--	--					0 VA	0 VA	--	--	--	30
31													32
33													34
35													36
37													38
39													40
41													42
		Total Load:		14026 VA		12990 VA		14026 VA					
		Total Amps:		51 A		47 A		51 A					

Branch Panel: ELEP (EXISTING PANEL SQUARE D) (STANDBY POWER)

Location: PENTHOUSE
Supply From: T-ELEP (16KVA)
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 60 A
MCB Rating: 60 A

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0 VA	0 VA					2	20 A	SPARE	2
3	GFI/WP RCPT ROOF	20 A	1			180 VA	0 VA			--	--	--	4
5	SPARE	20 A	1					0 VA	2392...	2	**35 A**	FCU-1 & CU-1	6
7	ELEVATOR PIT	20 A	1	0 VA	2392...					--	--	--	8
9	SPARE	20 A	1			0 VA	1176...			1	**30 A**	EF-6 3/4HP	10
11	SPARE	20 A	1					0 VA	0 VA	1	20 A	SPARE	12
13	SPARE	20 A	1	0 VA	0 VA					1	20 A	SPARE	14
15	SPARE	20 A	1			0 VA	0 VA			1	20 A	SPARE	16
17	SPARE	20 A	1					0 VA	0 VA	1	20 A	SPARE	18
19													20
21													22
23													24
25													26
27													28
29													30
31													32
33													34
35													36
37													38
39													40
41													42
		Total Load:		2392 VA		1356 VA		2392 VA					
		Total Amps:		21 A		11 A		21 A					

GENERAL PANELBOARD SCHEDULE NOTES:

1. REFER TO SPECIFICATIONS 26 2416 FOR ADDITIONAL PANELBOARD REQUIREMENTS RELATED TO DIRECTORIES AND IDENTIFICATION.
2. SECURE ALL NAMEPLATES WITH SCREWS. PROVIDE WHITE ON BLACK FOR NORMAL POWER AND WHITE ON RED FOR EMERGENCY POWER PANELS.
3. ALL PANELBOARD SUBMITTED SHALL MATCH SUBMITTED AND APPROVED ROOM SIGNAGE.

KEYED NOTES - E7.3

1 PROVIDE "GFCI" TYPE CIRCUIT BREAKERS.

2 PROVIDE HANDLE LOCKING DEVICE ON CIRCUIT BREAKER.

3 PROVIDE NEW BREAKERS

HVAC	LHVAC	LHC
EHA	ELA	--
EHB	ELB	ELB1
EHEP	ELEP	-

DHR ARCHITECTS
DURAND–HOLLIS RUPE ARCHITECTS, INC.
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SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

05/25/18
PERMIT SET

STATE OF TEXAS
RALPH E. MARTIN, JR.
39858
REGISTERED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10-481

PANELBOARD SCHEDULES

SHEET NUMBER
E7.3

5/25/2018 9:30:44 AM C:\Revit\Projects\Documents\P3OSD_VictoriaPlaza_Electrical_Nyarsa.rvt

KEYED NOTES

1. EXISTING WASTE STACK TO REMAIN.
2. EXISTING VENT STACK TO REMAIN.
3. REMOVE EXISTING COLD WATER LINE AND ASSOCIATED VALVES, SUPPORTS & HANGERS.
4. REMOVE EXISTING COLD WATER RISE TO FLOOR ABOVE.
5. REMOVE EXISTING WASTE PIPING AND ASSOCIATED SUPPORTS & HANGERS.
6. REMOVE EXISTING VENT PIPING AND ASSOCIATED SUPPORTS & HANGERS.
7. EXISTING 6" FIRE LINE SERVING STANDPIPES TO REMAIN.
8. EXISTING WATER LINE TO REMAIN.
9. REMOVE EXISTING VENT STACK.
10. REMOVE EXISTING FIRE STANDPIPE UP TO PENTHOUSE, INCLUDING ASSOCIATED FIRE HOSE CABINET AT PENTHOUSE.
11. EXISTING FIRE STANDPIPE TO REMAIN.
12. REMOVE EXISTING HOT WATER LINE AND ASSOCIATED VALVES, SUPPORTS & HANGERS.
13. EXISTING WASTE LINE TO REMAIN.
14. EXISTING 1/2"CW & 1/2"HW RISING TO EXISTING SINK ON 1ST LEVEL TO REMAIN. CUT PIPING ALLOWING INSTALLATION OF NEW PIPING.
15. EXISTING WASTE LINE FROM SINK ON FLOOR ABOVE TO REMAIN.
16. REMOVE EXISTING FIRE DEPT. CONNECTION LINE INCLUDING ASSOCIATED VALVES & HANGERS
17. REMOVE EXISTING GREASE WASTE PIPING AND ASSOCIATED SUPPORTS AND HANGERS IN CRAWL SPACE.
18. ABANDON EXISTING GREASE WASTE AND GREASE VENT & PIPING BELOW GRADE.
19. CLEAN OUT EXISTING GREASE INTERCEPTOR, FILL WITH SAND AND ABANDON IN PLACE.
20. CAP EXISTING WASTE LINE BELOW GRADE.

EXISTING WATER LINE TO POOL

EXISTING WATER LINE TO COOLING TOWER

REFER TO SHEET PD2.1 FOR 1/4" SCALE BASEMENT PLUMBING DEMOLITION PLAN

1 PD1.0 UNDERFLOOR/BASEMENT PLAN – DEMOLITION – PLUMBING
SCALE: 1/8" = 1'-0"

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REVISIONS

ISSUE	DESCRIPTION	DATE

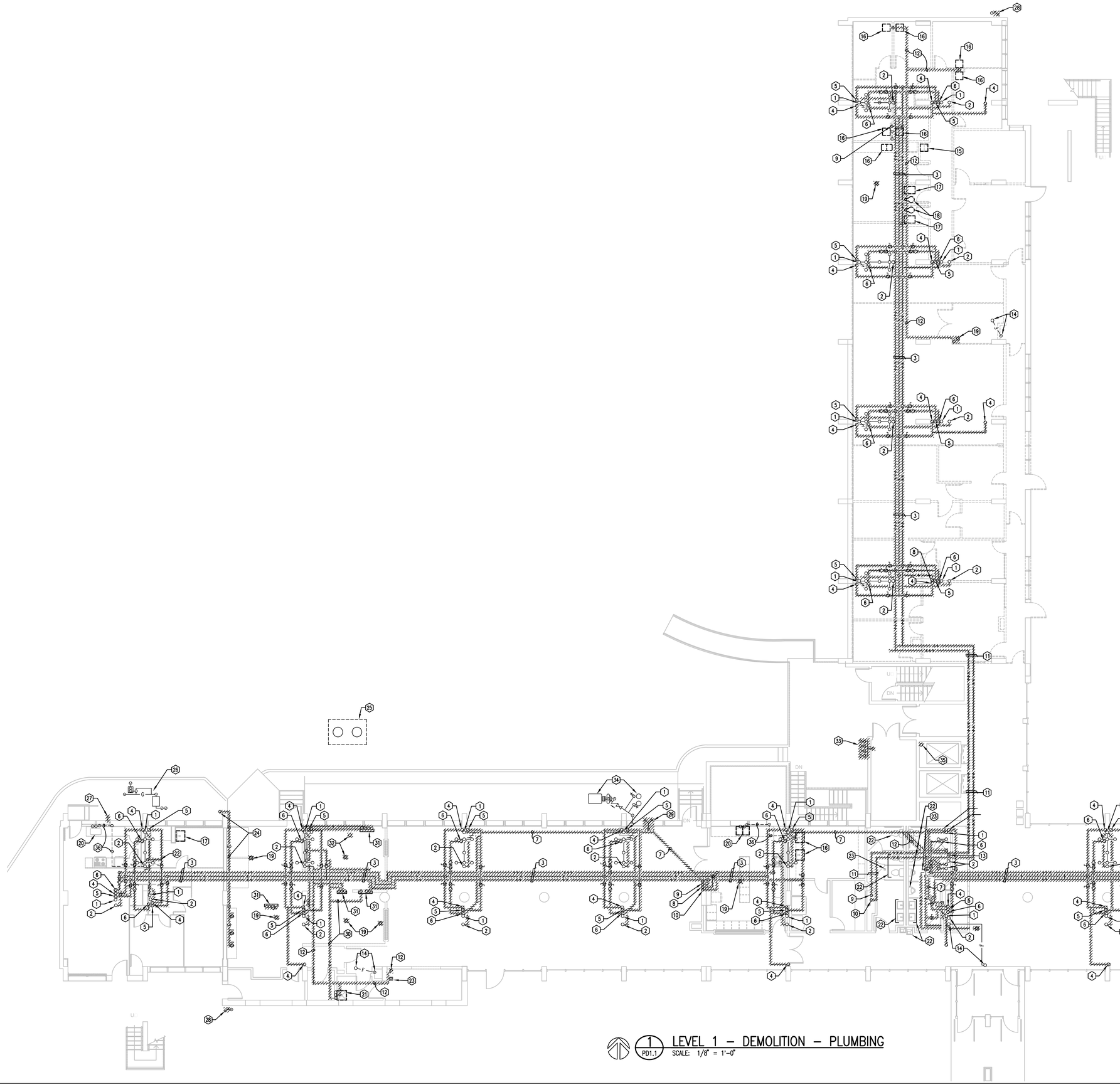
PERMIT SET 05/25/18

STATE OF TEXAS
MEHDI J. MIRMOMENI
113121
LICENSED
PROFESSIONAL ENGINEER
05.25.2018

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
STATE LICENSE NO. 13-3841

UNDERFLOOR/BASEMENT PLAN - DEMOLITION - PLUMBING

SHEET NUMBER
PD1.0



KEYED NOTES

1. EXISTING WASTE STACK TO REMAIN.
2. EXISTING VENT STACK TO REMAIN.
3. REMOVE EXISTING HOT WATER RETURN, COLD WATER, HOT WATER PIPING AND ASSOCIATED VALVES, SUPPORTS & HANGERS ABOVE CEILING.
4. REMOVE EXISTING COLD WATER RISER.
5. REMOVE EXISTING HOT WATER RISER.
6. REMOVE EXISTING HOT WATER RETURN RISER.
7. REMOVE EXISTING WASTE PIPING SUPPORTS & HANGERS ABOVE CEILING.
8. REMOVE EXISTING COLD WATER PIPING FROM BELOW FLOOR TO ABOVE CEILING.
9. REMOVE EXISTING HOT WATER PIPING FROM BELOW FLOOR TO ABOVE CEILING.
10. REMOVE EXISTING HOT WATER RETURN PIPING FROM BELOW FLOOR TO ABOVE CEILING.
11. REMOVE EXISTING HOT WATER RETURN, HOT WATER PIPING AND ASSOCIATED VALVES, SUPPORTS & HANGERS ABOVE CEILING.
12. REMOVE EXISTING VENT PIPING.
13. REMOVE EXISTING VENT STACK.
14. EXISTING FIRE STANDPIPE TO REMAIN.
15. REMOVE EXISTING ELECTRIC DRINKING FOUNTAIN & ALL ASSOCIATED WATER, WASTE & VENT PIPING.
16. REMOVE EXISTING SINK, TRIM, STOPS & ALL ASSOCIATED WATER, WASTE & VENT PIPING.
17. REMOVE EXISTING LAVATORY, TRIM, STOPS & ALL ASSOCIATED WATER, WASTE & VENT PIPING.
18. REMOVE EXISTING WATER CLOSET & ALL ASSOCIATED WATER, WASTE & VENT PIPING.
19. REMOVE FLOOR DRAIN & ALL ASSOCIATED WASTE & VENT PIPING.
20. REMOVE EXISTING SINK. MODIFY EXISTING ROUGH-IN FOR NEW SINK. SEE NEW WORK.
21. REMOVE EXISTING MOP SINK AND ASSOCIATED WASTE PIPING. MODIFY EXISTING HW & CW ROUGH-IN FOR NEW MOP SINK FAUCET.
22. EXISTING PLUMBING FIXTURE TO REMAIN.
23. EXISTING FLOOR DRAIN TO REMAIN.
24. REMOVE EXISTING GAS PIPING SERVING KITCHEN EQUIPMENT AND CAP BELOW GRADE.
25. CLEAN OUT EXISTING GREASE INTERCEPTOR, FILL WITH SAND AND ABANDON IN PLACE. ABANDON ASSOCIATED GREASE WASTE & VENT PIPING BELOW GRADE.
26. EXISTING GAS METER SET-UP.
27. REMOVE EXISTING WALL HYDRANT & REPLACE WITH NEW. SEE NEW WORK.
28. REMOVE EXISTING HOSE BIBB & REPLACE WITH NEW. SEE NEW WORK.
29. REMOVE EXISTING FIRE DEPT. CONNECTION INCLUDING ASSOCIATED PIPING IN CRAWL SPACE.
30. REMOVE EXISTING HOT WATER PIPING ABOVE CEILING.
31. REMOVE EXISTING HOT WATER, COLD WATER, WASTE/GREASE WASTE & VENT/GREASE VENT PIPING FROM BELOW FLOOR TO ABOVE CEILING.
32. REMOVE EXISTING FLOOR DRAIN/HUB DRAIN & ASSOCIATED GREASE WASTE & VENT PIPING.
33. REMOVE EXISTING TEST HEADER & ASSOCIATED PIPING TO BASEMENT.
34. EXISTING STORM DRAIN SYSTEM PUMPS TO REMAIN.
35. REMOVE EXISTING FIRE STANDPIPE UP TO PENTHOUSE INCLUDING ASSOCIATED FIRE HOSE CABINET IN PENTHOUSE.
36. EXISTING VENT PIPING TO REMAIN.

1 PD1.1 LEVEL 1 – DEMOLITION – PLUMBING
SCALE: 1/8" = 1'-0"

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PROJECT ARCHITECT
MARIEL DURAND-HOLLIS, AIA
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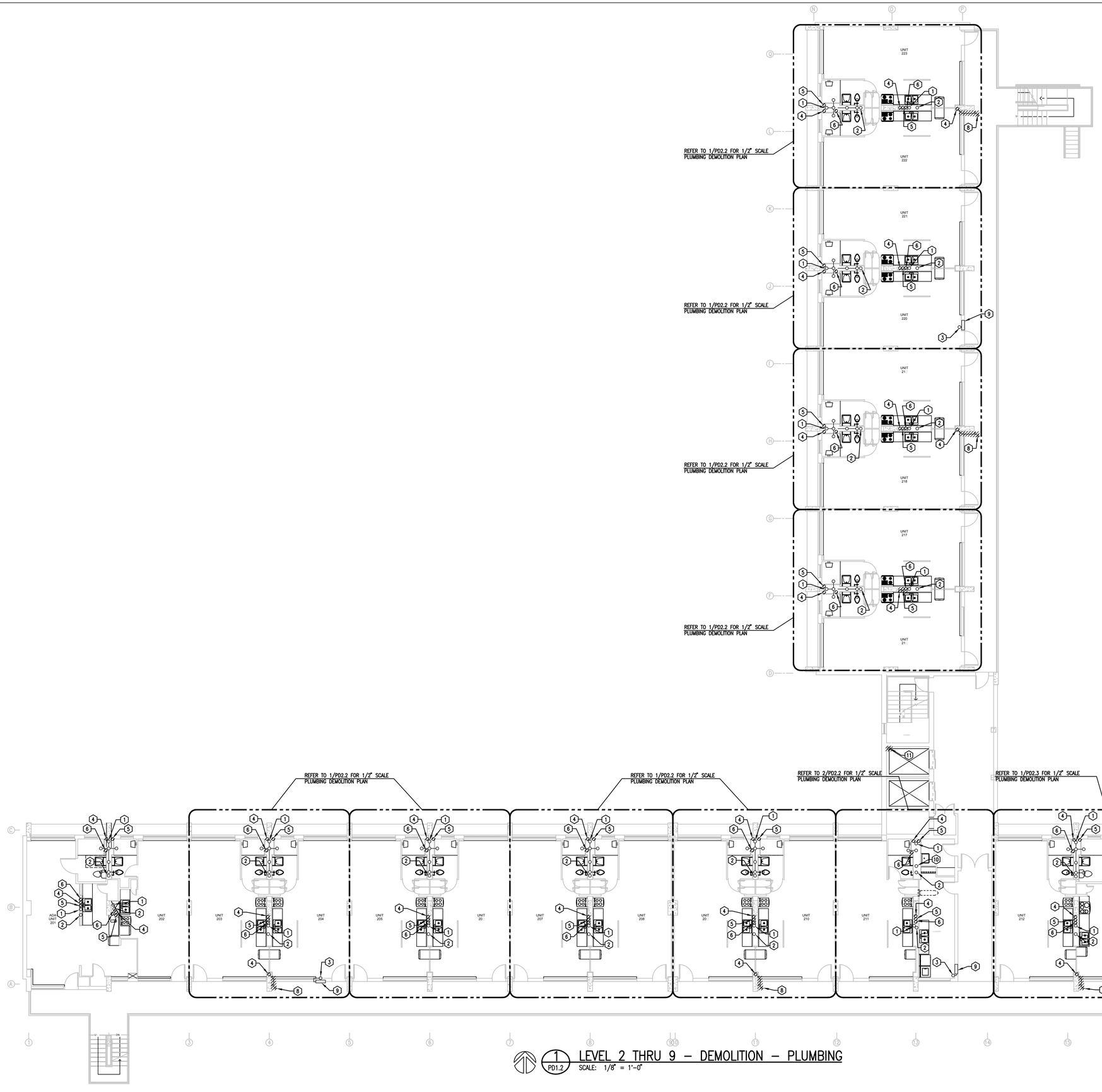
LEVEL 1 - DEMOLITION - PLUMBING

SHEET NUMBER
PD1.1



KEYED NOTES

1. EXISTING WASTE STACK TO REMAIN.
2. EXISTING VENT STACK TO REMAIN.
3. EXISTING STANDPIPE TO REMAIN.
4. REMOVE EXISTING COLD WATER RISER.
5. REMOVE EXISTING HOT WATER RISER.
6. REMOVE EXISTING HOT WATER RETURN RISER.
7. REMOVE EXISTING WASTE PIPING SUPPORTS & HANGERS ABOVE CEILING.
8. REMOVE EXISTING HOSE BIBB.
9. EXISTING FIRE HOSE CABINET TO REMAIN. REMOVE EXISTING FIRE HOSE & RE-LABEL CABINET. NEW LABEL SHALL READ "FIRE HOSE VALVE FOR FIRE DEPARTMENT USE ONLY".
10. REMOVE EXISTING VENT STACK.
11. REMOVE EXISTING FIRE STANDPIPE UP TO PENTHOUSE TO EXISTING FIRE HOSE CABINET. ALLOW FOR RECONNECTION OF NEW FIRE LINE TO EXISTING FIRE HOSE VALVE. EXISTING FIRE HOSE CABINET & FIRE HOSE VALVE TO REMAIN. REMOVE EXISTING FIRE HOSE & RE-LABEL EXISTING CABINET. NEW LABEL SHALL READ "FIRE HOSE VALVE FOR FIRE DEPARTMENT USE ONLY". SEE NEW WORK FOR RECONNECTION TO EXISTING FIRE HOSE VALVE.

1 PD1.2 LEVEL 2 THRU 9 – DEMOLITION – PLUMBING
SCALE: 1/8" = 1'-0"

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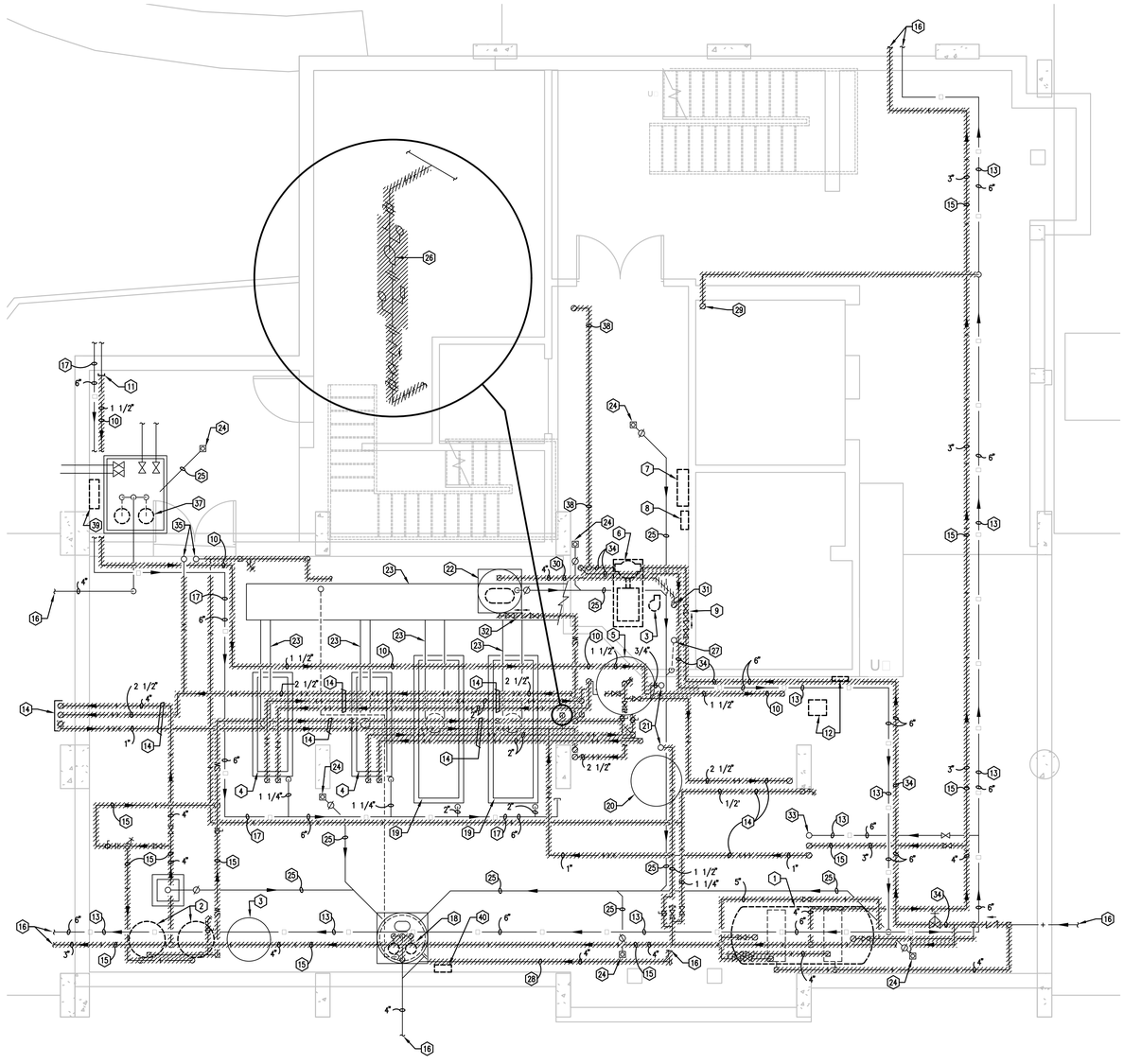
PROJECT ARCHITECT
BARREL DURAND-HOLLIS, AIA
STATE LICENSE NO. 10-3841

LEVEL 2 THRU 9 - DEMOLITION - PLUMBING

SHEET NUMBER
PD1.2



1 PD2.1 ENLARGED FLOOR PLAN – DEMOLITION – PLUMBING
SCALE: 1/4" = 1'-0"

KEYED NOTES

1. REMOVE EXISTING DOMESTIC WATER STORAGE TANK, PUMPS & ASSOCIATED PIPING.
2. REMOVE EXISTING WATER SOFTENER & REPLACE WITH NEW. SEE NEW WORK.
3. EXISTING BRINE TANK TO REMAIN.
4. EXISTING DOMESTIC WATER HEATER TO REMAIN.
5. EXISTING DOMESTIC HOT WATER STORAGE TANK TO REMAIN.
6. REMOVE EXISTING FIRE PUMP INCLUDING ASSOCIATED PIPING.
7. REMOVE EXISTING FIRE PUMP CONTROL PANEL.
8. REMOVE EXISTING JOCKEY PUMP CONTROL PANEL.
9. REMOVE EXISTING 6" DOUBLE CHECK VALVE ASSEMBLY.
10. REMOVE EXISTING GAS PIPING.
11. CAP EXISTING GAS PIPING AT WALL.
12. REMOVE EXISTING NATURAL GAS PRESSURE PUMP INCLUDING ASSOCIATED PIPING TO INCINERATOR & CONTROL PANEL.
13. EXISTING 6" FIRE LINE SERVING STANDPIPES IN BUILDING TO REMAIN.
14. REMOVE EXISTING DOMESTIC COLD WATER, HOT WATER, HOT WATER RETURN, AND SOFT WATER PIPING INCLUDING ASSOCIATED HANGERS, SUPPORTS, VALVES AND FITTINGS.
15. REMOVE EXISTING DOMESTIC WATER PIPING.
16. REFER TO SHEET PD1.0 FOR CONTINUATION.
17. EXISTING GAS PIPING TO BOILERS TO REMAIN.
18. EXISTING DUPLEX SEWAGE EJECTOR PUMPS IN BASIN TO BE REMOVED & REPLACED WITH NEW INCLUDING ASSOCIATED PIPING ABOVE FLOOR. SEE NEW WORK.
19. EXISTING BUILDING HEATING BOILER TO REMAIN.
20. EXISTING HOT WATER BUFFER TANK TO REMAIN.
21. EXISTING 1 1/2"CW & 3/4"HW RISING TO EXISTING MEN/WOMEN TOILET ROOM ON 1ST LEVEL TO REMAN. CUT PIPING ALLOWING INSTALLATION OF NEW PIPING.
22. ABANDON EXISTING BASIN.
23. EXISTING FLUE TO REMAIN.
24. EXISTING FLOOR DRAIN TO REMAIN.
25. EXISTING WASTE PIPING BELOW FLOOR TO REMAIN.
26. REMOVE EXISTING HOT WATER RETURN PUMP AND ALL ASSOCIATED PIPING & VALVE.
27. EXISTING VENT STACK TO REMAIN.
28. REMOVE EXISTING WASTE PIPING AND ASSOCIATED HANGERS & SUPPORTS FROM OVERHEAD.
29. REMOVE EXISTING FIRE RISER SERVING FIRE HOSE CABINET IN PENTHOUSE.
30. REMOVE EXISTING VENT PIPING AND ASSOCIATED SUPPORTS AND HANGERS.
31. REMOVE EXISTING VENT STACK.
32. REMOVE EXISTING BACKFLOW PREVENTER SERVING HVAC EQUIPMENT MAKE-UP WATER.
33. EXISTING STANDPIPE TO REMAIN.
34. REMOVE EXISTING FIRE PROTECTION LINE.
35. EXISTING 1/2"CW & 1/2"HW RISING TO EXISTING SINK ON 1ST LEVEL TO REMAIN. CUT PIPING ALLOWING INSTALLATION OF NEW PIPING.
36. REMOVE EXISTING JOCKEY PUMP INCLUDING ALL ASSOCIATED PIPING.
37. EXISTING SUMP PUMPS IN BASIN TO BE REMOVED & REPLACED WITH NEW. SEE NEW WORK.
38. REMOVE EXISTING TEST HEADER PIPE INCLUDING ASSOCIATED HANGERS.
39. REMOVE EXISTING SUMP PUMP CONTROL PANEL & REPLACE WITH NEW. SEE NEW WORK.
40. REMOVE EXISTING SEWAGE EJECTOR PUMP CONTROL PANEL & REPLACE WITH NEW. SEE NEW WORK.
41. REMOVE EXISTING BACKFLOW PREVENTOR

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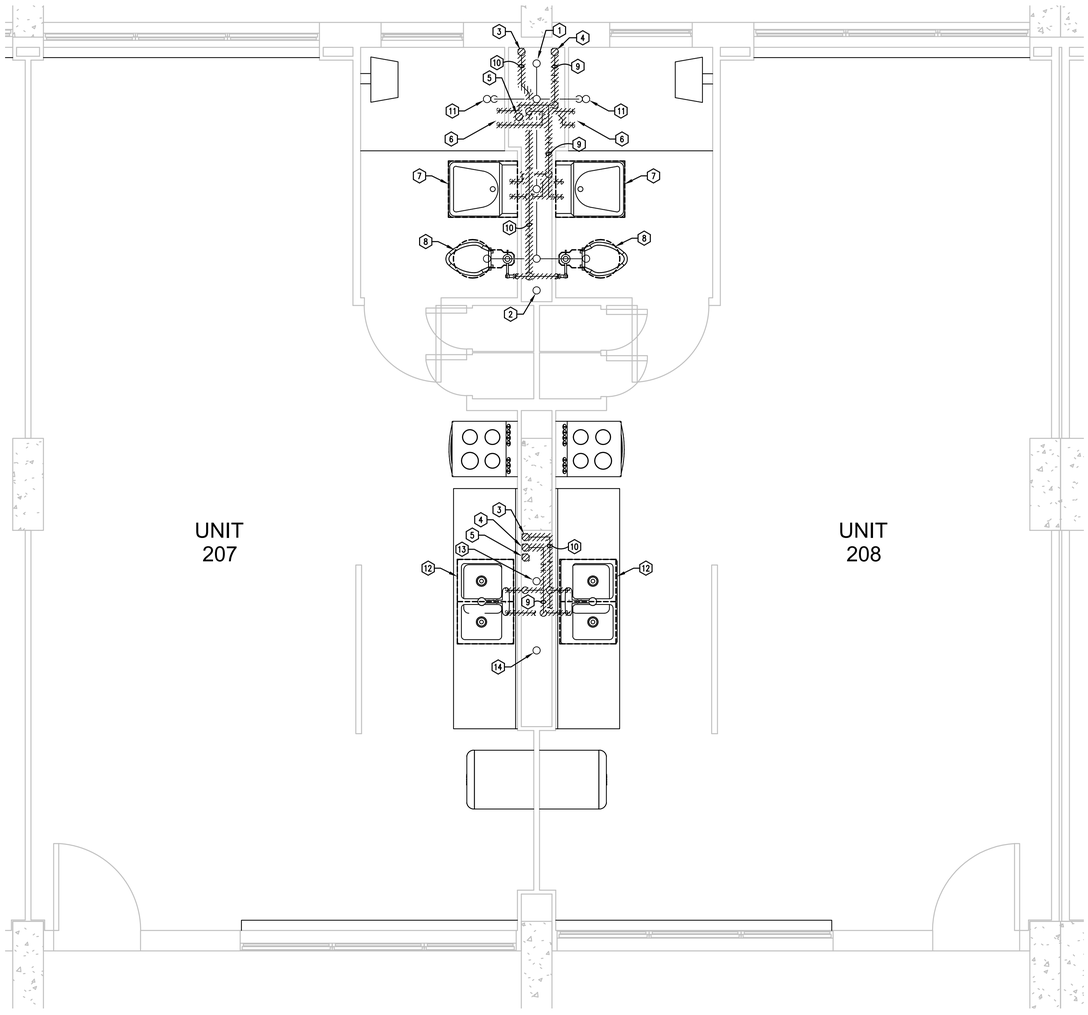
05.25.2018

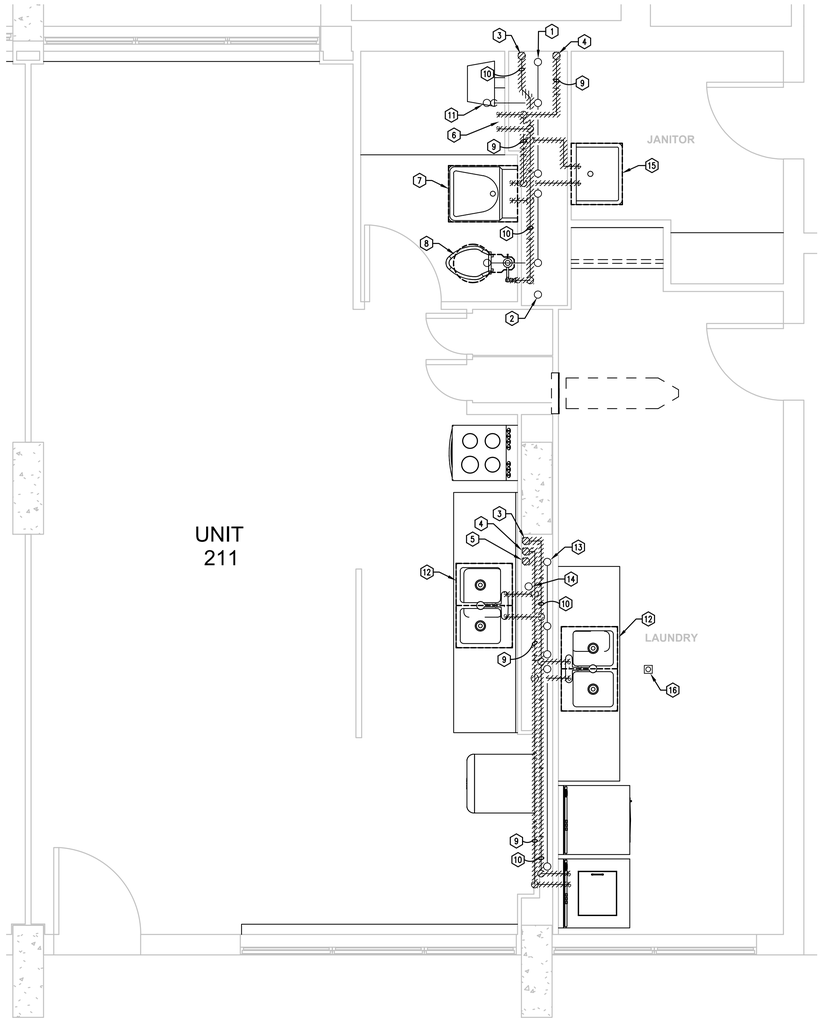
PROJECT ARCHITECT
MARK VANHOOVE, AIA
PROJECT MANAGER

ENLARGED FLOOR PLAN - DEMOLITION - PLUMBING

SHEET NUMBER
PD2.1



1 PD2.2 ENLARGED FLOOR PLAN – DEMOLITION – PLUMBING
SCALE: 1/2" = 1'-0"



2 PD2.2 ENLARGED FLOOR PLAN – DEMOLITION – PLUMBING
SCALE: 1/2" = 1'-0"

KEYED NOTES

1. EXISTING 6" SOIL STACK TO REMAIN.
2. EXISTING 4" VENT STACK TO REMAIN.
3. REMOVE EXISTING COLD WATER RISER.
4. REMOVE EXISTING HOT WATER RISER.
5. REMOVE EXISTING HOT WATER RETURN RISER.
6. REMOVE EXISTING SHOWER VALVE.
7. REMOVE EXISTING LAVATORY & ASSOCIATED STOPS & TRIM.
8. REMOVE EXISTING WATER CLOSET INCLUDING FLUSHVALVE.
9. REMOVE EXISTING HOT WATER LINES IN CHASE.
10. REMOVE EXISTING COLD WATER LINES IN CHASE.
11. REMOVE EXISTING SHOWER DRAIN & REPLACE WITH NEW.
12. REMOVE EXISTING SINK & ASSOCIATED STOPS & TRIM.
13. EXISTING 3" WASTE STACK TO REMAIN.
14. EXISTING 3" VENT STACK TO REMAIN.
15. REMOVE EXISTING SERVICE SINK & ASSOCIATED STOPS & TRIM.
16. REMOVE EXISTING FLOOR DRAIN AND REPLACE WITH NEW.

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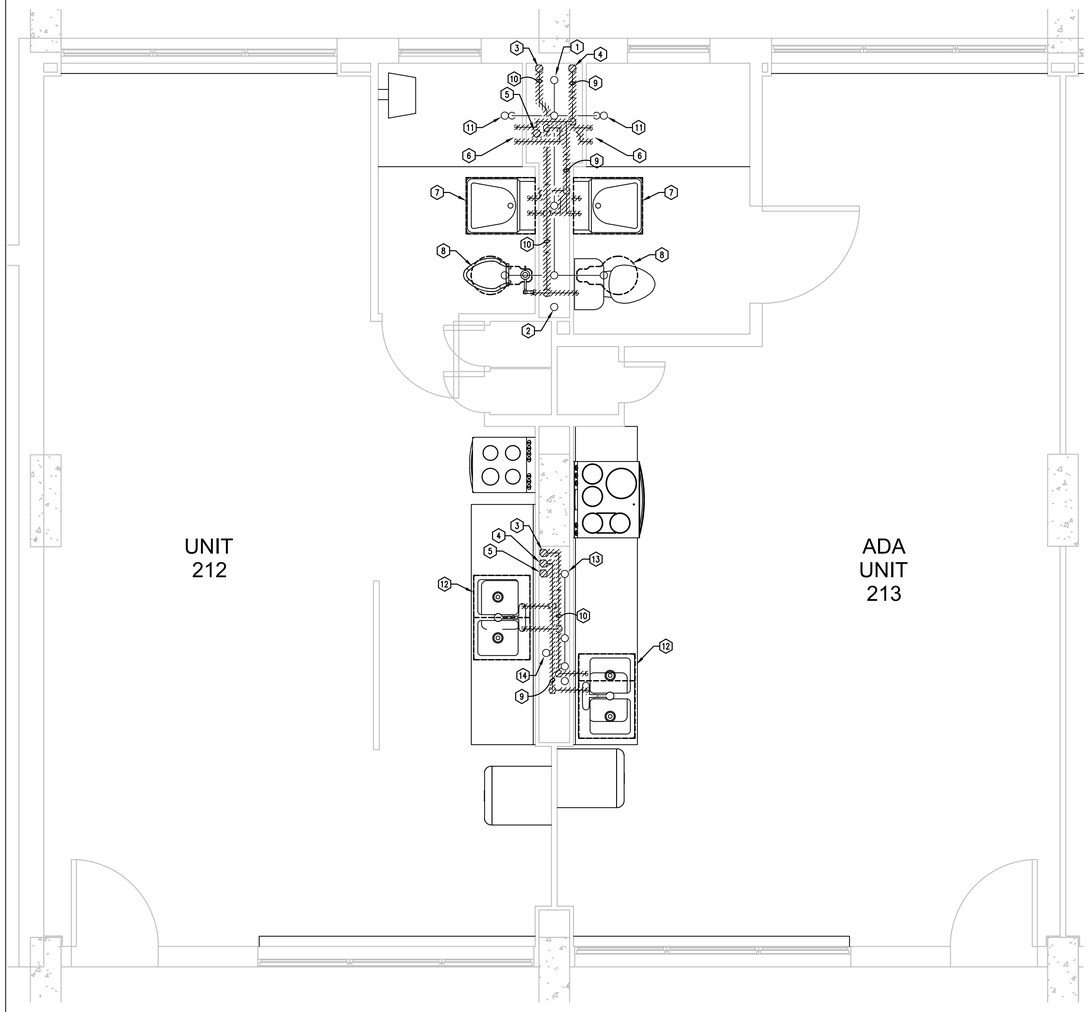
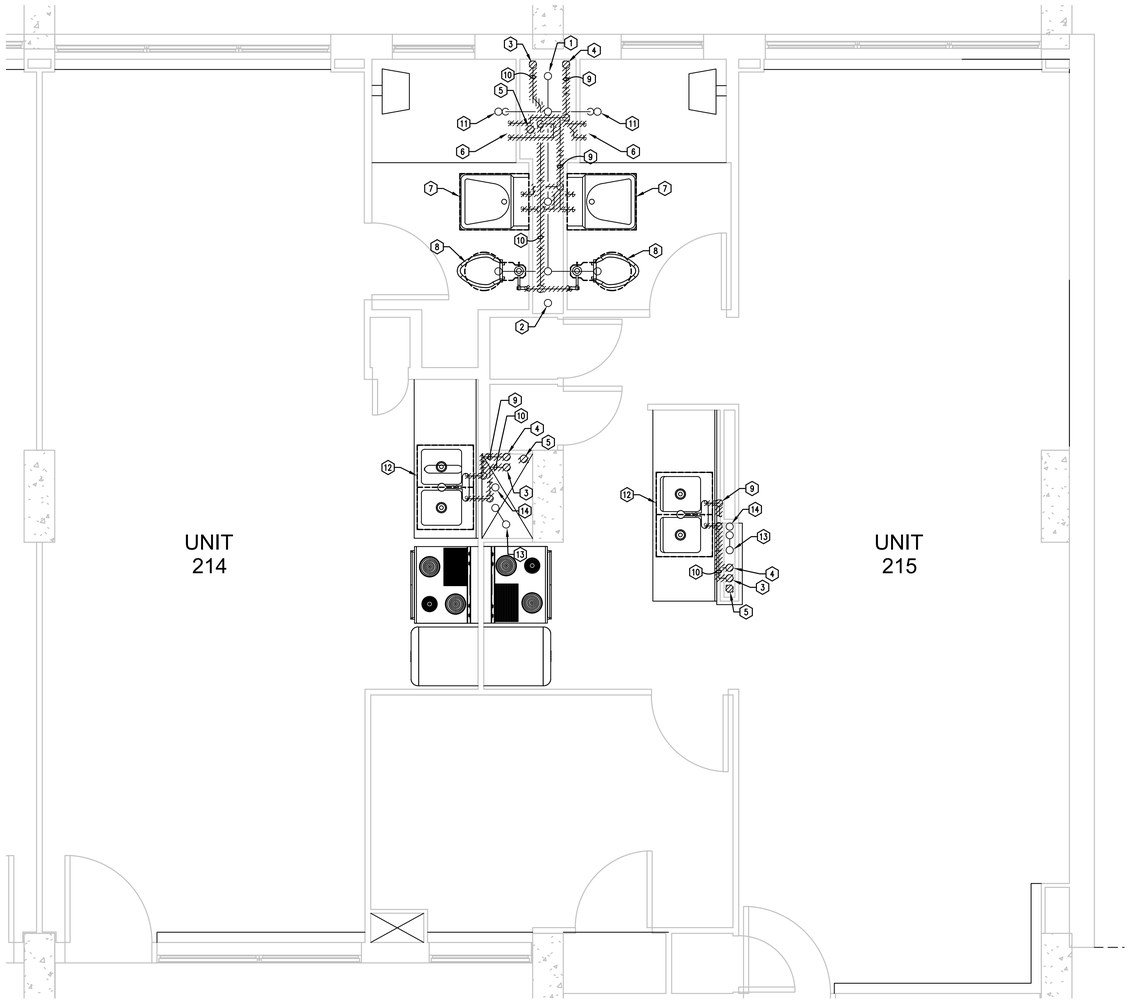
PROJECT ARCHITECT
MIRMOMENI, MEHDI J.
STATE LICENSE NO. 113121

ENLARGED FLOOR PLANS - DEMOLITION - PLUMBING

SHEET NUMBER
PD2.2



1 PD2.3 ENLARGED FLOOR PLAN – DEMOLITION – PLUMBING
SCALE: 1/2" = 1'-0"



2 PD2.3 ENLARGED FLOOR PLAN – DEMOLITION – PLUMBING
SCALE: 1/2" = 1'-0"

KEYED NOTES

1. EXISTING 6" SOIL STACK TO REMAIN.
2. EXISTING 4" VENT STACK TO REMAIN.
3. REMOVE EXISTING COLD WATER RISER.
4. REMOVE EXISTING HOT WATER RISER.
5. REMOVE EXISTING HOT WATER RETURN RISER.
6. REMOVE EXISTING SHOWER VALVE.
7. REMOVE EXISTING LAVATORY & ASSOCIATED STOPS & TRIM.
8. REMOVE EXISTING WATER CLOSET INCLUDING FLUSHVALVE.
9. REMOVE EXISTING HOT WATER LINES IN CHASE.
10. REMOVE EXISTING COLD WATER LINES IN CHASE.
11. REMOVE EXISTING SHOWER DRAIN.
12. REMOVE EXISTING SINK & ASSOCIATED STOPS & TRIM.
13. EXISTING 3" WASTE STACK TO REMAIN.
14. EXISTING 3" VENT STACK TO REMAIN.

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05.25.2018

PROJECT ARCHITECT
DARREL HOLLIS RUPE, FAIA
STATE LICENSE NO. 10-3867

ENLARGED FLOOR PLANS - DEMOLITION - PLUMBING

SHEET NUMBER
PD2.3

PLUMBING LEGEND

(NOTE: ALL SYMBOLS SHOWN ARE NOT NECESSARILY USED ON DRAWINGS)

VALVES

- PNEUMATIC ACTUATED TWO-WAY VALVE
- PNEUMATIC ACTUATED THREE-WAY VALVE
- UNION
- ORIFICE FLANGE
- BUTTERFLY VALVE
- TEMPERATURE/ PRESSURE RELIEF VALVE
- GLOBE VALVE
- CHECK VALVE
- GATE VALVE
- GATE VALVE IN C.I. VALVE BOX
- FLANGED VALVE AS DESIGNATED
- MANUAL PRESSURE RELIEF VALVE
- BELLOWS VALVE
- BELLOWS VALVE W/PURGE PORTS
- MANUAL DIAPHRAGM VALVE
- STRAINER W/ BLOWDOWN GATE VALVE
- THERMOWELL W/ THERMOMETER
- THERMOMETER WELL
- PRESSURE GAUGE W/ GAUGE COCK (PI)
- AUTOMATIC AIR VENT
- EXTERIOR 2-WAY FLOOR CLEANOUT IN CONCRETE PAD
- EXTERIOR FLOOR CLEANOUT IN CONCRETE PAD
- FCO — FLOOR CLEANOUT
- WCO — WALL CLEANOUT
- P - TRAP
- FLANGE CONNECTION
- DROP AT 45° ANGLE
- ELBOW TURNING DOWN
- ELBOW TURNING UP
- CAPPED PIPE
- FLEXIBLE CONNECTION
- CONCENTRIC PIPE REDUCER/ INCREASER
- ECCENTRIC PIPE REDUCER/ INCREASER
- PIPE SLEEVE
- SLOPE — DIRECTION OF SLOPE (DNWARD)
- FD — FLOOR DRAIN
- FLOOR SINK 1/2 GRATE
- P / 1 — SANITARY WASTE OR VENT STACK; WASTE OR VENT NO.
- BALL VALVE
- CIRCUIT SETTER, BALANCING VALVE
- PLUG VALVE
- NEEDLE VALVE
- SOLENOID OPERATED VALVE
- PNEUMATIC ACTUATED DIAPHRAGM VALVE
- VALVE IN VERTICAL
- DIRT LEG (6" LONG)
- VENTURI FLOW TUBE
- ANNUBAR FLOW ELEMENT

FIRE CONTROL

- FS — FIRE SPRINKLER LINE
- F — BUILDING FIRE LINE (BUILDING LINE)
- FDC — FIRE DEPARTMENT CONNECTION LINE

SYMBOL LEGEND

PIPING

- \+ — EXISTING COLD WATER (POTABLE)
- \+ + — EXISTING DOMESTIC HOT WATER (POTABLE)
- \+ + + — EXISTING DOMESTIC HOT WATER RETURN (POTABLE)
- TW — EXISTING TEMPERED HOT WATER (POTABLE)
- EXISTING SANITARY VENT
- EXISTING SANITARY SEWER
- DOMESTIC COLD WATER (POTABLE)
- DOMESTIC HOT WATER (POTABLE)
- DOMESTIC HOT WATER RETURN (POTABLE)
- D — CONDENSATE DRAIN
- G — NATURAL GAS
- NPW — NON-POTABLE WATER
- SD — STORM DRAIN
- RD — ROOF DRAIN
- EOD — EMERGENCY OVERFLOW DRAIN
- DIRECTION OF FLOW
- WATER HAMMER ARRESTOR
- A — MEDICAL COMPRESSED AIR
- AV — ACID VENT
- AW — ACID WASTE
- HPG — HIGH PRESSURE GAS
- V — VACUUM
- LV — LAB VACUUM
- ZA — ZERO GRADE AIR
- IA — INSTRUMENT AIR
- CA — COMPRESSED AIR
- AR — ARGON SUPPLY
- DW — DISTILLED WATER SUPPLY
- DWR — DISTILLED WATER RETURN
- DIW — DEIONIZED WATER SUPPLY
- DIWR — DEIONIZED WATER RETURN
- He — HELIUM SUPPLY
- H_2 — HYDROGEN SUPPLY
- N_2O — NITROUS OXIDE
- N_2 — NITROGEN SUPPLY
- O_2 — OXYGEN SUPPLY
- C_2H_2 — ACETYLENE
- LP — LIQUID PROPANE
- 150IR — STEAM SUPPLY (XXX = PSIG)
- 80IR — STEAM RETURN (XXX = PSIG)
- L — LIQUID REFRIGERANT
- S — SUCTION REFRIGERANT
- HG — HOT GAS REFRIGERANT
- CHS — CHILLED WATER SUPPLY
- CHR — CHILLED WATER RETURN
- CWS — CONDENSER WATER SUPPLY
- CWR — CONDENSER WATER RETURN
- HWS — HEATING WATER SUPPLY
- HWR — HEATING WATER RETURN

ABBREVIATION

ABBREVIATION	DESCRIPTION
AC	ABOVE CEILING
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
ALT	ALTERNATE
ARCH	ARCHITECT
BAL VA	CIRCUIT SETTER BALANCING VALVE
BFF	BELOW FINISHED FLOOR
BLDG	BUILDING
BTUH	BRITISH THERMAL UNITS PER HOUR
B VA	BALL VALVE
BF	BELOW FLOOR
CAP	CAPACITY
CFH	CUBIC FEET PER HOUR
CH VA	CHECK VALVE
CI	CAST IRON
CO	CLEANOUT
CONC	CONCRETE
COND	CONDENSING
CONN	CONNECTION
CONT	CONTINUATION
CU	COPPER
CW	DOMESTIC COLD WATER (POTABLE)
C VA	CONTROL VALVE
D	CONDENSATE DRAIN LINE
DIA	DIAMETER
DIV	DIVISION
DN	DOWN
DWGS	DRAWINGS
DI	DUCTILE IRON
EFFIC	EFFICIENCY
ELEC	ELECTRICAL
EOD	EMERGENCY OVERFLOW DRAIN
EWT	ENTERING WATER TEMPERATURE
EXH	EXHAUST
EXT	EXTERIOR
EXT	EXTERNAL
F	DEGREES FAHRENHEIT
FCO	FLOOR CLEANOUT
FD	FLOOR DRAIN
FIN	FINISHED
FLEX	FLEXIBLE
FLR	FLOOR
FT	FEET
F/SD	COMBINATION FIRE/ SMOKE DAMPER
G	NATURAL GAS
GALV	GALVANIZED
GA	GAUGE
GL VA	GLOBE VALVE
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GT VA	GATE VALVE
HP	HORSEPOWER
HR	HOUR
HW	DOMESTIC HOT WATER (140F)
HWR	HEATING WATER RETURN
HWRP	HOT WATER RECIRCULATING PUMP
HWS	HEATING WATER SUPPLY
HZ	HERTZ

ABBREVIATION	DESCRIPTION
IN	INCHES
IE	INVERT ELEVATION
KW	KILOWATTS
LB	POUNDS
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MECH	MECHANICAL
MEZZ	MEZZANINE
MFR	MANUFACTURER
MIN	MINIMUM
MTD	MOUNTED
MTR	MOTOR
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OA	OUTSIDE AIR
OS&Y	OUTSIDE STEM & YOKE
OC	ON CENTERS
OH	OVERHEAD
PD	PRESSURE DROP
PH	PHASE
PLBG	PLUMBING
PR VA	PRESSURE REDUCING VALVE
PSIG	POUNDS PER SQUARE INCH GAUGE
RA	RETURN AIR
RED	REDUCER
RE:	REFERENCE
RH	RELATIVE HUMIDITY
RPBP	REDUCED PRESSURE BACKFLOW PREVENTER
RPM	REVOLUTIONS PER MINUTE
SAN	SOIL & WASTE (ABOVE GRADE)
SCH	SCHEDULE
SD	STORM DRAIN
SIM	SIMILAR
SPKR	SPRINKLER
SQ FT	SQUARE FEET
SS	STAINLESS STEEL
SS	SUPERVISORY SWITCH
STL	STEEL
STRUC	STRUCTURAL
TI	TEMPERATURE INDICATOR (THERMOMETER)
TOT	TOTAL
TYP	TYPICAL
T&P	TEMPERATURE & PRESSURE RELIEF VALVE
UON	UNLESS OTHERWISE NOTED
V	SANITARY VENT
VD	VOLUME DAMPER
VTR	VENT THROUGH ROOF
WCO	WALL CLEANOUT
W/	WITH

NOTES

PLUMBING GENERAL NOTES:

1. CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS PRIOR TO CONSTRUCTION.
2. REFER TO ARCHITECTURAL DRAWING FOR MOUNTING HEIGHT OF PLUMBING FIXTURES.
3. CONTRACTOR SHALL REVIEW AND FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO SUBMITTING BID.
4. CONTRACTOR SHALL COORDINATE WITH ALL TRADES DURING CONSTRUCTION.
5. CONTRACTOR SHALL VERIFY EXISTING FLOOR CONSTRUCTION PRIOR TO CORE DRILLING FOR NEW PLUMBING.
6. SLOPE ALL WASTE PIPING AT 1/4" PER FOOT.
7. REFER TO ARCHITECTURAL ELEVATION AND SECTIONS PRIOR TO ROUTING OF PIPING.
8. INSTALL FLUSH LEVER HANDLES ON OPEN SIDE OF ADA WATER CLOSET STALLS.

FIRE PROTECTION NOTES:

1. SUMMARY: WHERE INDICATED ON THE DRAWINGS, FURNISH AND INSTALL A COMPLETE AND APPROVED WET PIPE AUTOMATIC FIRE SPRINKLER SYSTEM.
2. CODES AND STANDARDS: NFPA-13, NFPA14, NFPA24, STANDARD FIRE CODE, LOCAL FIRE DEPARTMENT, AND OWNER'S INSURANCE REQUIREMENTS (CONTRACTOR TO VERIFY).
3. COORDINATION: COORDINATE WITH EXISTING AND NEW DUCTWORK, PIPING, AND ELECTRICAL WORK TO AVOID CONFLICTS.
4. THE SPRINKLER PIPING SHOWN IS FOR GENERAL ROUTING OF MAINS AND NOT INTENDED FOR THE SPRINKLER INSTALLER'S USE FOR DESIGNING THE SYSTEM. THE SPRINKLER INSTALLER SHALL REVIEW ARCHITECTURAL SECTIONS OF BUILDING TO KNOW AREAS OF HIGH CEILINGS AND SPACE CONDITIONS IN ATTICS SPACES AND IN MECHANICAL ROOMS.
5. THE ENTIRE SPRINKLER SYSTEM SHALL BE HYDRAULICALLY CALCULATED.
6. THE SPRINKLER INSTALLER WILL BE REQUIRED TO CONDUCT FIRE FLOW TEST TO DETERMINE EXACT PRESSURES & FLOW AT WATER MAINS.
7. THE SPRINKLER INSTALLER WILL BE REQUIRED TO VERIFY EXACT PRESSURES PRIOR TO DESIGN.

PLUMBING FIXTURE CONNECTION SCHEDULE

MARK	DESCRIPTION	CONNECTION SIZE (IN.) CW	HW	WASTE	VENT	REMARKS
WC-1	WATERCLOSET	1"	-	4"	2"	FLOOR MOUNTED, FLUSHVALVE
LAV-1	LAVATORY	1/2"	1/2"	2"	2"	WALL HUNG
LAV-2	LAVATORY	1/2"	1/2"	2"	2"	WALL HUNG (KITCHEN AREA)
SK-1	DOUBLE COMPT. SINK	1/2"	1/2"	2"	2"	STAINLESS STEEL SINK, SELF RIMMING
SK-2	DOUBLE COMPT. SINK	1/2"	1/2"	2"	2"	STAINLESS STEEL, SELF RIMMING, ADA COMPLIANT
SK-3	SINGLE SINK	1/2"	1/2"	2"	2"	STAINLESS STEEL, SELF RIMMING (WASH ROOM AREA)
SK-4	THREE COMPT. SINK	1/2"	1/2"	2"	2"	FREE STANDING STAINLESS STEEL SINK
SH-1	SHOWER	1/2"	1/2"	-	-	SHOWER
SH-2	SHOWER	1/2"	1/2"	-	-	ADA SHOWER
MS-1	MOP SINK	3/4"	3/4"	3"	2"	FLOOR MOUNTED
MS-2	MOP SINK	3/4"	3/4"	-	-	TRIM ONLY
SS-1	SERVICE SINK	3/4"	3/4"	3"	2"	WALL MOUNTED
ESEW-1	EMERGENCY SHOWER/EYEWASH	1 1/2"	-	-	-	EMERGENCY SHOWER/EYEWASH
EW-1	EYEWASH	3/4"	-	-	-	FREE STANDING EYEWASH
WB-1	WALL BOX	1/2"	-	-	-	REFRIGERATOR/ICE MAKER SUPPLY BOX
WB-2	WALL BOX	1/2"	1/2"	2"	2"	CLOTHES WASHER SUPPLY & DRAIN BOX
FD-1	FLOOR DRAIN	-	-	-	-	FINISHED AREA, SEE FLOOR PLANS FOR SIZES
FD-2	FLOOR DRAIN	-	-	-	-	MECHANICAL ROOMS, SEE FLOOR PLANS FOR SIZES
HB-1	HOSE BIBB	1/2"	-	-	-	FINISHED AREAS
HB-2	HOSE BIBB	1/2"	-	-	-	MECHANICAL ROOM
WH-1	WALL HYDRANT	1/2"	-	-	-	NON-FREEZE

TRIPLEX DOMESTIC BOOSTER PUMP SCHEDULE

MARK	DESCRIPTION	HP	HD. FT.	GPM	RPM	VOLTS/ PH	REMARKS
TBP-1	DOMESTIC WATER BOOSTER PUMP	5	71	105	360-3470	480/3Ø	GRUNDFOS 3 CRE 15-2 MULTI-E BOOSTER SYSTEM
	DOMESTIC WATER BOOSTER PUMP	5	71	105	360-3470	480/3Ø	
	DOMESTIC WATER BOOSTER PUMP	5	71	105	360-3470	480/3Ø	

NOTES:
1. EACH BOOSTER PACKAGE SHALL BE TRIPLEX WITH EACH PUMP AS SCHEDULED.
2. PUMP PACKAGE SHALL BE PROVIDED WITH VFD'S AND CONTROLS.
3. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.

FIRE PUMP SCHEDULE

MARK	SERVICE	TYPE	SIZE (APPROX.) DISCH.	SUCT.	GPM	TOTAL HEAD H2O	HP/VOLTS/ PH	RPM	NOTES
FP-1	FIRE PUMP	SPLIT CASE	6"	6"	1000	196	100/480/3Ø	1770	AURORA NO. 5-481-15 OR APPROVED EQUIVALENT
JP-1	JOCKEY PUMP	VERTICAL	1"	1"	10	200	2/480/3Ø	3450	AURORA NO. PVM(X)4 SERIES OR APPROVED EQUIVALENT

HOT WATER RECIRCULATING PUMP SCHEDULE

MARK	DESCRIPTION	HP	HD. FT.	GPM	RPM	VOLTS/ PH	REMARKS
HWRP-1	HOT WATER RETURN	1/6	12	12	1725	120/1Ø	B & G NO. HV SERIES

DUPLEX SEWAGE EJECTOR PUMP SCHEDULE

MARK	SERVICE	HP	HD. FT.	GPM	RPM	VOLTS/ PH	REMARKS
SEP-1	BASEMENT	1 1/2	30	30	1750	480/3Ø	WEIL NO. 2441
SEP-2	BASEMENT	1 1/2	30	30	1750	480/3Ø	WEIL NO. 2441

NOTES:
1. DUPLEX SUMP PUMP SHALL BE COMPLETE WITH CONTROL PANEL, HIGH WATERS ALARM & NEW SWITCHES.
2. BOTH PUMPS ARE CAPABLE OF OPERATING SIMULTANEOUS.
3. PROVIDE PUMPS WITH WEIL NO.2613 QUICK REMOVAL SYSTEM

STORM WATER DUPLEX SUMP PUMP SCHEDULE

MARK	SERVICE	HP	HD. FT.	GPM	RPM	VOLTS/ PH	REMARKS
SP-1	STORM WATER	2	35	100	1750	480/3Ø	WEIL NO. 1608
SP-2	STORM WATER	2	35	100	1750	480/3Ø	WEIL NO. 1608

NOTES:
1. DUPLEX SUMP PUMP SHALL BE COMPLETE WITH CONTROL PANEL, HIGH WATERS ALARM & NEW SWITCHES.
2. BOTH PUMPS ARE CAPABLE OF OPERATING SIMULTANEOUS.
3. PROVIDE PUMPS WITH WEIL NO.2613 QUICK REMOVAL SYSTEM

WATER SOFTENER SCHEDULE

MARK	EXCHANGE CAPACITY, GPG@ SALT DOSAGE (LBS). MAX.	MIN.	SERVICE FLOW RATES PEAK FLOW (GPM)	PEAK PRESS. DROP (PSI)	CONTINUOUS FLOW (GPM)	CONTINUOUS PRESS. DROP (PSI)	PIPE SIZE (IN.)	BACKWASH FLOW RATE (GPM)	RESIN QUANT. (CU. FT.)	SOFTENER TANK SIZE (IN.)	BRINE TANK SIZE (IN.)	SALT STORAGE (LBS.)	REMARKS
WS-1	450,000	300,000	110	25	83	15	2	25	15	30 X 72	30 X 48	730	HEAT & TREAT NO. HT42-0450-20
-	-	-	-	-	-	-	-		-	-	-		-
-	-	-	-	-	-	-	-		-	-	-		-

SUMP PUMP SCHEDULE

MARK	SERVICE	HP	HD. FT.	GPM	RPM	VOLTS/ PH	REMARKS
SP-3	FIRE PUMP ROOM	2	30	50	1750	480/3Ø	WEIL NO. 1413
-	-	-	-	-	-	-	-

NOTES:
1. SUMP PUMP SHALL BE COMPLETE WITH CONTROL PANEL, HIGH WATER ALARM & SWITCHES.

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05/25/18

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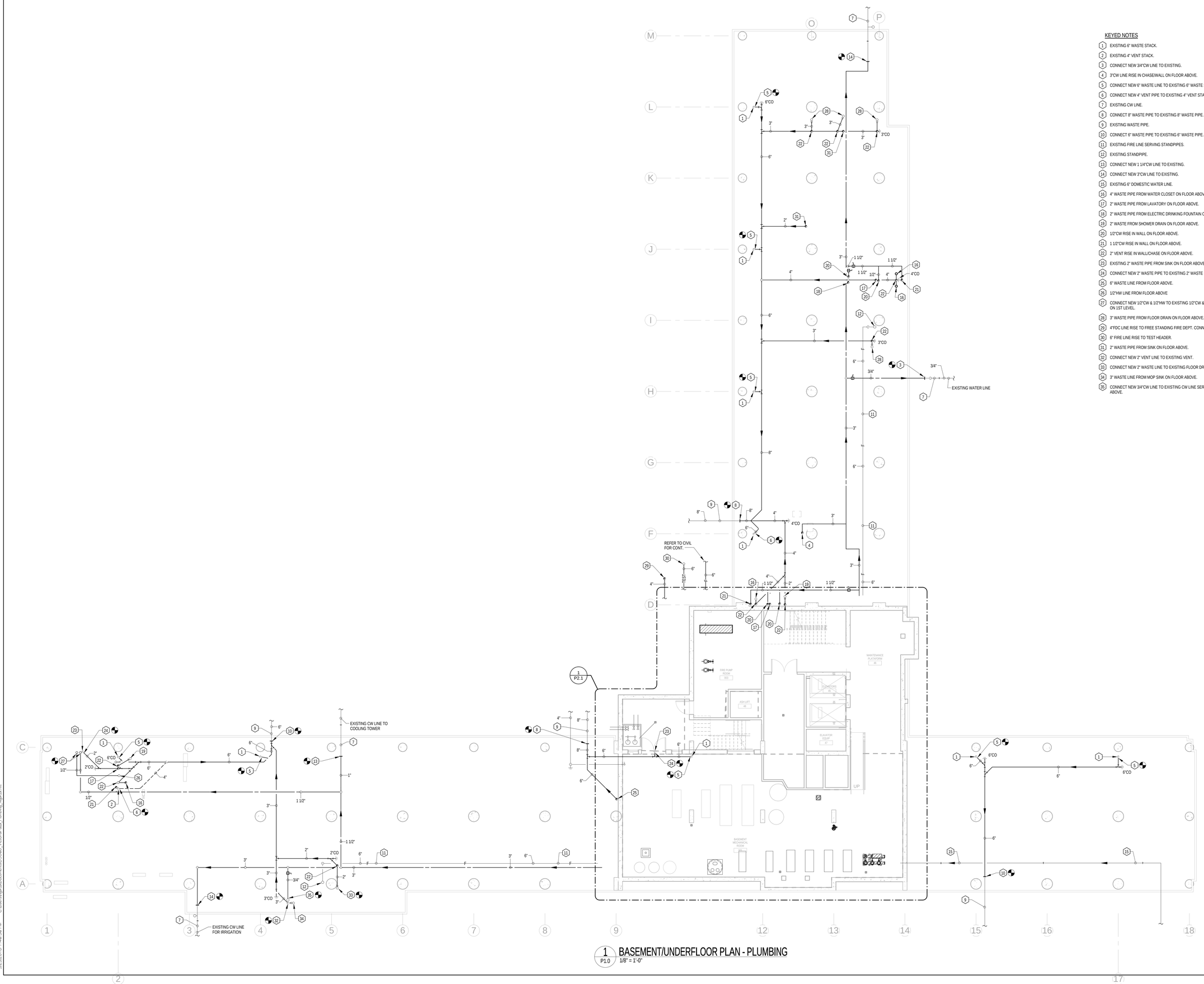
LICENSED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–581

PLUMBING LEGEND, SYMBOLS & ABBREVIATIONS

SHEET NUMBER
P0.1



1 P1.0 BASEMENT/UNDERFLOOR PLAN - PLUMBING
1/8" = 1'-0"

KEYED NOTES

1. EXISTING 6" WASTE STACK.
2. EXISTING 4" VENT STACK.
3. CONNECT NEW 3/4"CW LINE TO EXISTING.
4. 3"CW LINE RISE IN CHASE/WALL ON FLOOR ABOVE.
5. CONNECT NEW 6" WASTE LINE TO EXISTING 6" WASTE STACK.
6. CONNECT NEW 4" VENT PIPE TO EXISTING 4" VENT STACK.
7. EXISTING CW LINE.
8. CONNECT 8" WASTE PIPE TO EXISTING 8" WASTE PIPE.
9. EXISTING WASTE PIPE.
10. CONNECT 6" WASTE PIPE TO EXISTING 6" WASTE PIPE.
11. EXISTING FIRE LINE SERVING STANDPIPES.
12. EXISTING STANDPIPE.
13. CONNECT NEW 1 1/4"CW LINE TO EXISTING.
14. CONNECT NEW 3"CW LINE TO EXISTING.
15. EXISTING 6" DOMESTIC WATER LINE.
16. 4" WASTE PIPE FROM WATER CLOSET ON FLOOR ABOVE.
17. 2" WASTE PIPE FROM LAVATORY ON FLOOR ABOVE.
18. 2" WASTE PIPE FROM ELECTRIC DRINKING FOUNTAIN ON FLOOR ABOVE.
19. 2" WASTE FROM SHOWER DRAIN ON FLOOR ABOVE.
20. 1/2"CW RISE IN WALL ON FLOOR ABOVE.
21. 1 1/2"CW RISE IN WALL ON FLOOR ABOVE.
22. 2" VENT RISE IN WALL/CHASE ON FLOOR ABOVE.
23. EXISTING 2" WASTE PIPE FROM SINK ON FLOOR ABOVE.
24. CONNECT NEW 2" WASTE PIPE TO EXISTING 2" WASTE PIPE.
25. 6" WASTE LINE FROM FLOOR ABOVE.
26. 1/2"HW LINE FROM FLOOR ABOVE
27. CONNECT NEW 1/2"CW & 1/2"HW TO EXISTING 1/2"CW & 1/2"HW RISING TO SINK ON 1ST LEVEL.
28. 3" WASTE PIPE FROM FLOOR DRAIN ON FLOOR ABOVE.
29. 4"FDC LINE RISE TO FREE STANDING FIRE DEPT. CONNECTION.
30. 6" FIRE LINE RISE TO TEST HEADER.
31. 2" WASTE PIPE FROM SINK ON FLOOR ABOVE.
32. CONNECT NEW 2" VENT LINE TO EXISTING VENT.
33. CONNECT NEW 2" WASTE LINE TO EXISTING FLOOR DRAIN ON FLOOR ABOVE.
34. 3" WASTE LINE FROM MOP SINK ON FLOOR ABOVE.
35. CONNECT NEW 3/4"CW LINE TO EXISTING CW LINE SERVING MOP SINK ON FLOOR ABOVE.

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TEXAS LICENSE NO. 10–881

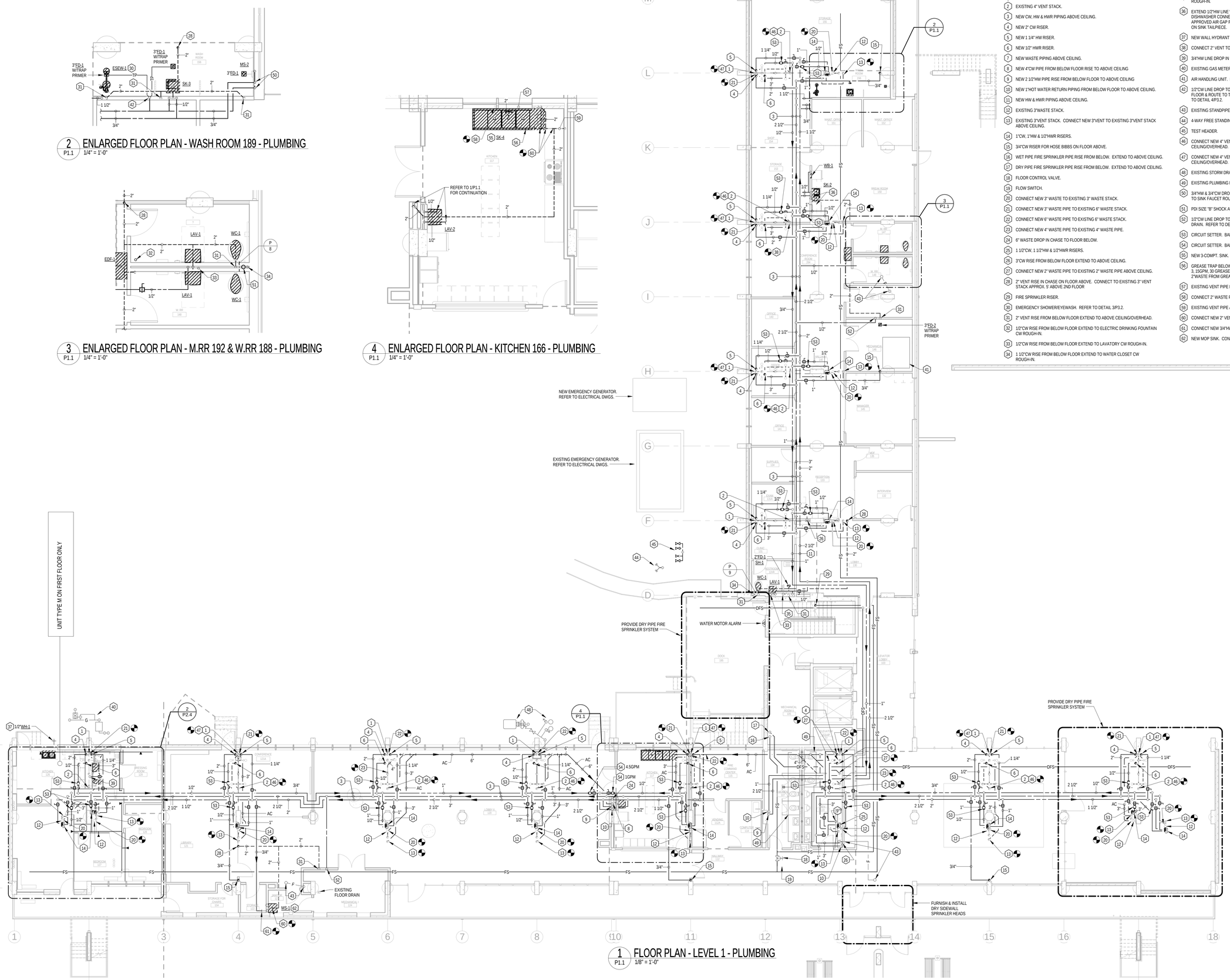
BASEMENT/UNDERFLOOR PLAN - PLUMBING

SHEET NUMBER
P1.0

2 P1.1 ENLARGED FLOOR PLAN - WASH ROOM 189 - PLUMBING
1/4" = 1'-0"

3 P1.1 ENLARGED FLOOR PLAN - M.RR 192 & W.RR 188 - PLUMBING
1/4" = 1'-0"

4 P1.1 ENLARGED FLOOR PLAN - KITCHEN 166 - PLUMBING
1/4" = 1'-0"



1 P1.1 FLOOR PLAN - LEVEL 1 - PLUMBING
1/8" = 1'-0"

KEYED NOTES

1. EXISTING 6" WASTE STACK.
2. EXISTING 4" VENT STACK.
3. NEW CW, HW & HWR PIPING ABOVE CEILING.
4. NEW 2" CW RISER.
5. NEW 1 1/4" HW RISER.
6. NEW 1/2" HWR RISER.
7. NEW WASTE PIPING ABOVE CEILING.
8. NEW 4"CW PIPE FROM BELOW FLOOR RISE TO ABOVE CEILING
9. NEW 2 1/2"HW PIPE RISE FROM BELOW FLOOR TO ABOVE CEILING
10. NEW 1"HOT WATER RETURN PIPING FROM BELOW FLOOR TO ABOVE CEILING.
11. NEW HW & HWR PIPING ABOVE CEILING.
12. EXISTING 3"WASTE STACK.
13. EXISTING 3"VENT STACK. CONNECT NEW 3"VENT TO EXISTING 3"VENT STACK ABOVE CEILING.
14. 1"CW, 1"HW & 1/2"HWR RISERS.
15. 3/4"CW RISER FOR HOSE BIBBS ON FLOOR ABOVE.
16. WET PIPE FIRE SPRINKLER PIPE RISE FROM BELOW. EXTEND TO ABOVE CEILING.
17. DRY PIPE FIRE SPRINKLER PIPE RISE FROM BELOW. EXTEND TO ABOVE CEILING.
18. FLOOR CONTROL VALVE.
19. FLOW SWITCH.
20. CONNECT NEW 3" WASTE TO EXISTING 3" WASTE STACK.
21. CONNECT NEW 3" WASTE PIPE TO EXISTING 6" WASTE STACK.
22. CONNECT NEW 6" WASTE PIPE TO EXISTING 6" WASTE STACK.
23. CONNECT NEW 4" WASTE PIPE TO EXISTING 4" WASTE PIPE.
24. 6" WASTE DROP IN CHASE TO FLOOR BELOW.
25. 1 1/2"CW, 1 1/2"HW & 1/2"HWR RISERS.
26. 3"CW RISE FROM BELOW FLOOR EXTEND TO ABOVE CEILING.
27. CONNECT NEW 2" WASTE PIPE TO EXISTING 2" WASTE PIPE ABOVE CEILING.
28. 2" VENT RISE IN CHASE ON FLOOR ABOVE. CONNECT TO EXISTING 3" VENT STACK APPROX. 5' ABOVE 2ND FLOOR
29. FIRE SPRINKLER RISER.
30. EMERGENCY SHOWER/EYEWASH. REFER TO DETAIL 3/P3.2.
31. 2" VENT RISE FROM BELOW FLOOR EXTEND TO ABOVE CEILING/OVERHEAD.
32. 1/2"CW RISE FROM BELOW FLOOR EXTEND TO ELECTRIC DRINKING FOUNTAIN CW ROUGH-IN.
33. 1/2"CW RISE FROM BELOW FLOOR EXTEND TO LAVATORY CW ROUGH-IN.
34. 1 1/2"CW RISE FROM BELOW FLOOR EXTEND TO WATER CLOSET CW ROUGH-IN.
35. 1/2"CW RISE FROM BELOW FLOOR EXTEND TO SHOWER VALVE CW ROUGH-IN.
36. EXTEND 1/2"HW LINE WITH BALL VALVE FROM SINK HW ROUGH-IN TO DISHWASHER CONNECTION & EXTEND DISHWASHER DRAIN THROUGH APPROVED AIR GAP FITTING & ROUTE TO DISHWASHER DRAIN CONNECTION ON SINK TAILPIECE.
37. NEW WALL HYDRANT CONNECT TO EXISTING CW LINE IN WALL.
38. CONNECT 2" VENT TO EXISTING VENT STACK.
39. 3/4"HW LINE DROP IN CHASE & EXTEND TO PLUMBING FIXTURES.
40. EXISTING GAS METER SET-UP.
41. AIR HANDLING UNIT. REFER TO HVAC DWGS.
42. 1/2"CW LINE DROP TO TRAP PRIMER VALVE EXTEND DISCHARGE TO BELOW FLOOR & ROUTE TO TRAP PRIMER CONNECTION ON FLOOR DRAIN. REFER TO DETAIL 4/P3.2.
43. EXISTING STANDPIPE.
44. 4-WAY FREE STANDING FIRE DEPT. CONNECTION. REFER TO DETAIL 5/P3.2.
45. TEST HEADER.
46. CONNECT NEW 4" VENT TO EXISTING 4" VENT STACK ABOVE CEILING/OVERHEAD.
47. CONNECT NEW 4" VENT TO EXISTING 6" WASTE STACK ABOVE CEILING/OVERHEAD.
48. EXISTING STORM DRAIN SYSTEM PUMPS.
49. EXISTING PLUMBING FIXTURE TO REMAIN.
50. 3/4"HW & 3/4"CW DROP IN WALL, OFFSET BELOW WINDOW SILL & EXTEND TO SINK FAUCET ROUGH-IN.
51. PDI SIZE "B" SHOCK ARRESTOR WITH ACCESS DOOR.
52. 1/2"CW LINE DROP TO TRAP PRIMER VALVE EXTEND DISCHARGE TO FLOOR DRAIN. REFER TO DETAIL 4/P3.2.
53. CIRCUIT SETTER. BALANCE @ 0.5GPM.
54. CIRCUIT SETTER. BALANCE @ FLOW INDICATED.
55. NEW 3-COMPT. SINK. CONNECT TO MODIFIED HW & CW ROUGH-INS.
56. GREASE TRAP BELOW 3-COMPT. SINK. GREASE TRAP SHALL BE MIFAB MI-G-3, 15GPM, 30 GREASE CAPACITY OR APPROVED EQUIVALENT. EXTEND 2"WASTE FROM GREASE TRAP OUTLET TO MODIFIED WASTE ROUGH-IN.
57. EXISTING VENT PIPE IN WALL BELOW WINDOW SILL.
58. CONNECT 2" WASTE PIPE TO MODIFIED WASTE ROUGH-IN.
59. EXISTING VENT PIPE ABOVE CEILING.
60. CONNECT NEW 2" VENT PIPE TO EXISTING VENT PIPE ABOVE CEILING.
61. CONNECT NEW 3/4"HW LINE TO EXISTING HW LINE ABOVE CEILING.
62. NEW MOP SINK. CONNECT TO MODIFIED HW & CW ROUGH-IN.

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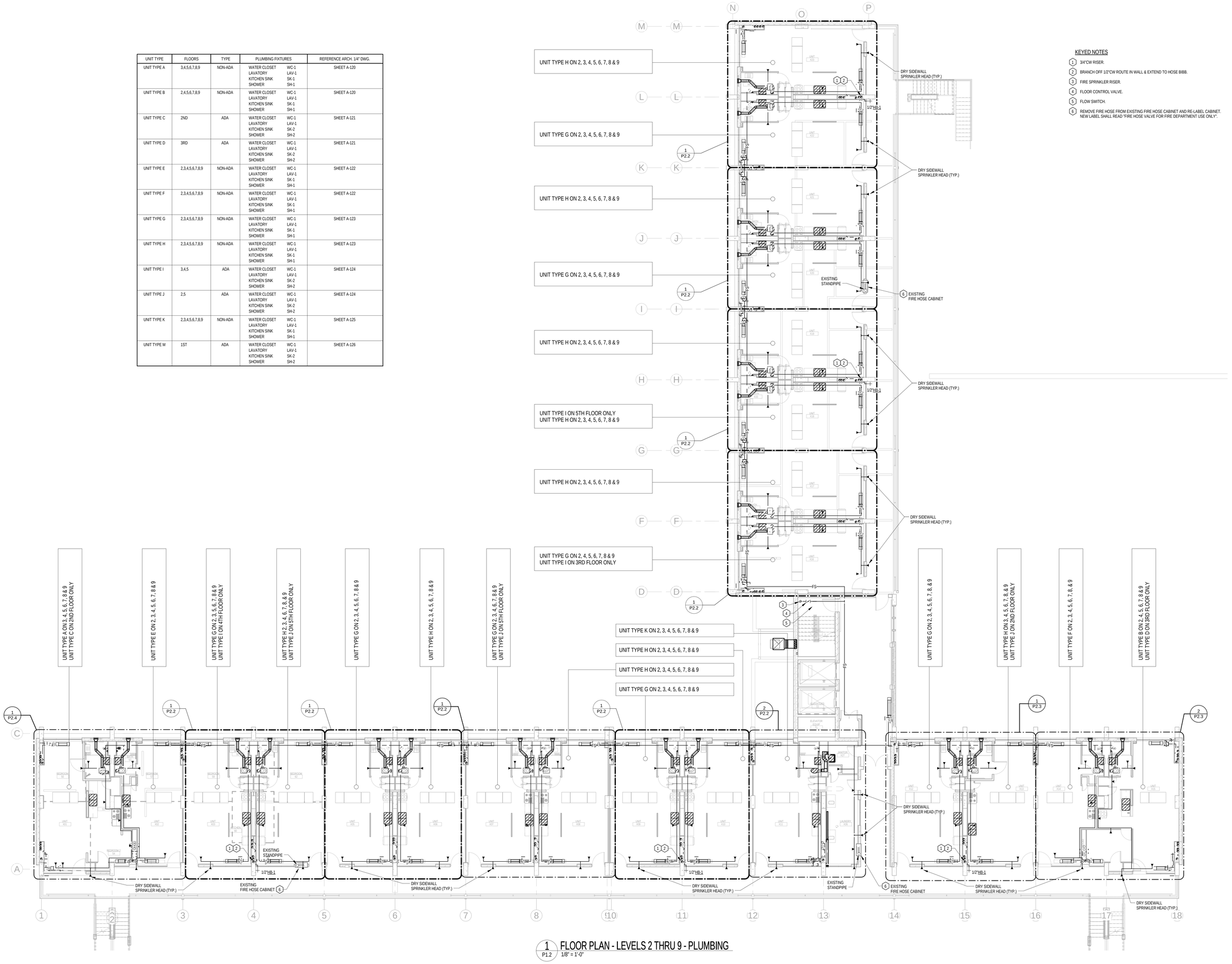
FLOOR PLAN - LEVEL 1 - PLUMBING

SHEET NUMBER
P1.1

UNIT TYPE	FLOORS	TYPE	PLUMBING FIXTURES		REFERENCE ARCH. 1/4" DWG.
UNIT TYPE A	3,4,5,6,7,8,9	NON-ADA	WATER CLOSET LAVATORY KITCHEN SINK SHOWER	WC-1 LAV-1 SK-1 SH-1	SHEET A-120
UNIT TYPE B	2,4,5,6,7,8,9	NON-ADA	WATER CLOSET LAVATORY KITCHEN SINK SHOWER	WC-1 LAV-1 SK-1 SH-1	SHEET A-120
UNIT TYPE C	2ND	ADA	WATER CLOSET LAVATORY KITCHEN SINK SHOWER	WC-1 LAV-1 SK-2 SH-2	SHEET A-121
UNIT TYPE D	3RD	ADA	WATER CLOSET LAVATORY KITCHEN SINK SHOWER	WC-1 LAV-1 SK-2 SH-2	SHEET A-121
UNIT TYPE E	2,3,4,5,6,7,8,9	NON-ADA	WATER CLOSET LAVATORY KITCHEN SINK SHOWER	WC-1 LAV-1 SK-1 SH-1	SHEET A-122
UNIT TYPE F	2,3,4,5,6,7,8,9	NON-ADA	WATER CLOSET LAVATORY KITCHEN SINK SHOWER	WC-1 LAV-1 SK-1 SH-1	SHEET A-122
UNIT TYPE G	2,3,4,5,6,7,8,9	NON-ADA	WATER CLOSET LAVATORY KITCHEN SINK SHOWER	WC-1 LAV-1 SK-1 SH-1	SHEET A-123
UNIT TYPE H	2,3,4,5,6,7,8,9	NON-ADA	WATER CLOSET LAVATORY KITCHEN SINK SHOWER	WC-1 LAV-1 SK-1 SH-1	SHEET A-123
UNIT TYPE I	3,4,5	ADA	WATER CLOSET LAVATORY KITCHEN SINK SHOWER	WC-1 LAV-1 SK-2 SH-2	SHEET A-124
UNIT TYPE J	2,5	ADA	WATER CLOSET LAVATORY KITCHEN SINK SHOWER	WC-1 LAV-1 SK-2 SH-2	SHEET A-124
UNIT TYPE K	2,3,4,5,6,7,8,9	NON-ADA	WATER CLOSET LAVATORY KITCHEN SINK SHOWER	WC-1 LAV-1 SK-1 SH-1	SHEET A-125
UNIT TYPE M	1ST	ADA	WATER CLOSET LAVATORY KITCHEN SINK SHOWER	WC-1 LAV-1 SK-2 SH-2	SHEET A-126



KEYED NOTES

1. 3/4"CW RISER.
2. BRANCH OFF 1/2"CW ROUTE IN WALL & EXTEND TO HOSE BIBB.
3. FIRE SPRINKLER RISER.
4. FLOOR CONTROL VALVE.
5. FLOW SWITCH.
6. REMOVE FIRE HOSE FROM EXISTING FIRE HOSE CABINET AND RE-LABEL CABINET. NEW LABEL SHALL READ "FIRE HOSE VALVE FOR FIRE DEPARTMENT USE ONLY".

1 P1.2 FLOOR PLAN - LEVELS 2 THRU 9 - PLUMBING
1/8" = 1'-0"

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PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
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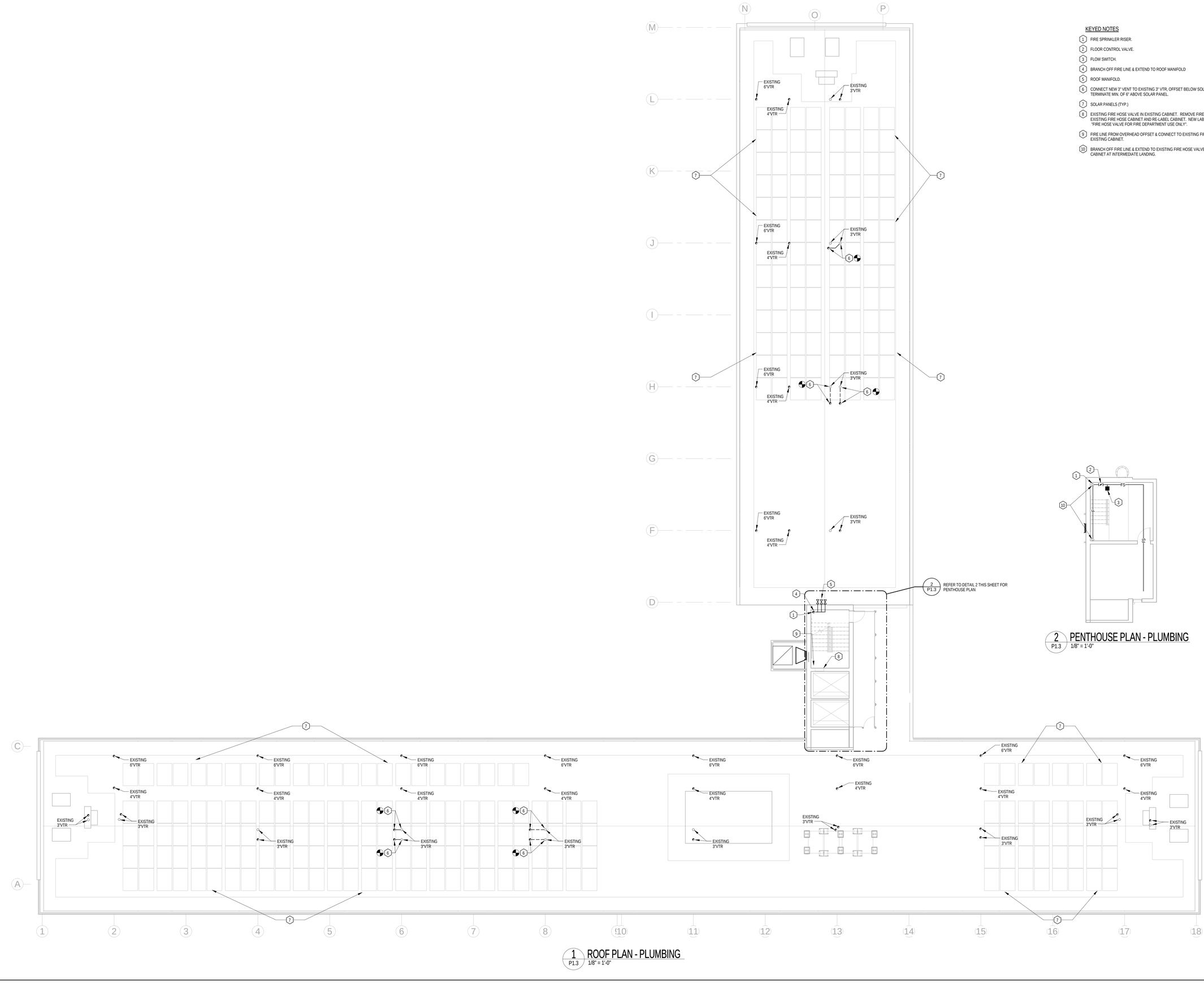
TEXAS LICENSE NO. 10–881

FLOOR PLAN - LEVEL 2 THRU 9 - PLUMBING

SHEET NUMBER
P1.2



1 ROOF PLAN - PLUMBING
P1.3 1/8" = 1'-0"

2 PENTHOUSE PLAN - PLUMBING
P1.3 1/8" = 1'-0"

KEYED NOTES

1. FIRE SPRINKLER RISER.
2. FLOOR CONTROL VALVE.
3. FLOW SWITCH.
4. BRANCH OFF FIRE LINE & EXTEND TO ROOF MANIFOLD
5. ROOF MANIFOLD.
6. CONNECT NEW 3" VENT TO EXISTING 3" VTR, OFFSET BELOW SOLAR PANEL AND TERMINATE MIN. OF 6" ABOVE SOLAR PANEL.
7. SOLAR PANELS (TYP.)
8. EXISTING FIRE HOSE VALVE IN EXISTING CABINET. REMOVE FIRE HOSE FROM EXISTING FIRE HOSE CABINET AND RE-LABEL CABINET. NEW LABEL SHALL READ "FIRE HOSE VALVE FOR FIRE DEPARTMENT USE ONLY".
9. FIRE LINE FROM OVERHEAD OFFSET & CONNECT TO EXISTING FIRE HOSE VALVE IN EXISTING CABINET.
10. BRANCH OFF FIRE LINE & EXTEND TO EXISTING FIRE HOSE VALVE IN EXISTING CABINET AT INTERMEDIATE LANDING.

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ROOF PLAN/PENTHOUSE PLAN - PLUMBING

SHEET NUMBER
P1.3

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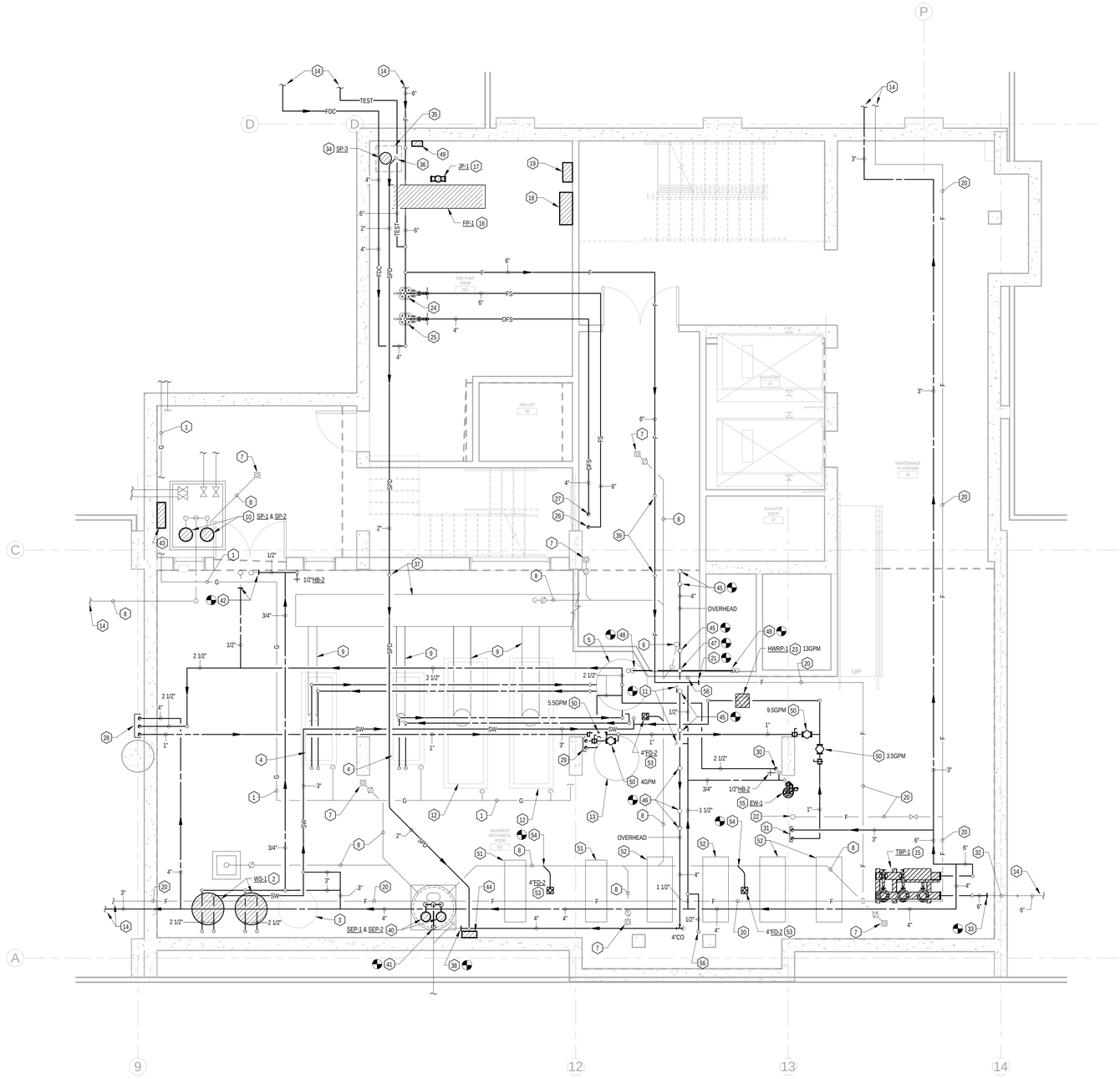

1 P2.1 ENLARGED BASEMENT PLAN - PLUMBING
1/4" = 1'-0"

KEYED NOTES

1. EXISTING GAS PIPING TO BOILERS.
2. NEW WATER SOFTENER. REFER TO DETAIL 2/P3.2.
3. EXISTING BRINE TANK.
4. EXISTING DOMESTIC WATER HEATER.
5. EXISTING DOMESTIC HOT WATER STORAGE TANK.
6. EXISTING VENT STACK.
7. EXISTING FLOOR DRAIN.
8. EXISTING WASTE PIPING BELOW FLOOR.
9. EXISTING FLUE.
10. NEW STORM WATER DUPLEX SUMP PUMPS IN EXISTING BASIN. REFER TO DETAIL 4/P3.1.
11. CONNECT NEW 1 1/2"CW & 3/4"HW TO EXISTING 1 1/2"CW & 3/4"HW RISING TO EXISTING MEN/WOMEN TOILET ROOM ON 1ST LEVEL.
12. EXISTING BUILDING HEATING BOILER. REFER TO HVAC DWGS.
13. HOT WATER BUFFER TANK. REFER TO HVAC DWGS.
14. REFER TO SHEET P1.0 FOR CONTINUATION.
15. TRIPLEX BOOSTER PUMP. REFER TO DETAIL 1/P3.1
16. FIRE PUMP. REFER TO DETAIL 1/P3.2.
17. JOCKEY PUMP. REFER TO DETAIL 1/P3.2.
18. FIRE PUMP CONTROLLER.
19. JOCKEY PUMP CONTROLLER.
20. EXISTING FIRE LINE FOR BUILDING STANDPIPES.
21. CONNECT NEW 6" FIRE LINE TO EXISTING.
22. EXISTING STANDPIPE.
23. HOT WATER RECIRC. PUMP.
24. WET PIPE FIRE SPRINKLER RISER ASSEMBLY. REFER TO DETAIL 2/P3.1.
25. DRY PIPE FIRE SPRINKLER RISER ASSEMBLY. REFER TO DETAIL 2/P3.1.
26. WET PIPE FIRE SPRINKLER PIPE RISE IN MECH. ROOM ON FLOOR ABOVE.
27. DRY PIPE FIRE SPRINKLER PIPE RISE IN MECH. ROOM ON FLOOR ABOVE.
28. 4"CW, 2 1/2"HW & 1"HWR PIPE RISE IN CHASE ON FLOOR ABOVE.
29. 2 1/2"HW & 1" HWR PIPE RISE IN CHASE ON FLOOR ABOVE.
30. 2 1/2"HW PIPE RISE IN CHASE ON FLOOR ABOVE.
31. 3"CW & 1"HWR PIPE RISE IN CHASE ON FLOOR ABOVE.
32. EXISTING WATER LINE.
33. CONNECT NEW 6" DOMESTIC WATER LINE TO EXISTING.
34. SUMP PUMP IN SUMP PUMP PIT. REFER TO DETAIL 7/P3.2.
35. SAWCUT EXISTING FLOOR FOR INSTALLATION OF NEW SUMP PUMP PIT.
36. EXTEND SUMP PUMP DISCHARGE TO OVERHEAD.
37. OFFSET SPD LINE TO AVOID CONFLICT WITH EXISTING FLUE.
38. CONNECT 4" WASTE PIPE TO EXISTING 4" WASTE PIPE OVERHEAD.
39. OFFSET FIRE PROTECTION LINE TO AVOID CONFLICT WITH EXISTING FLUE.
40. NEW DUPLEX SEWAGE EJECTOR PUMPS IN EXISTING BASIN. REFER TO DETAIL 3/P3.1.
41. CONNECT NEW 4" SEWAGE EJECTOR PUMP DISCHARGE TO EXISTING WASTE LINE OVERHEAD.
42. CONNECT NEW 1/2"CW & 1/2"HW TO EXISTING 1/2"CW & 1/2"HW RISING TO SINK ON 1ST LEVEL.
43. NEW STORM WATER DUPLEX SUMP PUMP CONTROL PANEL.
44. NEW DUPLEX SEWAGE EJECTOR PUMP CONTROL PANEL.
45. CONNECT EXISTING 4"WASTE LINE FROM PLUMBING FIXTURE ABOVE TO NEW 4" WASTE LINE.
46. CONNECT EXISTING 2"WASTE LINE FROM PLUMBING FIXTURE ABOVE TO NEW 4" WASTE LINE.
47. CONNECT EXISTING 1 1/2" VENT LINE FROM ABOVE TO NEW 1 1/2" VENT LINE.
48. CONNECT EXISTING 3" WASTE LINE TO NEW 3" WASTE LINE.
49. SUMP PUMP CONTROL PANEL.
50. CIRCUIT SETTER. BALANCE @ FLOW INDICATED.
51. HOT WATER PUMP. REFER TO HVAC DWGS.
52. CHILLED WATER PUMP. REFER TO HVAC DWGS.
53. SAWCUT EXISTING FLOOR FOR INSTALLATION OF NEW FLOOR AND ASSOCIATED WASTE PIPE. CONNECT TO NEAREST EXISTING WASTE PIPE BELOW FLOOR. REFER TO DETAIL 8/P3.2 FOR SAW CUTTING.
54. CONNECT NEW 4" WASTE PIPE TO EXISTING WASTE PIPE BELOW FLOOR.
55. FREE STANDING EYEWASH.
56. 1/2"CW LINE OFFSET TO TRAP PRIMER VALVE, EXTEND DISCHARGE TO FLOOR DRAINS. REFER TO DETAIL 4/P3.2.

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PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

ENLARGED BASEMENT PLAN - PLUMBING

SHEET NUMBER
P2.1

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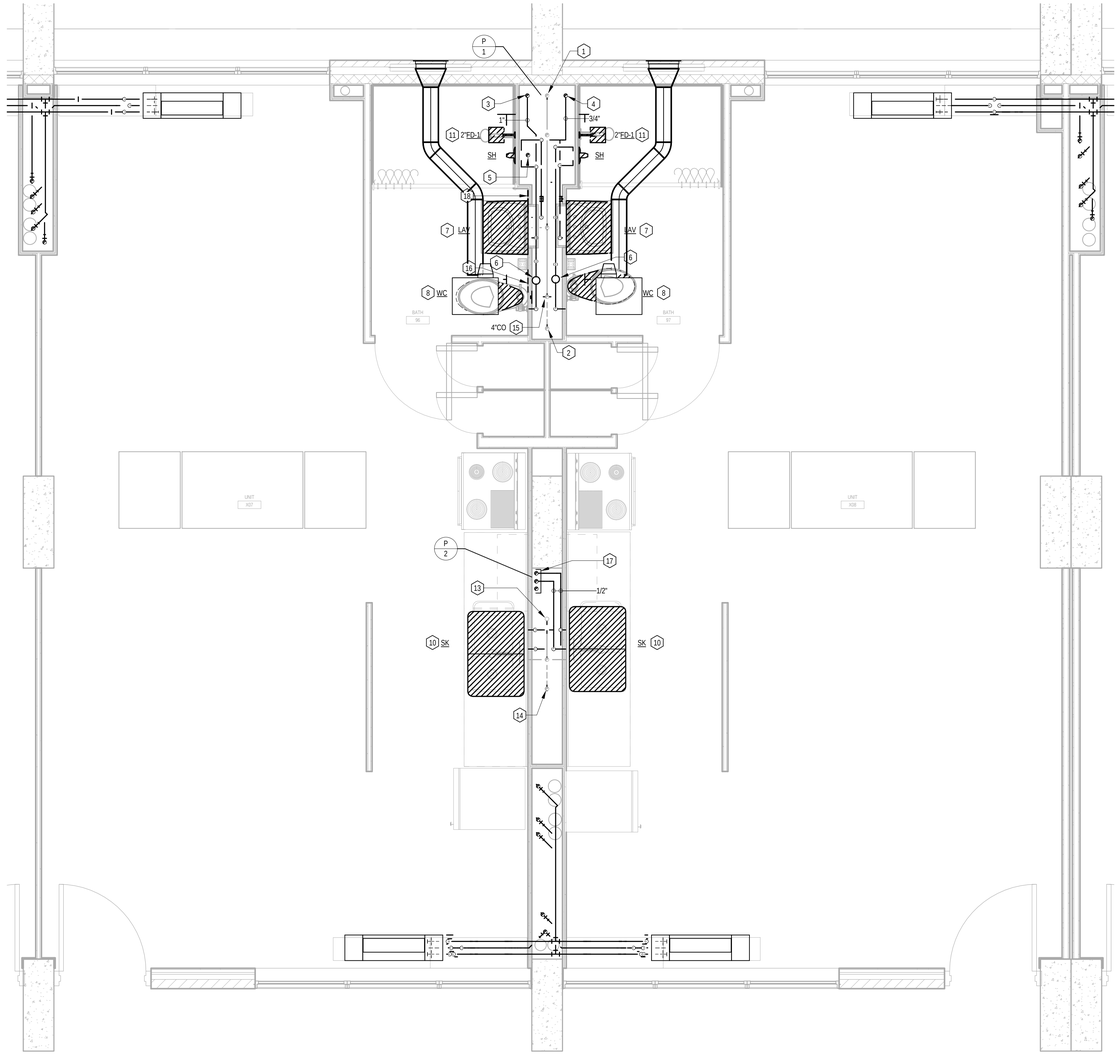
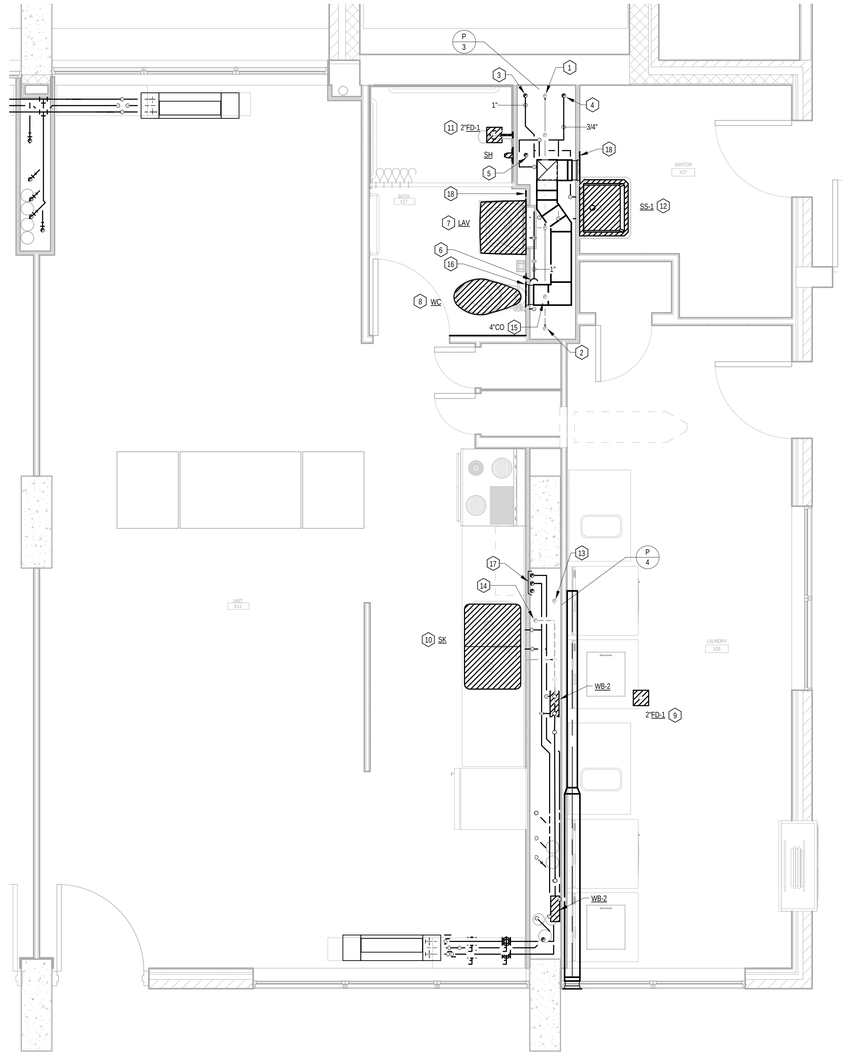
NOTE

REFER TO SCHEDULE ON SHEET P1.2 FOR FIXTURE TYPE FURNISHED BASED ON UNIT TYPE AT EACH FLOOR LEVEL



1 P2.2 ENLARGED FLOOR PLAN - UNITS X07, UNIT X08 - PLUMBING
1/2" = 1'-0"



2 P2.2 ENLARGED FLOOR PLAN - UNIT X11, LAUNDRY X28, JANITOR X26 - PLUMBING
1/2" = 1'-0"

KEYED NOTES

1. EXISTING 6" SOIL STACK.
2. EXISTING 4" VENT STACK.
3. NEW COLD WATER RISER.
4. NEW HOT WATER RISER.
5. NEW HOT WATER RETURN RISER.
6. PDI SIZE "B" SHOCK ARRESTOR W/ACCESS DOOR.
7. NEW LAVATORY. CONNECT TO EXISTING WASTE ROUGH-IN.
8. NEW WATER CLOSET. CONNECT TO EXISTING WASTE ROUGH-IN
9. NEW FLOOR DRAIN CONNECT TO EXISTING WASTE LINE.
10. NEW SINK. CONNECT TO EXISTING WASTE ROUGH-IN.
11. NEW SHOWER DRAIN . CONNECT TO EXISTING WASTE LINE.
12. NEW SERVICE SINK. CONNECT TO EXISTING WASTE ROUGH-IN.
13. EXISTING 3" WASTE STACK TO REMAIN.
14. EXISTING 3" VENT STACK TO REMAIN.
15. REMOVE PORTION OF EXISTING VENT PIPE. FURNISH & INSTALL CLEANOUT ABOVE WATER CLOSET'S FLOOD LEVEL RIM. COORDINATE LOCATION WITH FLUSHVALVE.
16. FURNISH & INSTALL ACCESS DOOR FOR SHOCK ARRESTOR AND CLEANOUT.
17. NEW CW,HW & HWR RISERS.
18. FURNISH & INSTALL ACCESS DOOR FOR ISOLATION VALVES.

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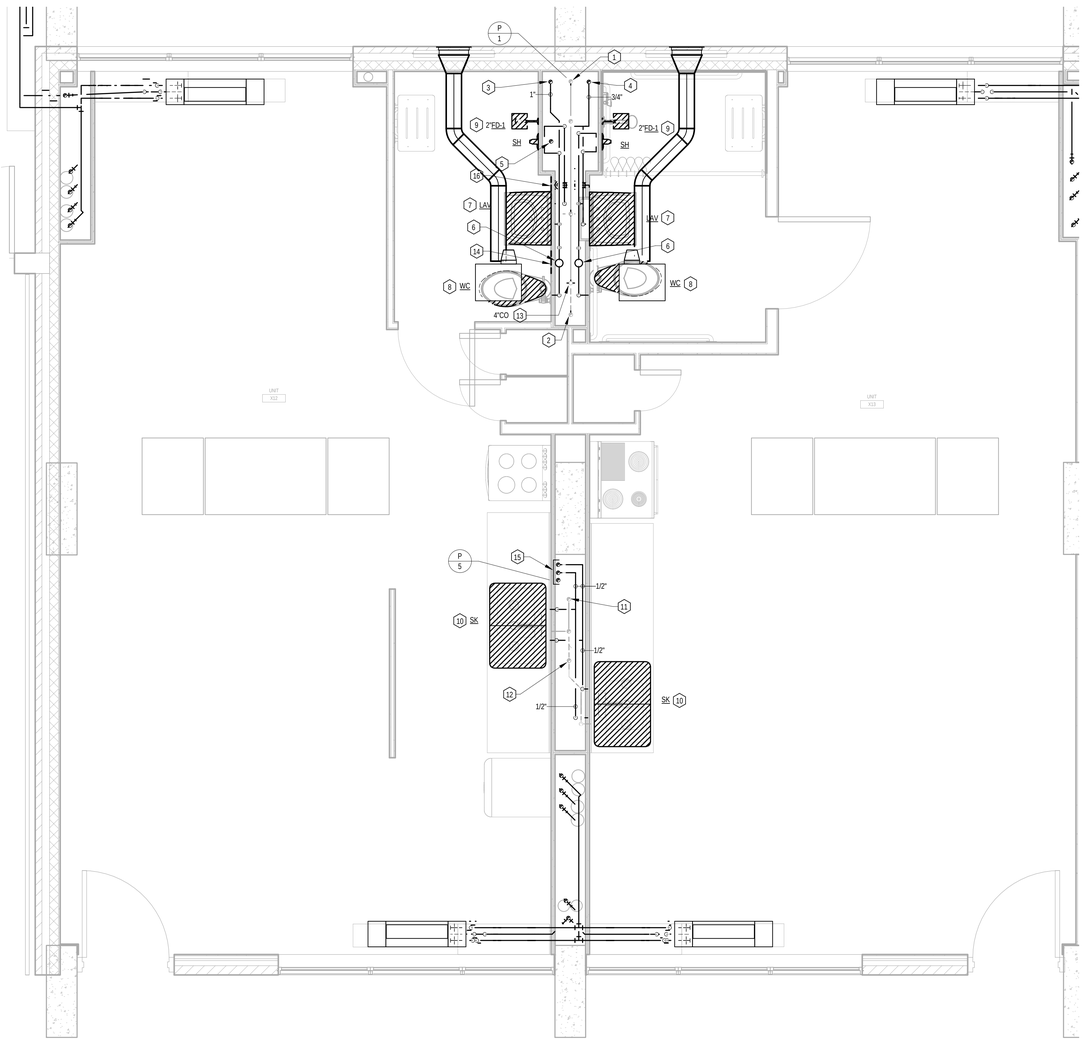
TEXAS LICENSE NO. 10–681

ENLARGED FLOOR PLANS - PLUMBING

SHEET NUMBER
P2.2

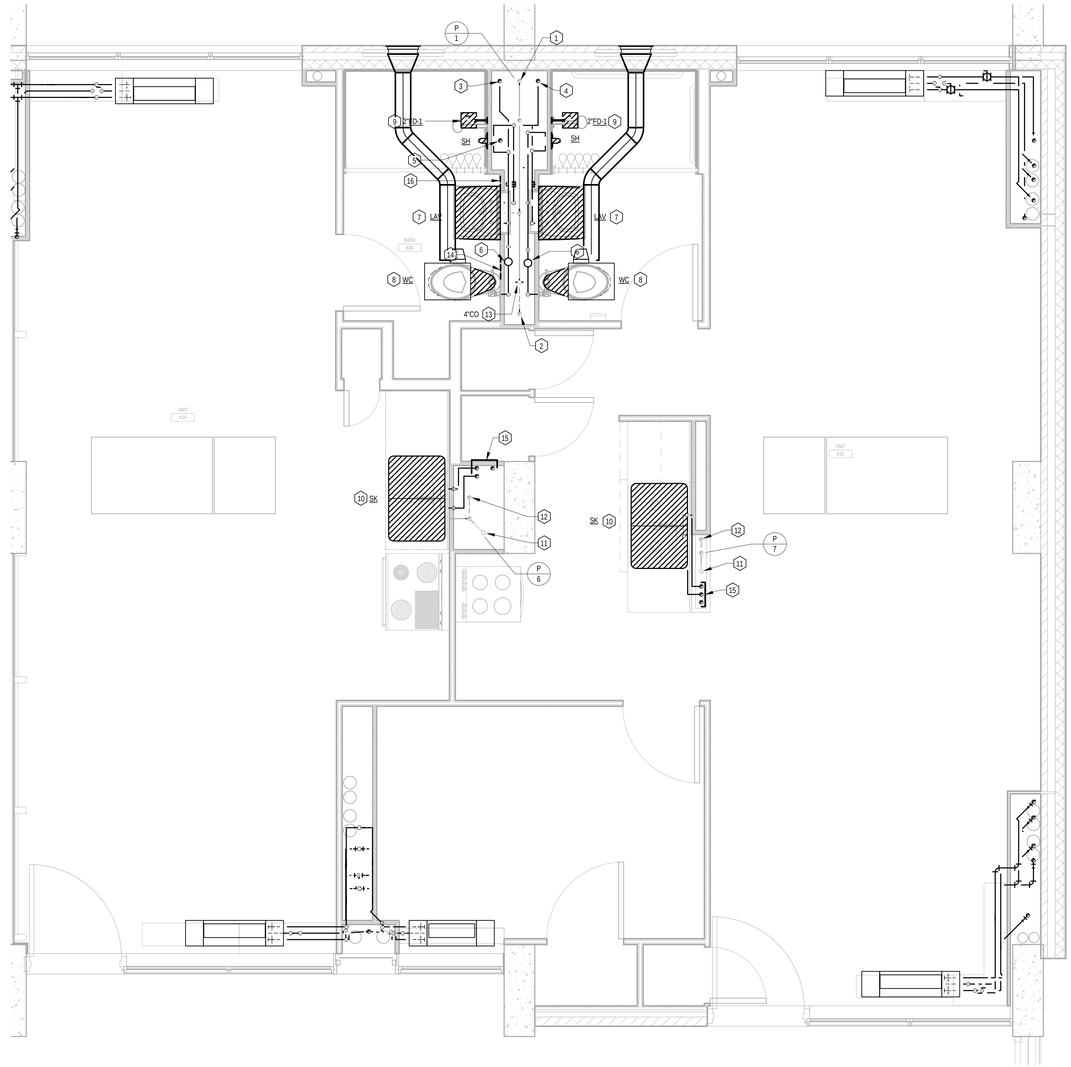
NOTE

REFER TO SCHEDULE ON SHEET P1.2 FOR FIXTURE TYPE FURNISHED BASED ON UNIT TYPE AT EACH FLOOR LEVEL



1 P2.3 ENLARGED FLOOR PLAN - UNIT X12, UNIT X13 - PLUMBING

1/2" = 1'-0"



2 P2.3 ENLARGED FLOOR PLAN - UNIT X14, UNIT X15 - PLUMBING

1/2" = 1'-0"

KEYED NOTES

1. EXISTING 6" SOIL STACK.
2. EXISTING 4" VENT STACK.
3. NEW COLD WATER RISER.
4. NEW HOT WATER RISER.
5. NEW HOT WATER RETURN RISER.
6. PDI SIZE "B" SHOCK ARRESTOR W/ACCESS DOOR.
7. NEW LAVATORY. CONNECT TO EXISTING WASTE ROUGH-IN.
8. NEW WATER CLOSET. CONNECT TO EXISTING WASTE ROUGH-IN
9. NEW SHOWER DRAIN CONNECT TO EXISTING WASTE LINE.
10. NEW SINK. CONNECT TO EXISTING WASTE ROUGH-IN.
11. EXISTING 3" WASTE STACK TO REMAIN.
12. EXISTING 3" VENT STACK TO REMAIN.
13. REMOVE PORTION OF EXISTING VENT PIPE. FURNISH & INSTALL CLEANOUT ABOVE WATER CLOSET'S FLOOD LEVEL RIM. COORDINATE LOCATION WITH FLUSHVALVE.
14. FURNISH & INSTALL ACCESS DOOR FOR SHOCK ARRESTOR AND CLEANOUT.
15. NEW CW,HW & HWR RISERS.
16. FURNISH & INSTALL ACCESS DOOR FOR ISOLATION VALVES.

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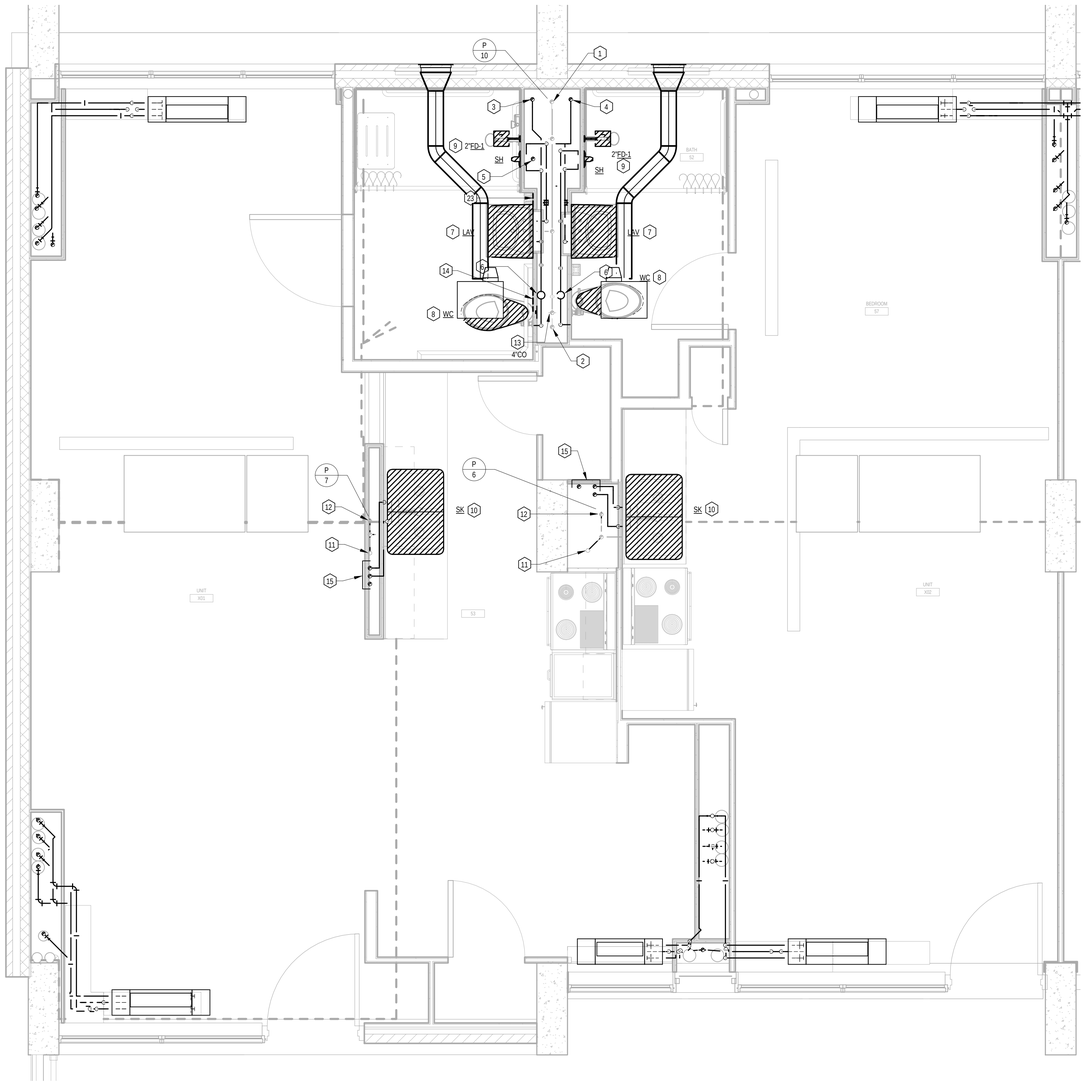
ENLARGED FLOOR PLANS - PLUMBING

SHEET NUMBER

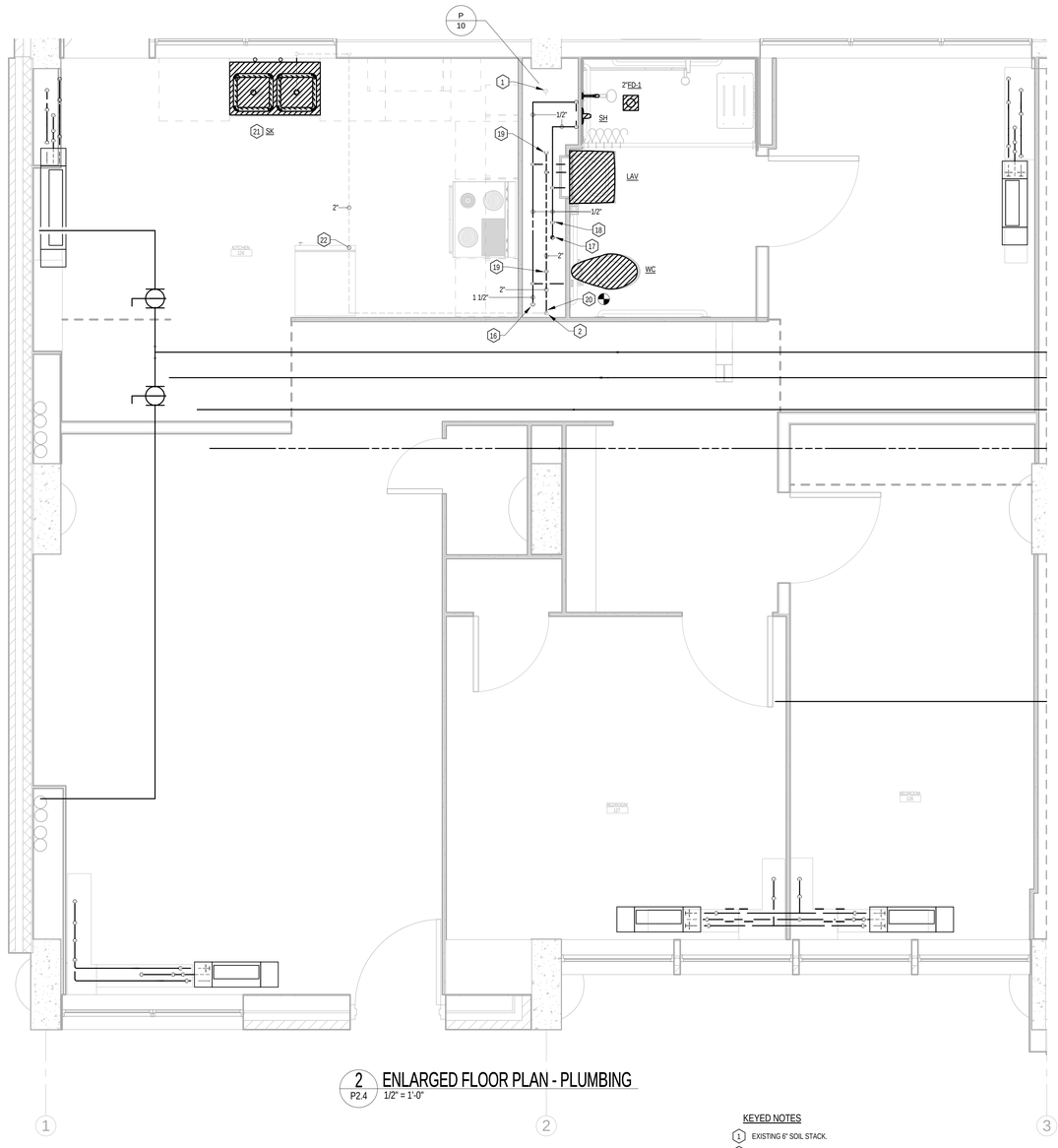
P2.3

NOTE

REFER TO SCHEDULE ON SHEET P1.2 FOR FIXTURE TYPE FURNISHED BASED ON UNIT TYPE AT EACH FLOOR LEVEL



1 P2.4 ENLARGED FLOOR PLAN - UNIT X01, UNIT X02 - PLUMBING
1/2" = 1'-0"



2 P2.4 ENLARGED FLOOR PLAN - PLUMBING
1/2" = 1'-0"

KEYED NOTES

1. EXISTING 6" SOIL STACK.
2. EXISTING 4" VENT STACK.
3. NEW COLD WATER RISER.
4. NEW HOT WATER RISER.
5. NEW HOT WATER RETURN RISER.
6. PDI SIZE "B" SHOCK ARRESTOR W/ACCESS DOOR.
7. NEW LAVATORY. CONNECT TO EXISTING WASTE ROUGH-IN.
8. NEW WATER CLOSET. CONNECT TO EXISTING WASTE ROUGH-IN
9. NEW SHOWER DRAIN CONNECT TO EXISTING WASTE LINE.
10. NEW SINK. CONNECT TO EXISTING WASTE ROUGH-IN.
11. EXISTING 3" WASTE STACK TO REMAIN.
12. EXISTING 3" VENT STACK TO REMAIN.
13. REMOVE PORTION OF EXISTING VENT PIPE. FURNISH & INSTALL CLEANOUT ABOVE WATER CLOSET'S FLOOD LEVEL RIM. COORDINATE LOCATION WITH PLUMBING FIXTURES.
14. FURNISH & INSTALL ACCESS DOOR FOR SHOCK ARRESTOR AND CLEANOUT.
15. NEW CW,HW & HWR RISERS.
16. 1 1/2"CW RISE FROM BELOW FLOOR EXTEND TO PLUMBING FIXTURES.
17. 3/4"HW FROM ABOVE CEILING.
18. 1/2"HW DROP TO BELOW FLOOR.
19. 2" VENT RISE FROM BELOW FLOOR EXTEND TO VENT SYSTEM IN CHASE.
20. CONNECT NEW 2" VENT TO EXISTING 4"VENT STACK.
21. NEW SINK CONNECT TO MODIFIED ROUGH-IN.
22. EXISTING VENT ABOVE CEILING.
23. FURNISH & INSTALL ACCESS DOOR FOR ISOLATION VALVES.

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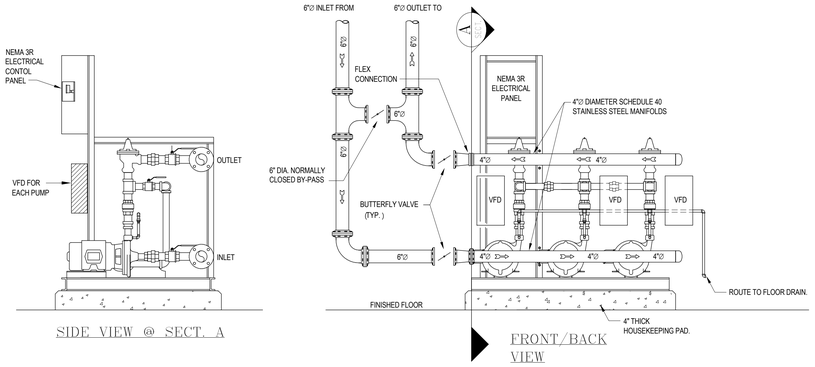
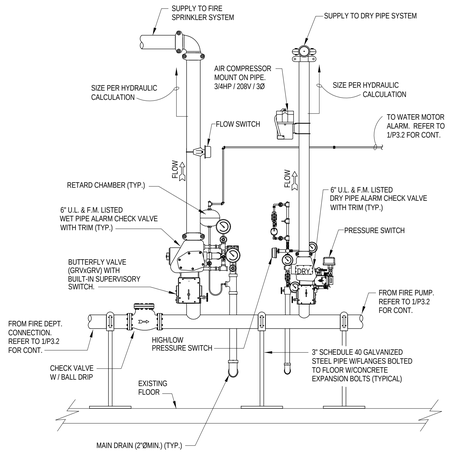
ENLARGED FLOOR PLANS - PLUMBING

SHEET NUMBER

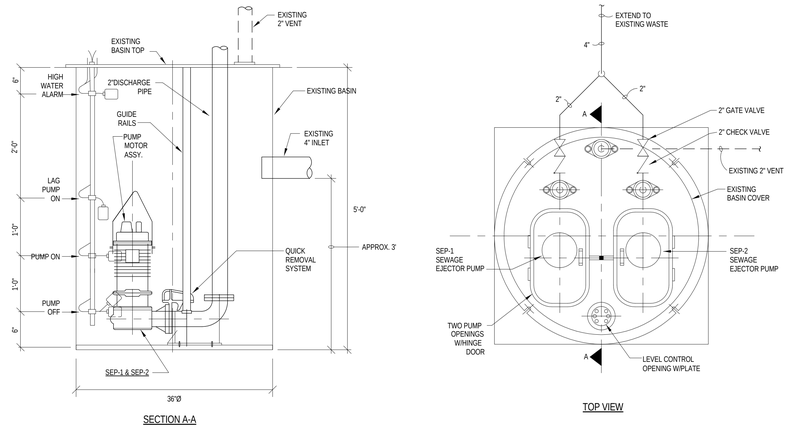
P2.4



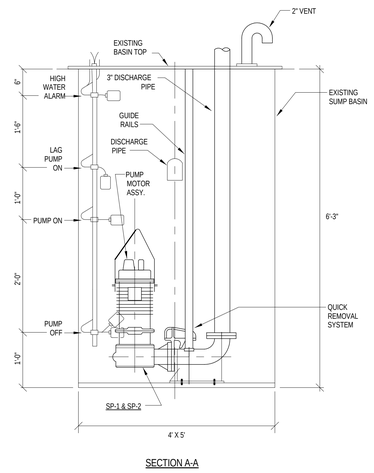
1 P3.1 DOMESTIC WATER PRESSURE BOOSTING SYSTEM - PIPING DIAGRAM
NOT TO SCALE

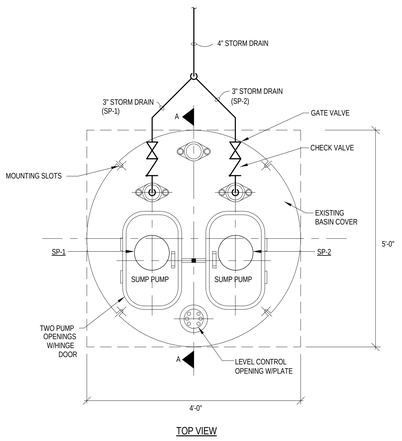


2 P3.1 WET & DRY FIRE SPRINKLER RISER ASSEMBLY
NOT TO SCALE

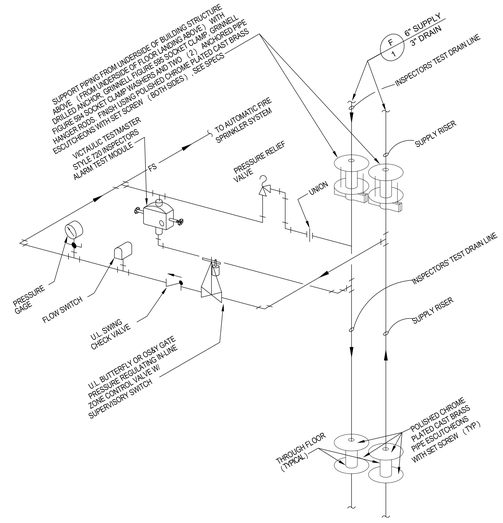


3 P3.1 DUPLEX SEWAGE EJECTOR PUMP DETAIL
1/8" = 1'-0"

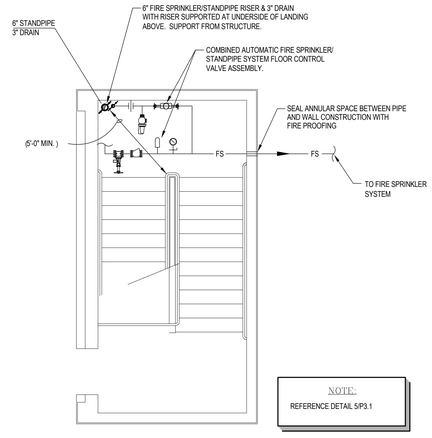




4 P3.1 DUPLEX SUMP PUMP DETAIL
NOT TO SCALE



5 P3.1 AUTOMATIC FIRE SPRINKLE RISER/FLOOR CONTROL VALVE ASSEMBLY
NOT TO SCALE



6 P3.1 TYPICAL STAIRWELL FIRE PROTECTION PIPING PLAN
NTS

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Fax: 210.525.0225
Texas Firm Registration #F-12003

SAN ANTONIO HOUSING AUTHORITY
VICTORIA PLAZA MODERNIZATION
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION:

REVISIONS		
ISSUE	DESCRIPTION	DATE

05/25/18
PERMIT SET

STATE OF TEXAS
MEHDI J. MIRMOMENI
113121
LICENSED
PROFESSIONAL ENGINEER
05/25/18

PROJECT ARCHITECT
GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

PLUMBING DETAILS

SHEET NUMBER
P3.1

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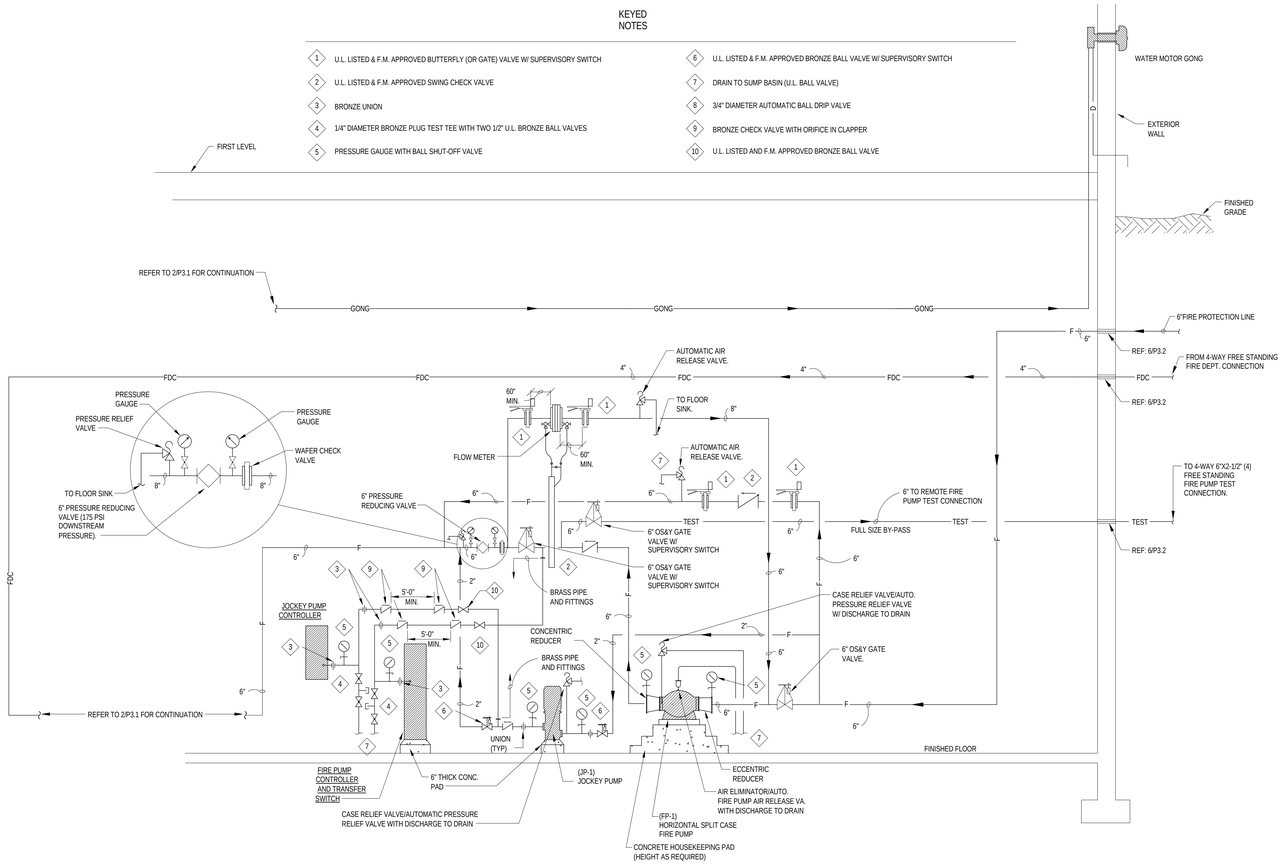
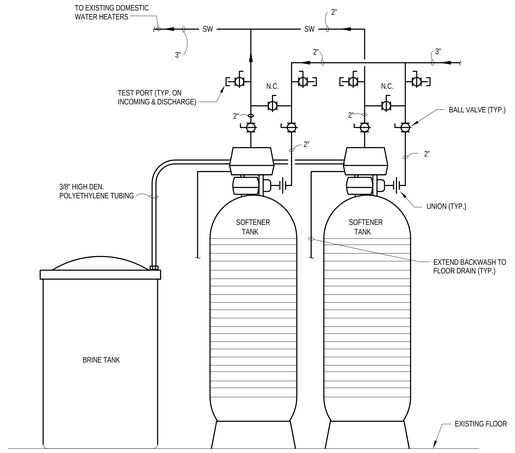
KEYED NOTES

1. U.L. LISTED & F.M. APPROVED BUTTERFLY (OR GATE) VALVE W/ SUPERVISORY SWITCH
2. U.L. LISTED & F.M. APPROVED SWING CHECK VALVE
3. BRONZE UNION
4. 1/4" DIAMETER BRONZE PLUG TEST TEE WITH TWO 1/2" U.L. BRONZE BALL VALVES
5. PRESSURE GAUGE WITH BALL SHUT-OFF VALVE
6. U.L. LISTED & F.M. APPROVED BRONZE BALL VALVE W/ SUPERVISORY SWITCH
7. DRAIN TO SUMP BASIN (U.L. BALL VALVE)
8. 3/4" DIAMETER AUTOMATIC BALL DRIP VALVE
9. BRONZE CHECK VALVE WITH ORIFICE IN CLAPPER
10. U.L. LISTED AND F.M. APPROVED BRONZE BALL VALVE



1 P3.2 FIRE PUMP PIPING DIAGRAM
NOT TO SCALE



2 P3.2 DUPLEX WATER SOFTENER DETAIL
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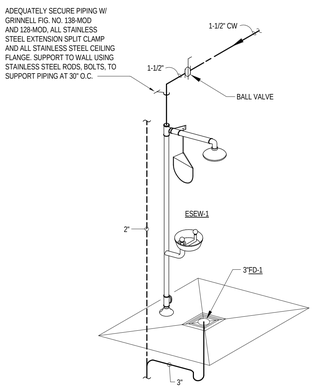
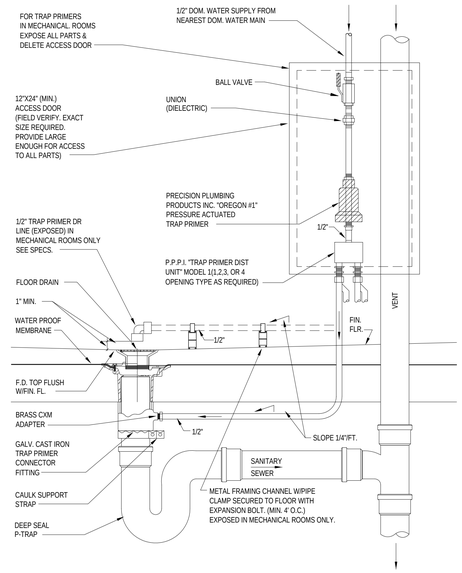
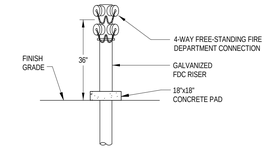


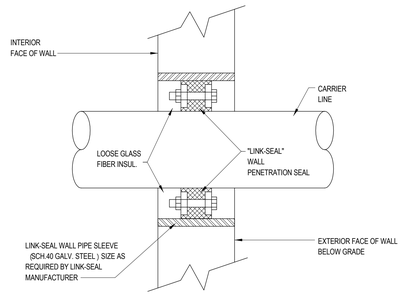
3 P3.2 EMERGENCY SHOWER / EYEWASH
NOT TO SCALE



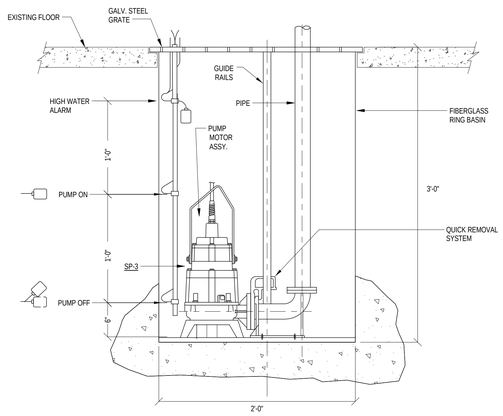
4 P3.2 TYPICAL TRAP PRIMER DETAIL
NOT TO SCALE



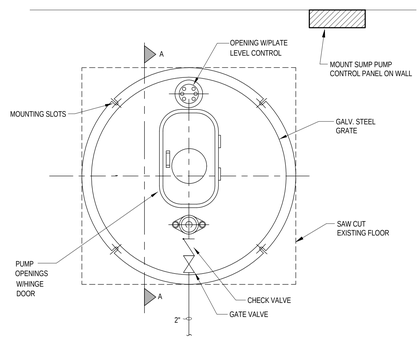
5 P3.2 FREE STANDING FIRE DEPT. CONNECTION
1/8" = 1'-0"



6 P3.2 PIPE BELOW GRADE THRU EXTERIOR WALL DETAIL
NOT TO SCALE

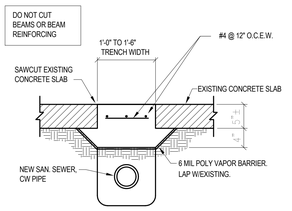


SECTION A-A



TOP VIEW

7 P3.2 SUMP PUMP DETAIL
NOT TO SCALE



8 P3.2 PIPE IN TRENCH DETAIL
1/8" = 1'-0"

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TEXAS LICENSE NO. 10–881

PLUMBING DETAILS

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P3.2

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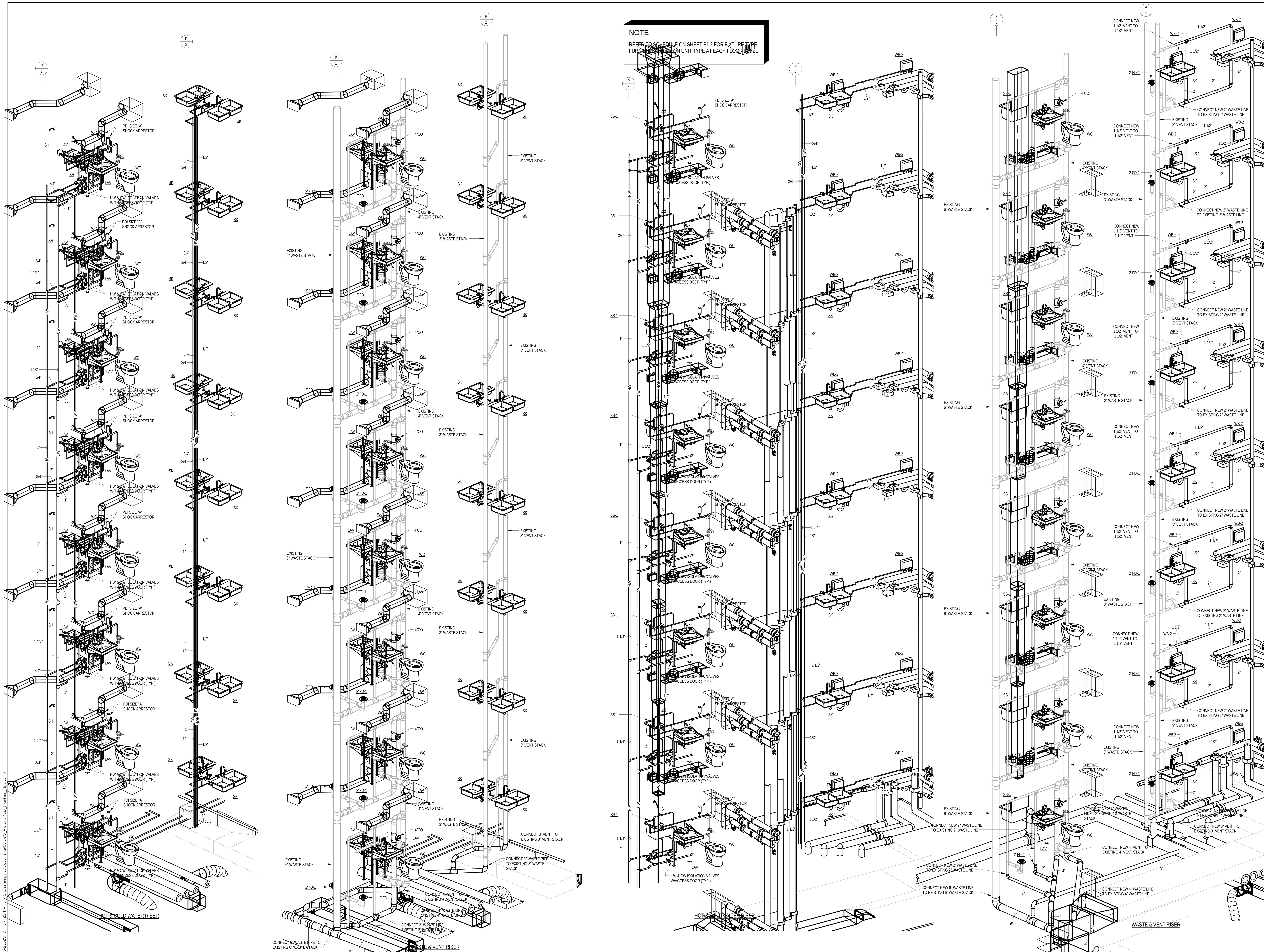
NOTE

REFER TO SCHEDULE ON SHEET P1.2 FOR FIXTURE TYPE FURNISHED BASED ON UNIT TYPE AT EACH FLOOR LEVEL



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TEXAS LICENSE NO. 10-881

PLUMBING RISERS

SHEET NUMBER
P4.1

NOTE

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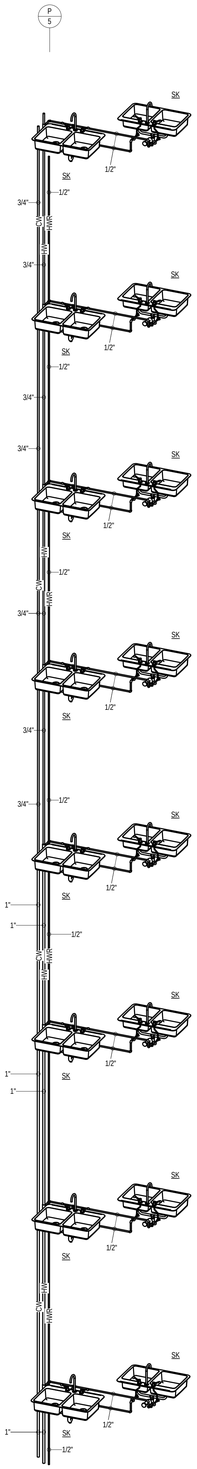
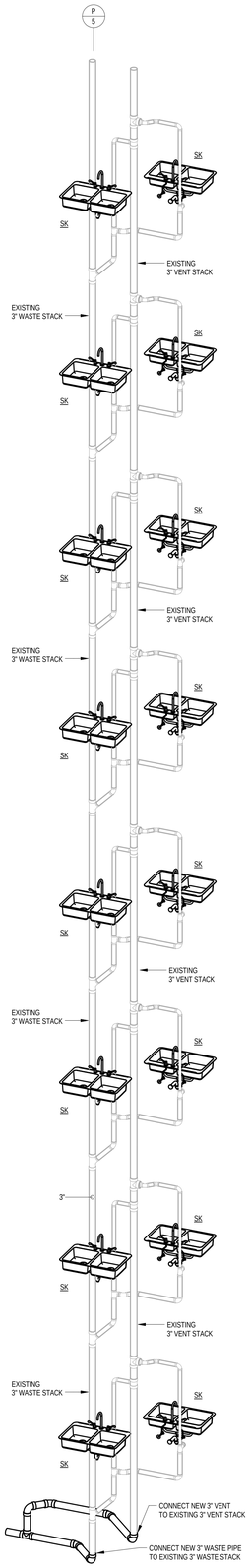
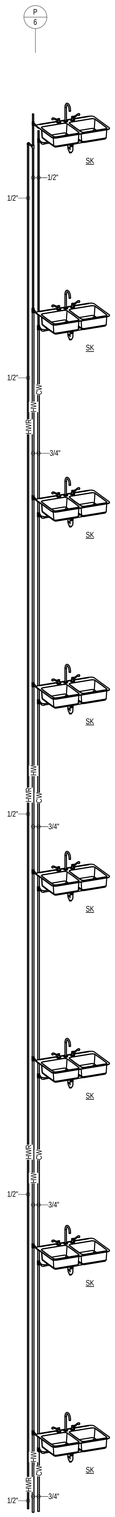


HOT & COLD WATER RISER



WASTE & VENT RISER



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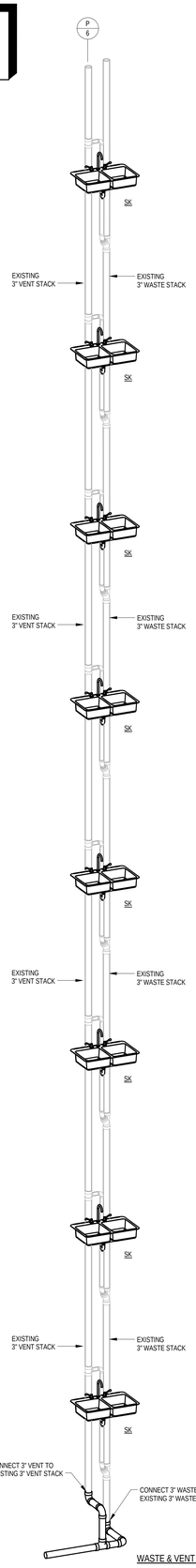
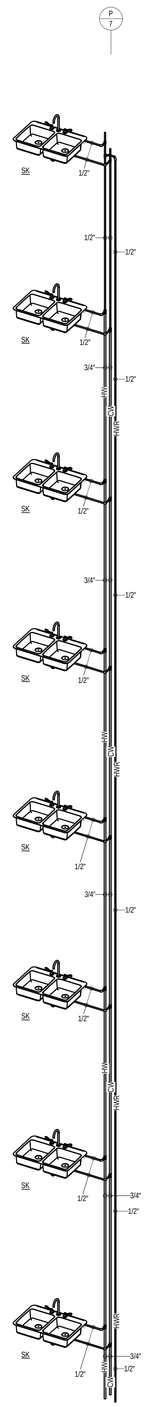


WASTE & VENT RISER



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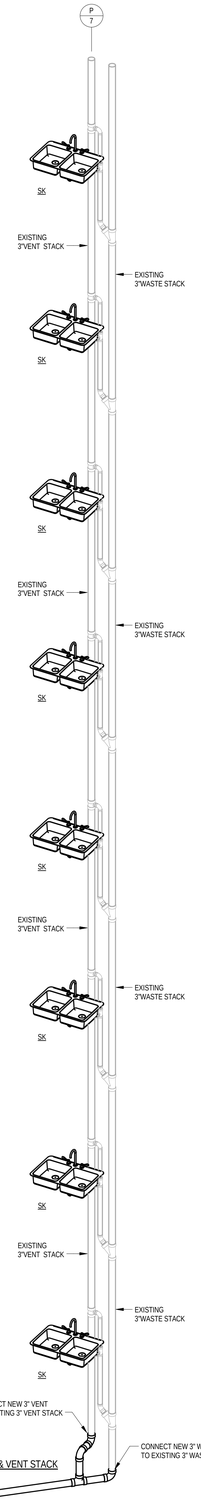

WASTE & VENT STACK

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GABRIEL DURAND–HOLLIS, AIA
TEXAS LICENSE NO. 10–881

PLUMBING RISERS

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NOTE

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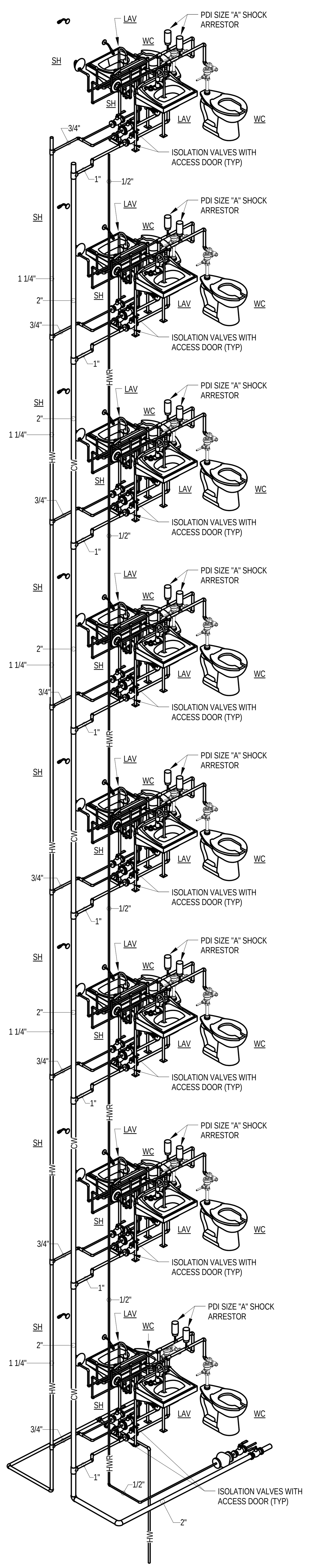
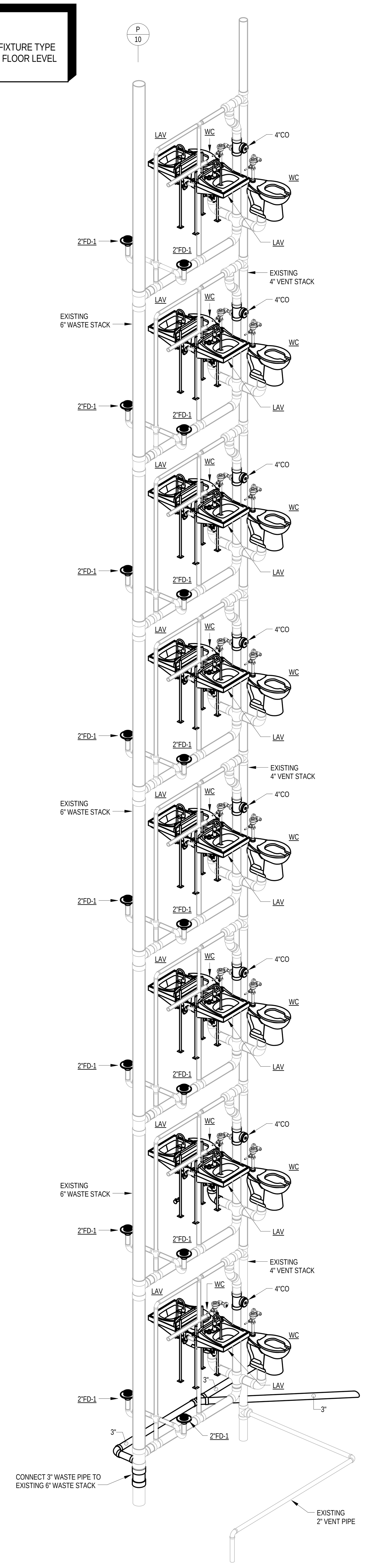


HOT & COLD WATER RISER



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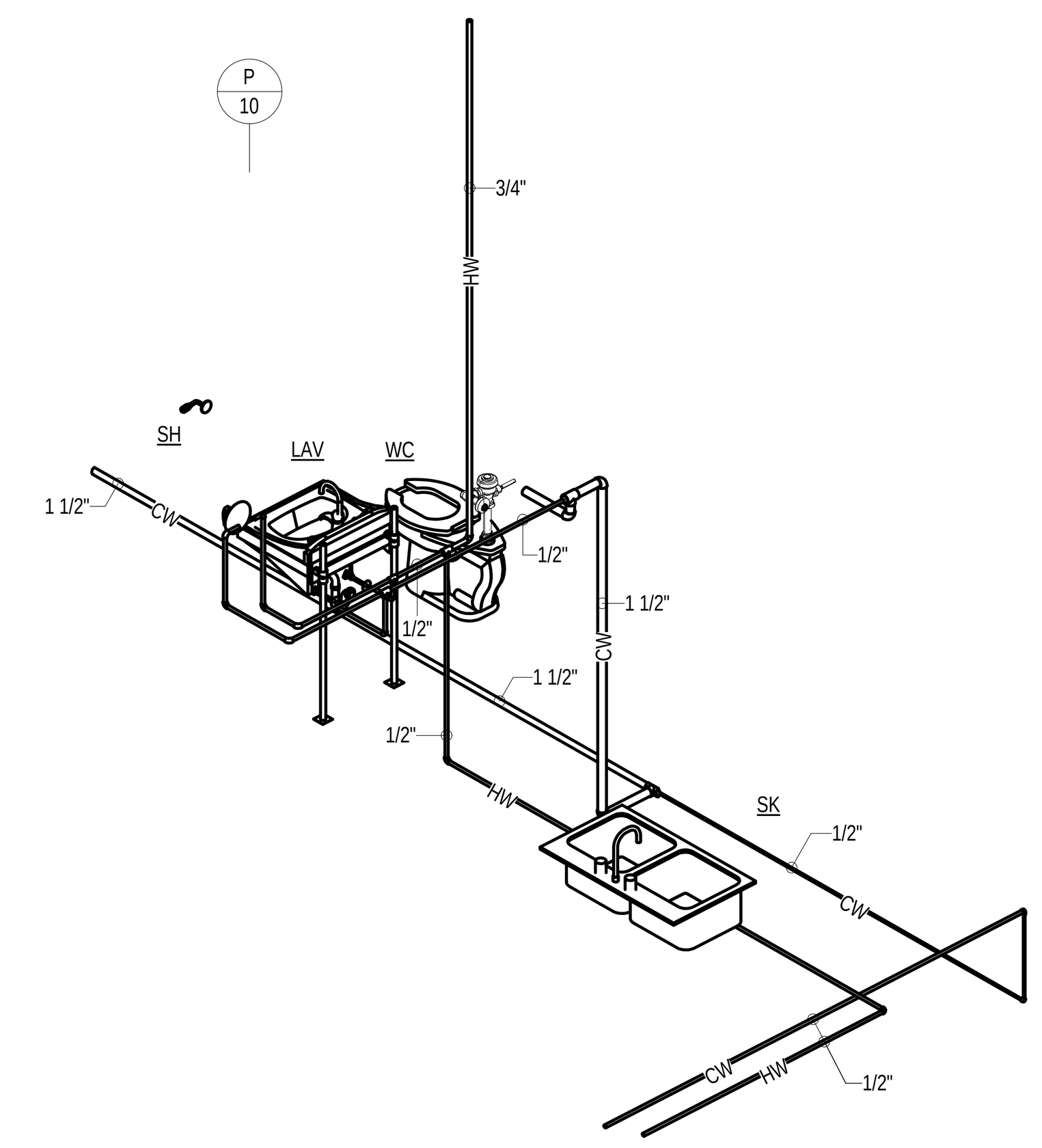
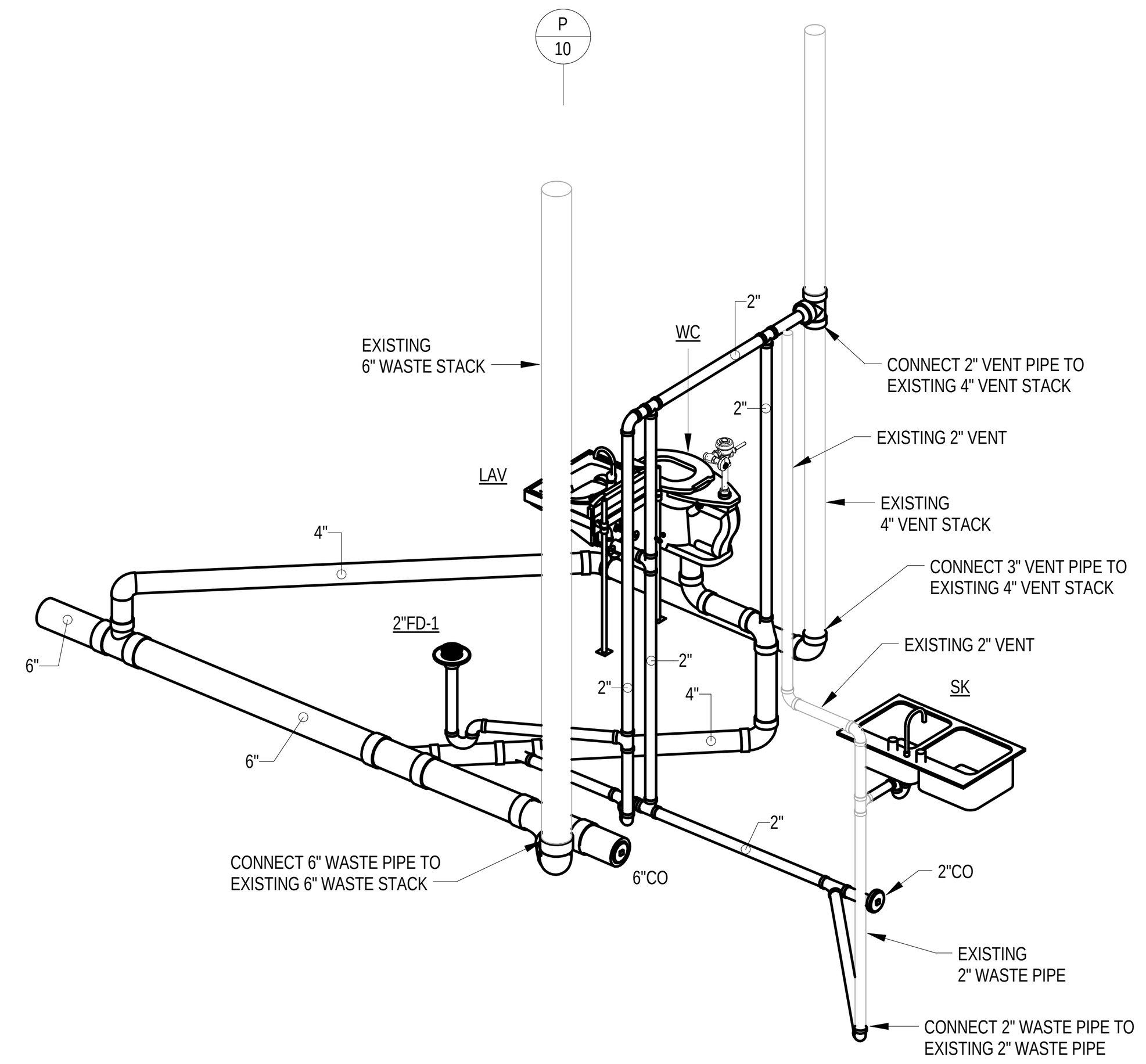


HOT & COLD WATER RISER



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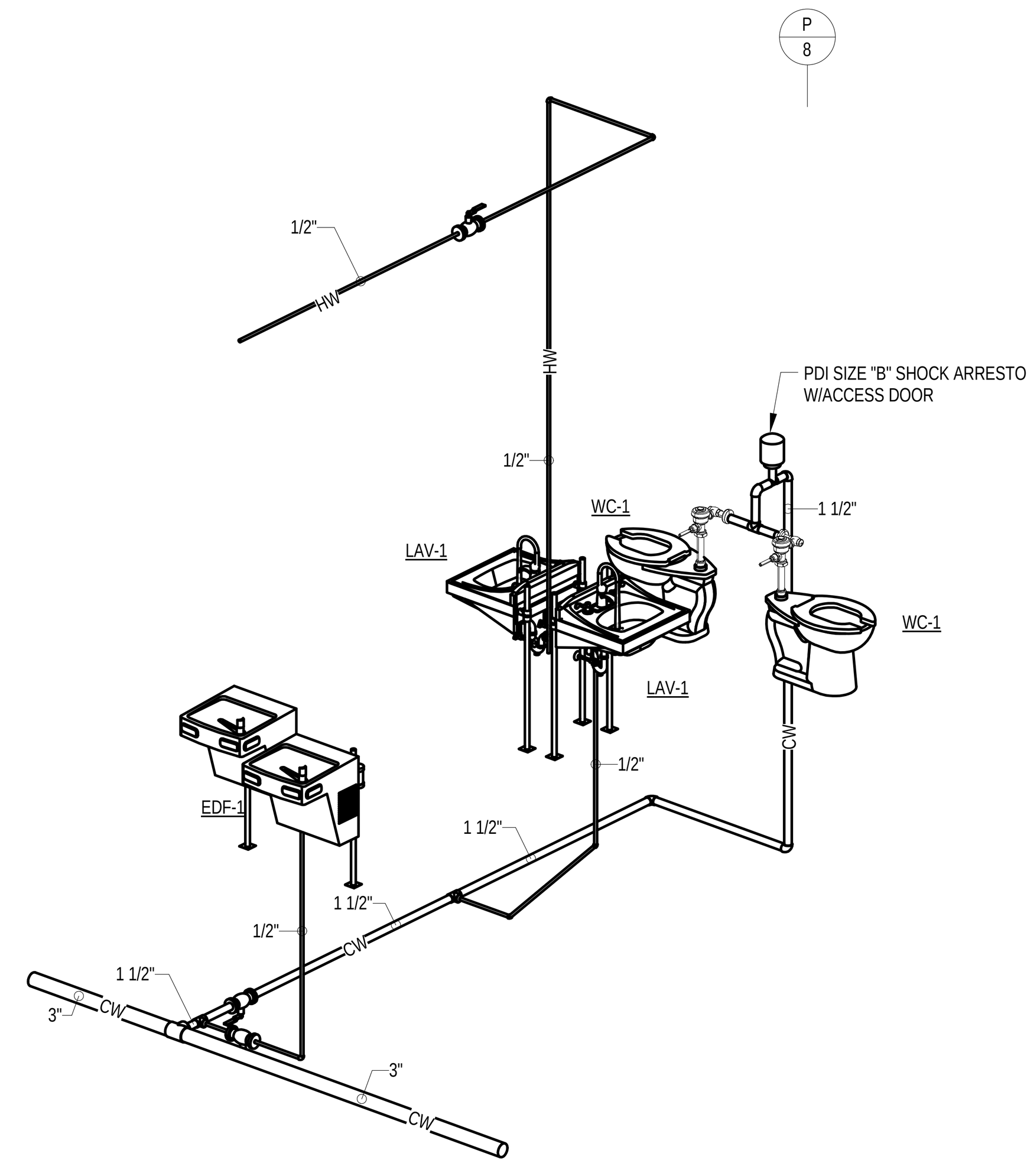

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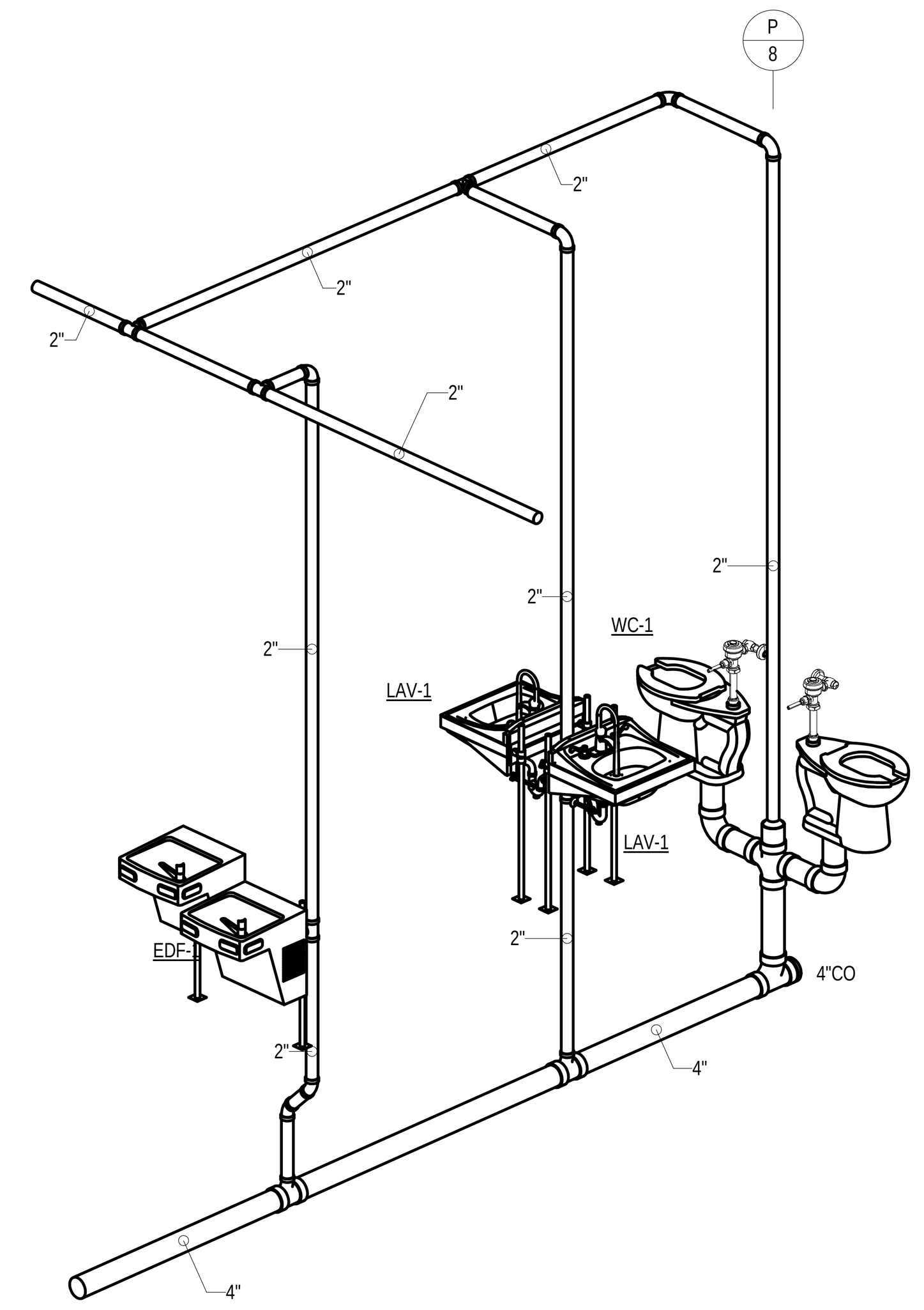
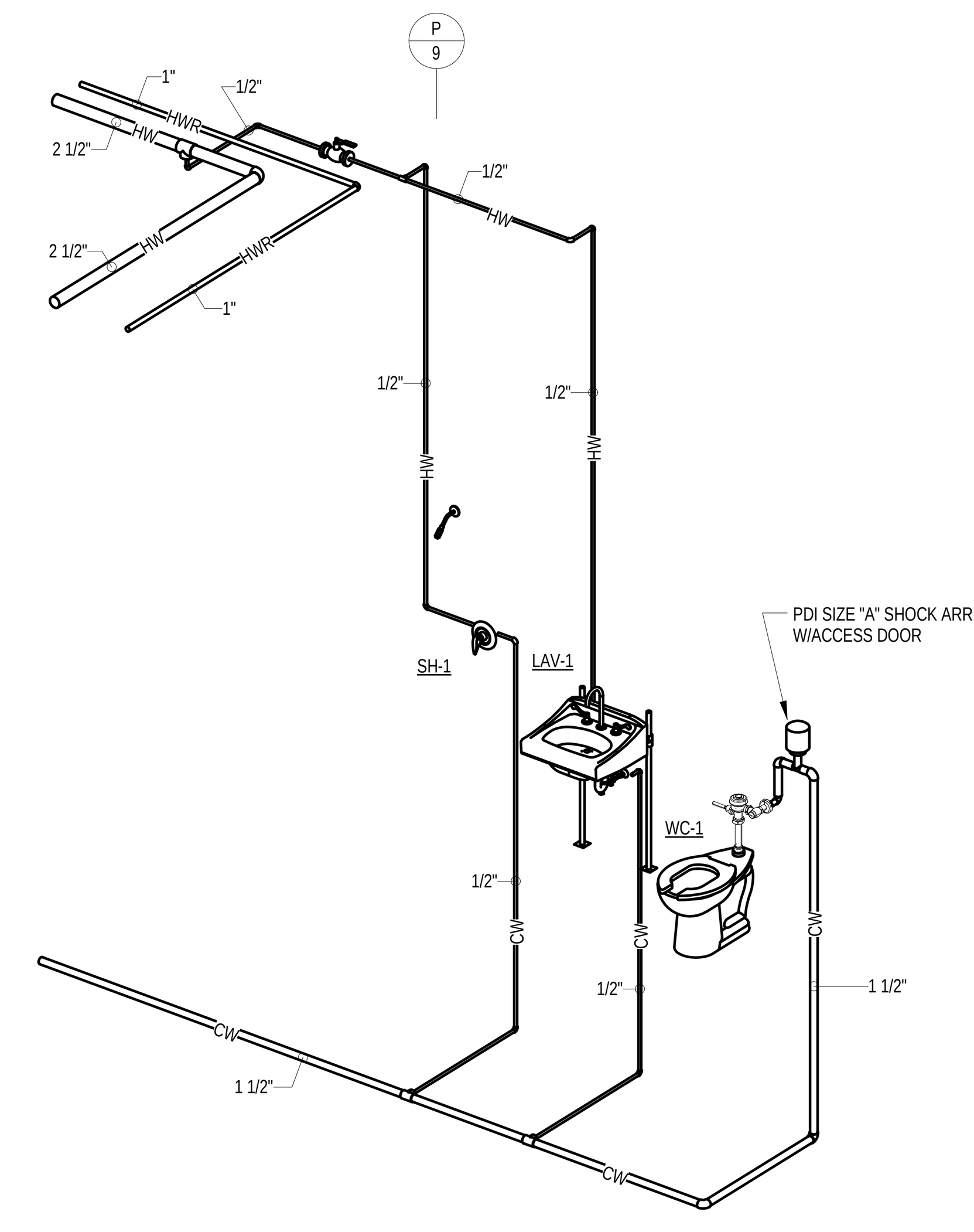
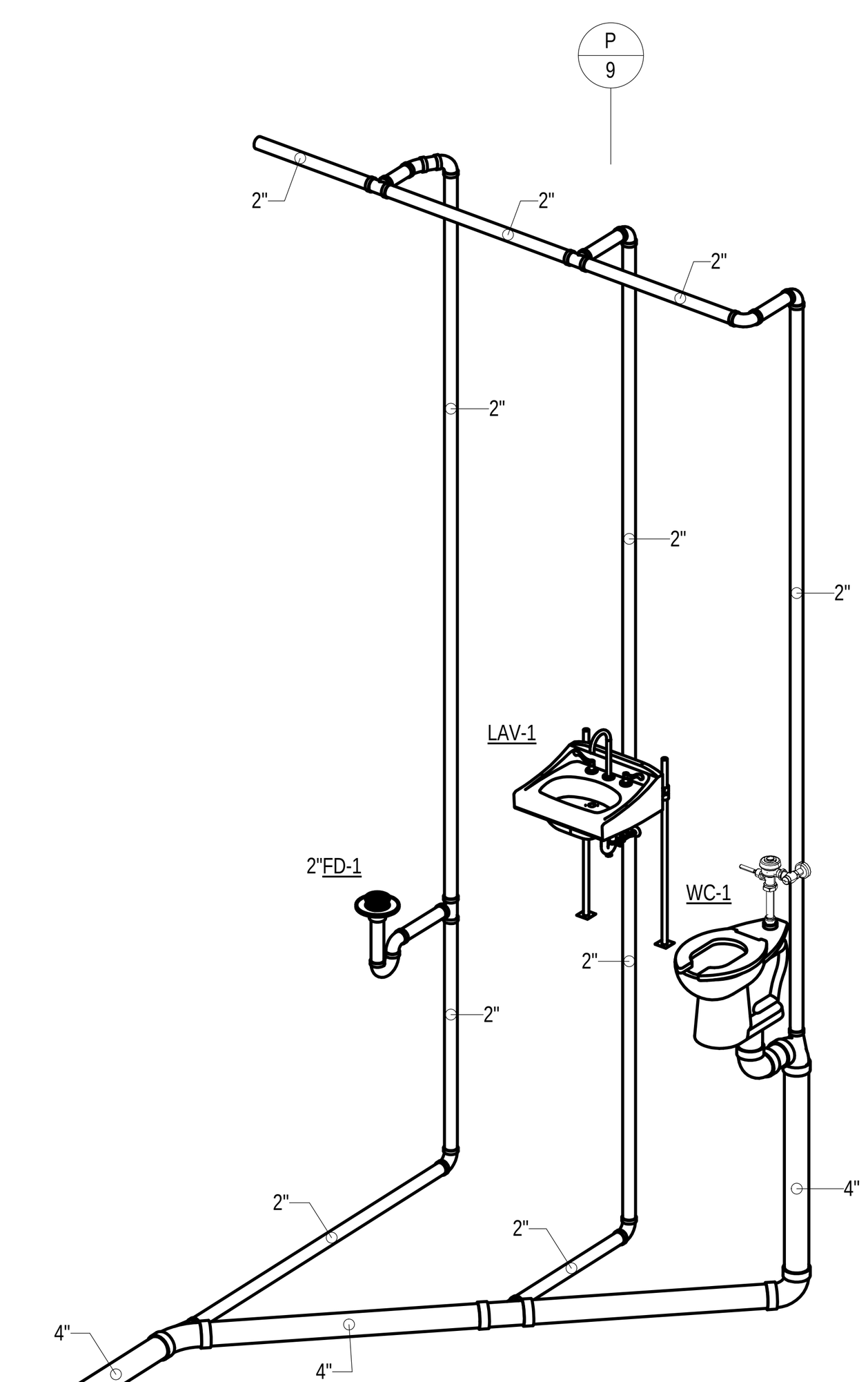


WASTE & VENT RISER



HOT & COLD WATER RISER



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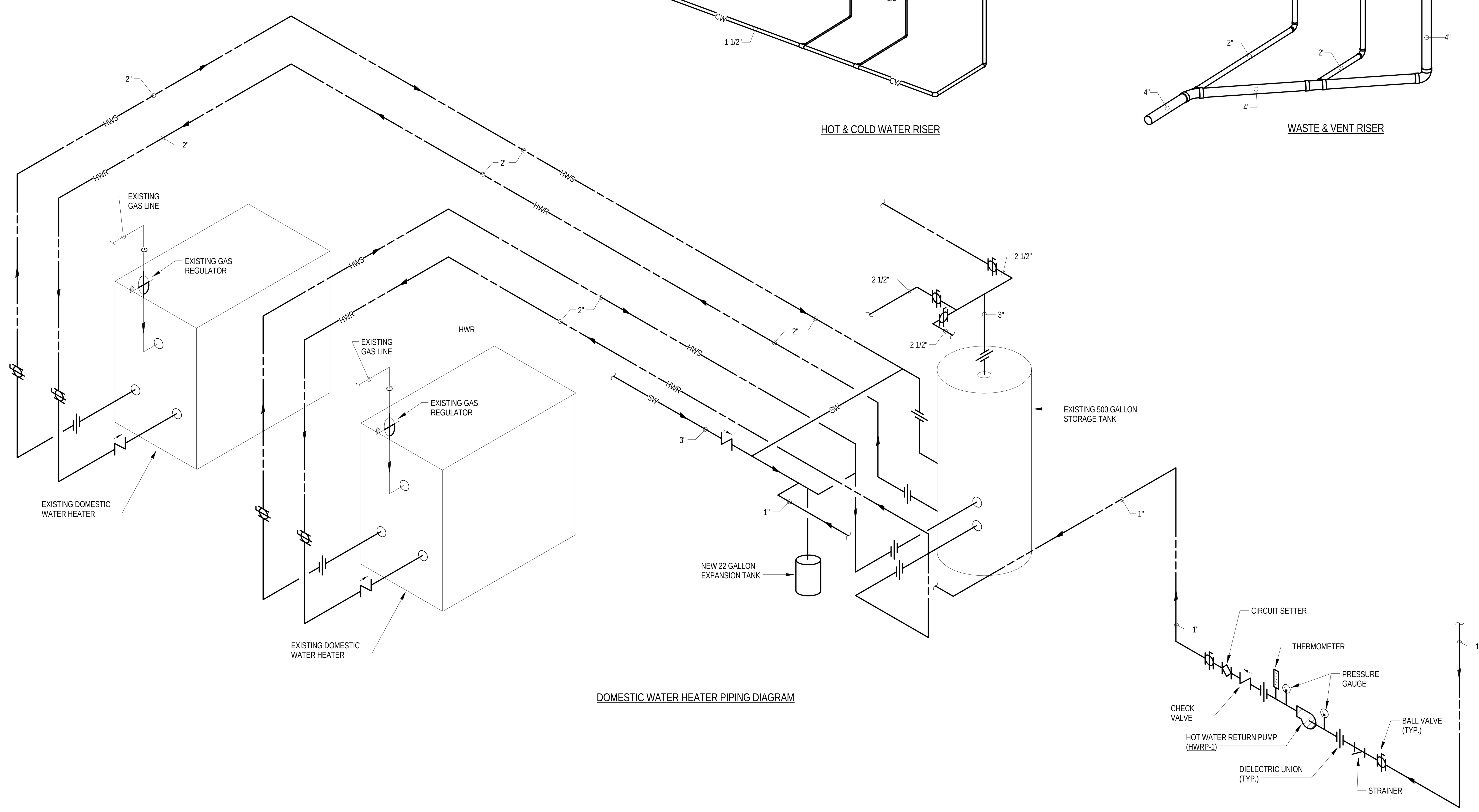

DOMESTIC WATER HEATER PIPING DIAGRAM

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LOCATION:

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PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, AIA
TEXAS LICENSE NO. 10-891

PLUMBING RISERS

SHEET NUMBER

P4.3

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TREE INVENTORY

Tag #	Species	Understory Species* 5.0" - 11.5" Removed	Understory Species* 5.0" - 11.5" Preserved	Significant Tree 6" - 23.5" Removed	Significant Tree 6" - 23.5" Preserved	Significant Tree** 10.0" - 23.5" Removed	Significant Tree** 10.0" - 23.5" Preserved	Heritage 3:1 Removed	Heritage 3:1 Preserved	Heritage 1:1 Removed	Heritage 1:1 Preserved	Additional Inches Preserved for Mitigation *** Preserved
101	35" heritage oak								35			
102	19" oak				19							
103	25" heritage cottonwood (to remain but counted as removed)							25				
104	4" crapemyrtle											
105	6" crapemyrtle (to remain but counted as removed)			6								
106	29" heritage pecan								26			
107	19" oak				19							
108	13" cedar elm				13							
109	13" cedar elm				13							
110	25" heritage oak								25			
111	21" pecan				21							
112	23" oak				23							
113	20" pecan				20							
114	15" cedar elm				15							
115	27" heritage oak								27			
116	39" heritage oak								39			
117	9" crapemyrtle				9							
118	8" crapemyrtle				8							
119	19" oak				19							
120	36" heritage oak								36			
121	23" oak				23							
122	33" heritage oak								33			
123	23" oak				23							
124	23" oak				23							
125	17" oak											
126	34" heritage oak								34			
127	31" heritage oak								31			
128	27" heritage oak								27			
129	23" oak				23							
130	18" pecan				18							
131	19" oak				19							
132	20" sycamore				20							
133	19" oak				19							
134	15" pine				15							
135	9" crapemyrtle				9							
136	9" crapemyrtle				9							
137	26" heritage oak								26			
138	28" heritage oak								28			
139	25" heritage oak								25			
140	25" heritage oak								25			
141	4" spanish olive											
142	4" spanish olive											
143	2" mt laurel											
144	2" mt laurel											
145	8" mt laurel	8										
146	21" sycamore (to remain but counted as removed)											
Sub. Tot. Inches=		8	0	6	380	0	0	25	417	0	0	0
Total inches by category=			8		386		0		442		0	
Preservation percentage=		0%		Significant Preservation		98%		Heritage Preservation		94%		0
Mitigation required (Commercial) =		3.2		Commercial (inches)		-225.6						
Mitigation required (Residential) =		2.8		Residential (inches)		-244.9		Heritage Mitigation (inches)		75		

No category to fall below 10% preservation:
Preserved- Tree to remain that meets root protection zone requirements described in section 35-523 of the UDC.
Mitigation 1:1 for significant trees below minimum preservation requirements; 3:1 for heritage trees below 100% preservation
** Small species: Condalia, Redbud, Tx. Mountain Laurel, Tx. Persimmon, Hawthorn, Possumhaw - these are mitigated at 1:1 for Heritage Trees*
*** Ashe Juniper, Huisache, Mesquite, Arizona Ash, Hackberry protected at 10" dbh and mitigated at 1:1 for heritage trees*
**** Mitigation Trees: Unprotected-sized trees to be used for mitigation calculations; subtract inches from mitigation owed*

ELECTIVE REQUIREMENTS - 25 points required

		Qty.	Points*
Tree Preservation - 40 points, maximum			
4 to 6 inch trees	3 points each	1	3
6 to 12 inch trees	4 points each	2	8
12 to 18 inch trees	6 points each	1	6
18 inch trees and larger	8 points each	1	8
Inside Streetyard:			
full credit up to 30 points			-
1/2 credit for total above 30 points			-
Outside Streetyard:			
1/2 credit up to a maximum of 15 points			-
Total Points: Tree Preservation			-
(40 Points, max.)			25

Parking Lot Shading

Percent Shaded	Points
25%	20
35%	25
50%	35

Total Points: Parking Lot Shading	-
Screening of Surface Parking - 25 points	-
Street Trees - 25 Points	-
Understory Preservation or Restoration - 15 Pnts.	-
Infill or Retrofit Use Pattern - 25 pnts.	-
Total Points - Elective Criteria	**25**

SITE CANOPY CALCULATION

25% Canopy Required (15% if in CRAG)

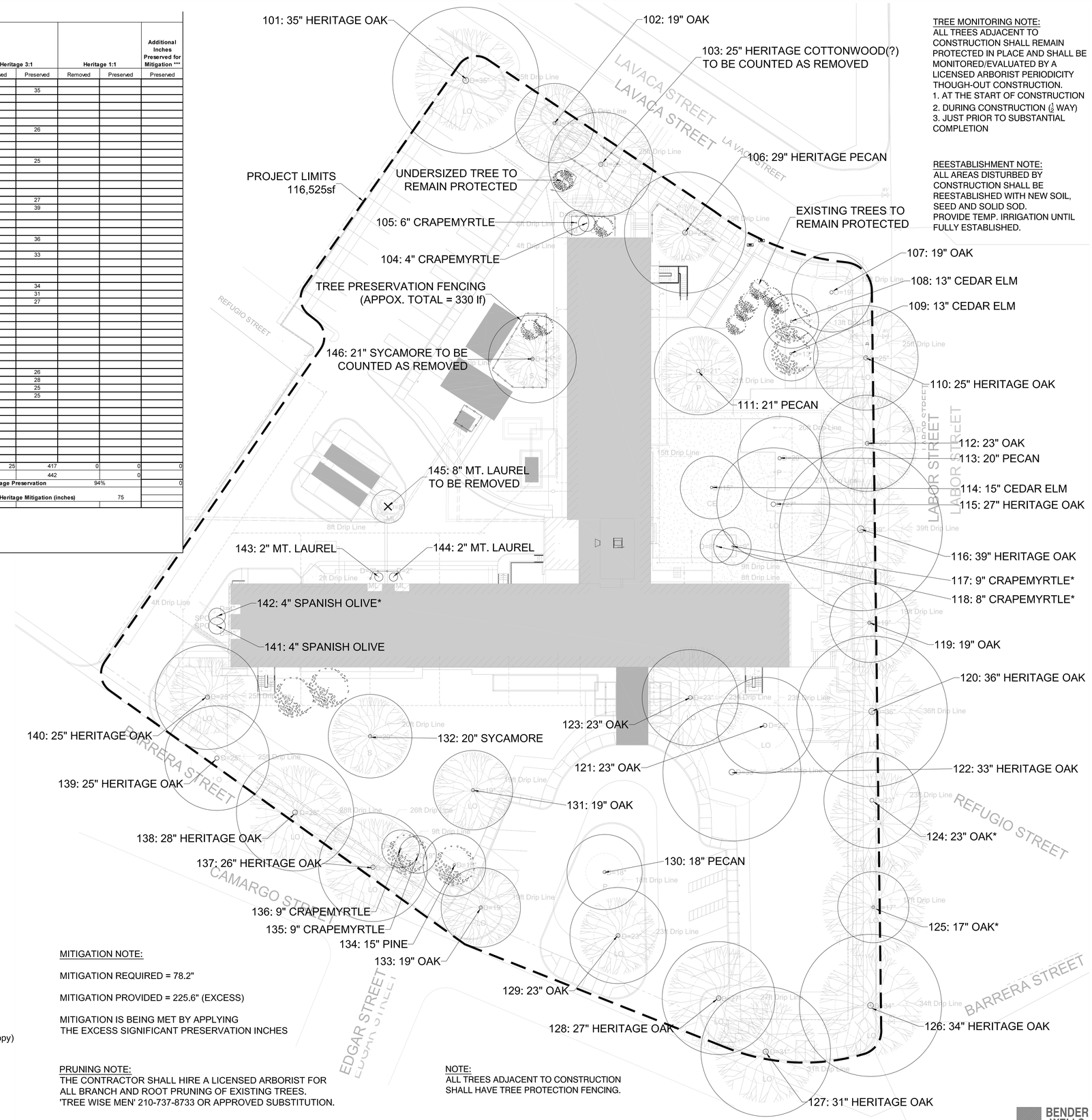
116,525sf (site area) x 15% = 17,478.75sf (canopy required)

EXISTING TREE CANOPY: (EC)

1,200sf x 4 (existing large trees)	=	4,800sf (existing large tree canopy)
875sf x 16 (existing medium/large trees)	=	14,000sf (existing medium/large tree canopy)
550sf x 0 (existing medium trees)	=	0sf (existing medium tree canopy)
275sf x 4 (existing small tree)	=	1,100sf (existing small tree canopy)
Total Canopy Provided	=	19,900sf (existing tree canopy)

SUMMARY

Canopy Required	=	17,478.75sf (required)
Canopy Provided	=	19,900sf (existing canopy)
Total Canopy Provided	=	19,900sf



MITIGATION NOTE:

MITIGATION REQUIRED = 78.2"

MITIGATION PROVIDED = 225.6" (EXCESS)

MITIGATION IS BEING MET BY APPLYING THE EXCESS SIGNIFICANT PRESERVATION INCHES

PRUNING NOTE:
THE CONTRACTOR SHALL HIRE A LICENSED ARBORIST FOR ALL BRANCH AND ROOT PRUNING OF EXISTING TREES.
'TREE WISE MEN' 210-737-8733 OR APPROVED SUBSTITUTION.

NOTE:
ALL TREES ADJACENT TO CONSTRUCTION SHALL HAVE TREE PROTECTION FENCING.

TREE MONITORING NOTE:
ALL TREES ADJACENT TO CONSTRUCTION SHALL REMAIN PROTECTED IN PLACE AND SHALL BE MONITORED/EVALUATED BY A LICENSED ARBORIST PERIODICITY THOUGH-OUT CONSTRUCTION.
1. AT THE START OF CONSTRUCTION
2. DURING CONSTRUCTION (@ WAY)
3. JUST PRIOR TO SUBSTANTIAL COMPLETION

REESTABLISHMENT NOTE:
ALL AREAS DISTURBED BY CONSTRUCTION SHALL BE REESTABLISHED WITH NEW SOIL, SEED AND SOLID SOD. PROVIDE TEMP. IRRIGATION UNTIL FULLY ESTABLISHED.

1 LANDSCAPE ORDINANCE PLAN
SCALE - 1" = 30'

NORTH

15 0 30 60 Feet

DURAND-HOLLIS RUPE ARCHITECTS, INC.
14603 HUEBNER ROAD
BUILDING 18
SAN ANTONIO, TEXAS 78230
TEL. 210 308-0080
210 524-6572
eMAIL ATE@DURANDHARCHITECTS.COM

REVISED ISSUE DATES:
1 _____
2 _____
3 _____
4 _____

SAN ANTONIO HOUSING AUTHORITY VICTORIA PLAZA MODERNIZATION-PHASE 1
411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
ISSUE	DESCRIPTION	DATE
1	For Permit	1/8/18

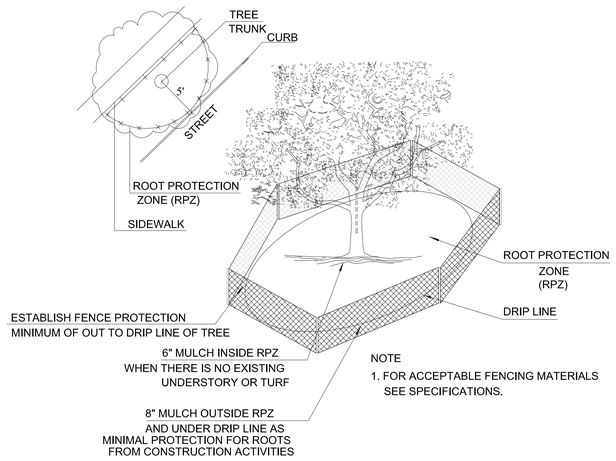
2018-01-08

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY LAWRENCE C. CLARK, 1211

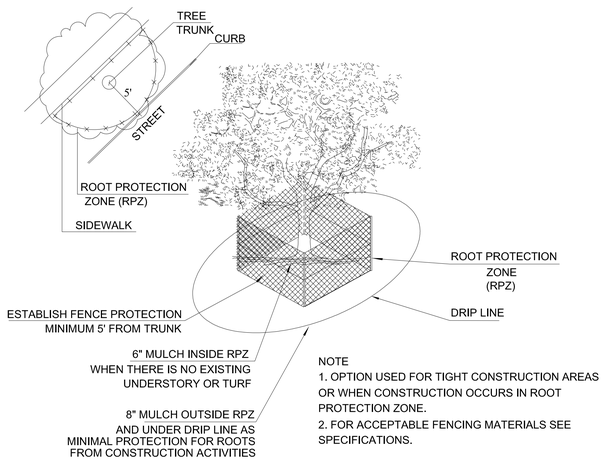
PROJECT ARCHITECT
BENDER, CLARK AND BELL, AIA
TEXAS LICENSE NO. 10487

Tree Preservation Plan

TP-1



1 TREE PROTECTION FENCING (LEVEL 1)
SCALE - NTS



2 TREE PROTECTION FENCING (LEVEL 2 A)
SCALE - NTS

TREE PROTECTION & PRESERVATION NOTES

1. ALL TREES SHALL REMAIN UNLESS NOTED ON THE CITY APPROVED PLANS. THE ROOT PROTECTION ZONE MAY BE SHIFTED AND CLUSTERED AS LONG AS THERE IS NO CONSTRUCTION CLOSER TO THE TRUNK THAN ONE-HALF (1/2) THE ROOT PROTECTION ZONE RADIUS.

2. NO DISTURBANCE SHALL OCCUR IN THE ROOT PROTECTION ZONE AREA.

3. NO CONSTRUCTION SHALL BEGIN IN AREAS WHERE TREE PRESERVATION AND TREATMENT MEASURES HAVE NOT BEEN COMPLETED AND APPROVED.

4. TREE PROTECTION FENCING SHALL BE REQUIRED. TREE PROTECTION FENCING SHALL BE INSTALLED, MAINTAINED AND REPAIRED BY THE CONTRACTOR DURING SITE CONSTRUCTION.

5. THE CONTRACTOR SHALL AVOID CUTTING ROOTS LARGER THAN ONE-INCH IN DIAMETER WHEN EXCAVATING NEAR EXISTING TREES. EXCAVATIONS IN THE VICINITY OF TREES SHALL PROCEED WITH CAUTION. THE CONTRACTOR SHALL CONTACT THE CITY INSPECTOR FOR GUIDANCE.

6. EXPOSED ROOTS SHALL BE COVERED AT THE END OF THE WORK DAY USING TECHNIQUES SUCH AS COVERING WITH SOIL, MULCH OR WET BURLAP.

7. NO, EQUIPMENT, VEHICLES OR MATERIALS SHALL BE OPERATED OR STORED WITHIN THE ROOT PROTECTION ZONE OF ANY TREE NEAR THE PROJECT. THE ROOT PROTECTION ZONE FOR ALL PROTECTED TREES SHALL BE AN AREA DEFINED BY AN AVERAGE RADIUS EXTENDING OUTWARD FROM THE TRUNK OF A TREE A DISTANCE OF ONE (1) LINEAR FOOT FOR EACH INCH (DBH).

8. ROOT OR BRANCHES IN CONFLICT WITH CONSTRUCTION SHALL BE CUT CLEANLY ACCORDING TO PROPER PRUNING METHODS. ALL OAK WOUNDS SHALL BE PAINTED WITHIN 30 MINUTES TO PREVENT 'OAK WILT' INFECTION.

9. ANY TREE REMOVAL SHALL BE APPROVED BY THE CITY ARBORIST.

10. TREES WHICH ARE DAMAGED OR LOST DUE TO THE CONTRACTOR'S NEGLIGENCE DURING CONSTRUCTION SHALL BE MITIGATED TO THE CITY'S SATISFACTION.

11. TREES, TREE LIMBS, BUSHES AND SHRUBS LOCATED IN THE STREET OR ALLEY RIGHT-OF-WAY OR PAVEMENT EASEMENTS WHICH INTERFERE WITH PROPOSED CONSTRUCTION ACTIVITIES MAY BE NEATLY TRIMMED BY THE CONTRACTOR ONLY AFTER APPROVAL FROM THE INSPECTOR.

12. SAPLINGS, SHRUBS, OR BUSHES TO BE CLEARED FROM THE PROTECTED ROOT ZONE AREA OF A PROTECTED TREE SHALL BE REMOVED BY HAND AS DESIGNATED BY THE INSPECTOR.

13. ALL DEBRIS GENERATED BY THE PRUNING AND REMOVAL OF THE TREES AND/OR BUSHES SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF PROPERLY.

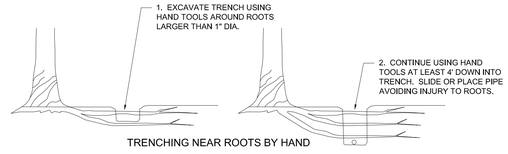
14. THE PROPOSED FINISHED GRADE WITHIN THE ROOT PROTECTION ZONE OF ANY TREE TO BE PRESERVED SHALL NOT BE RAISED OR LOWERED MORE THAN THREE (3) INCHES.

IF ROOTS MUST BE CUT TO COMPLETE THE OPERATION, EXCAVATE AS DESCRIBED ABOVE AND PRUNE ALL ROOTS 1 INCH OR GREATER IN DIAMETER AS THEY ARE ENCOUNTERED. THE TRENCH SHOULD BE BACKFILLED AS SOON AS POSSIBLE TO MINIMIZE ROOT EXPOSURE TO THE AIR. ROOTS THAT WILL BE LEFT EXPOSED IN THE TRENCH FOR GREATER THAN EIGHT HOURS SHOULD BE COVERED TO PREVENT DRYING AND TO PREVENT INSECT INVASION.

ROOT PRUNING PROCEDURE

PLAN: TRENCHING BELOW TREES

DIG THE TRENCH IN SHALLOW DEPTHS UNTIL ROOTS ARE ENCOUNTERED AND THEN EXCAVATE BELOW THE ROOTS AS THE TRENCH DEEPENS. ONCE AT THE DESIRED DEPTH, THREAD THE PIPE OR CABLE UNDER THE ROOTS AND BACKFILL THE TRENCH.



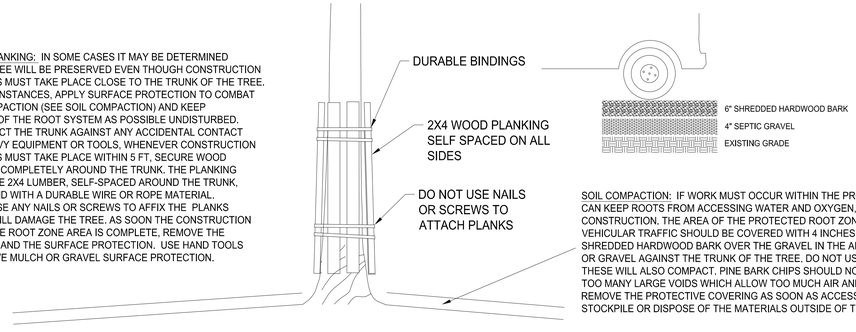
TRENCHING NEAR ROOTS BY HAND

3 ROOT PRUNING PROCEDURE
SCALE - NTS

GENERAL NOTES:

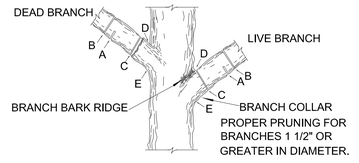
1. CONTRACTOR SHALL REFER TO ALL AVAILABLE DRAWINGS, INCLUDING CIVIL PLANS FOR ALL GRADING AND UTILITIES INFORMATION.
2. CONTRACTOR SHALL VERIFY ALL SITE CONDITIONS SHOWN ON PLAN. SHOULD A CONFLICT RESULT, CONTRACTOR SHALL NOTIFY LANDSCAPE ARCHITECT BEFORE ANY WORK COMMENCES.
3. ALL DISTURBED AREAS OUTSIDE OF PROJECT LIMITS CAUSED BY CONSTRUCTION SHALL BE GRASS HYDROMULCHED.
4. ALL DEBRIS GENERATED BY THE PRUNING AND REMOVAL OF THE TREES SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF PROPERLY OFFSITE.
5. TREES WHICH ARE DAMAGED OR LOST DUE TO THE CONTRACTOR'S NEGLIGENCE DURING CONSTRUCTION SHALL BE MITIGATED TO THE CITY OF SAN ANTONIO AND LANDSCAPE ARCHITECTS SATISFACTION.

TRUNK PLANKING: IN SOME CASES IT MAY BE DETERMINED THAT A TREE WILL BE PRESERVED EVEN THOUGH CONSTRUCTION ACTIVITIES MUST TAKE PLACE CLOSE TO THE TRUNK OF THE TREE. IN THESE INSTANCES, APPLY SURFACE PROTECTION TO COMBAT SOIL COMPACTION (SEE SOIL COMPACTION) AND KEEP AS MUCH OF THE ROOT SYSTEM AS POSSIBLE UNDISTURBED. TO PROTECT THE TRUNK AGAINST ANY ACCIDENTAL CONTACT WITH HEAVY EQUIPMENT OR TOOLS, WHENEVER CONSTRUCTION ACTIVITIES MUST TAKE PLACE WITHIN 5 FT, SECURE WOOD PLANKING COMPLETELY AROUND THE TRUNK. THE PLANKING SHOULD BE 2X4 LUMBER, SELF-SPACED AROUND THE TRUNK, AND BOUND WITH A DURABLE WIRE OR ROPE MATERIAL. DO NOT USE ANY NAILS OR SCREWS TO AFFIX THE PLANKS AS THIS WILL DAMAGE THE TREE. AS SOON THE CONSTRUCTION WITHIN THE ROOT ZONE AREA IS COMPLETE, REMOVE THE PLANKING AND THE SURFACE PROTECTION. USE HAND TOOLS TO REMOVE MULCH OR GRAVEL SURFACE PROTECTION.



SOIL COMPACTION: IF WORK MUST OCCUR WITHIN THE PROTECTED ROOT ZONE, COMPACTED SOIL CAN KEEP ROOTS FROM ACCESSING WATER AND OXYGEN, CAUSING TREE DAMAGE DURING CONSTRUCTION. THE AREA OF THE PROTECTED ROOT ZONE EXPOSED TO PEDESTRIAN OR VEHICULAR TRAFFIC SHOULD BE COVERED WITH 4 INCHES OF SEPTIC GRAVEL AND 6 INCHES OF SHREDDED HARDWOOD BARK OVER THE GRAVEL IN THE AFFECTED AREA. DO NOT PLACE MULCH OR GRAVEL AGAINST THE TRUNK OF THE TREE. DO NOT USE SOIL OR COMPOST BECAUSE THESE WILL ALSO COMPACT. PINE BARK CHIPS SHOULD NOT BE USED BECAUSE THEY PROVIDE TOO MANY LARGE VOIDS WHICH ALLOW TOO MUCH AIR AND ARE EASILY DISLODGED. REMOVE THE PROTECTIVE COVERING AS SOON AS ACCESS IS NO LONGER NECESSARY. STOCKPILE OR DISPOSE OF THE MATERIALS OUTSIDE OF THE PROTECTED ROOT ZONE.

4 TRUNK PLANKING AND SOIL COMPACTION PREVENTION (LEVEL 3)
SCALE - NTS



NOTE: DO NOT CUT FROM D to E.

A. FIRST CUT - TO PREVENT THE BARK FROM BEING PEELED WHEN THE BRANCH FALLS.
B. SECOND CUT - TO REDUCE THE WEIGHT OF BRANCH.
C. FINAL CUT - ALLOW FOR HEALING COLLAR BUT NO STUBS
D. BRANCH RIDGES - INDENT PROPERLY BRANCH RIDGES WHICH ARE SITE FOR DECAY.

FOR OAKS ONLY: PAINT ALL WOUNDS OR CUTS WITH PRUNING PAINT WITHIN 20 MIN TO PREVENT THE SPREAD OF OAK WILT.

PROPER PRUNING FOR BRANCHES 1 1/2" OR GREATER IN DIAMETER.

5 TREE PROTECTION FENCING
SCALE - NTS

DURAND-HOLLIS RUPE ARCHITECTS, INC.
14603 HUEBNER ROAD
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210 524-6572
eMAIL ATDURANDHOLLIS@ATT.NET

REVISED ISSUE DATES:
1
2
3
4

SAN ANTONIO HOUSING AUTHORITY VICTORIA PLAZA MODERNIZATION-PHASE 1

411 BARRERA, SAN ANTONIO, TEXAS 78210

REVISIONS		
ISSUE	DESCRIPTION	DATE
1	For Permit	1/8/18

2018-01-08

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY LAWRENCE C. CLARK, 1211

PROJECT ARCHITECT
GABRIEL DURAND-HOLLIS, III
SAN ANTONIO, TEXAS

Tree Preservation Notes & Details

TP-2

BENDER WELLS CLARK DESIGN
830 N. ALAMO STREET
SAN ANTONIO,
TX 78215
ph: 210-692-9221
fax: 210-223-9582

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General Specifications Manual
For
San Antonio Housing Authority
Victoria Plaza Modernization

411 Barrera St.
San Antonio, Texas 78210

DHR Project # 16-084
May, 2018

Durand-Hollis Rupe Architects, Inc.
14603 Huebner Road, Building 18, San Antonio, Texas 78230
Telephone: 210.308.0080, Fax: 210.697.3309

Project Specifications Manual

For

San Antonio Housing Authority (SAHA)
Victoria Plaza Modernization
411 BARRERA ST., SAN ANTONIO, TEXAS 78210

ARCHITECT:
DURAND-HOLLIS RUPE ARCHITECTS, INC.
14603 HUEBNER ROAD, BUILDING 18
SAN ANTONIO, TEXAS 78230
PHONE: 210.308.0080
FAX: 210.697.3309

CIVIL ENGINEER:
INTELLIGENT ENGINEERING SERVICES
UNION SQUARE 11, 10001 REUNION PLACE
SAN ANTONIO, TEXAS 78216
PHONE: 210.349.9098

STRUCTURAL ENGINEER:
LUNDY & FRANKE ENGINEERING
549 HEIMER ROAD
SAN ANTONIO, TEXAS 78232
PHONE: 210.979.7900
(Specifications in the Drawings)

MEP ENGINEER:
H2MG, LLC
70 N.E. LOOP 410, #1071
SAN ANTONIO, TEXAS 78216
PHONE: 210.525.0220

LANDSCAPE:
BENDER WELLS CLARK DESIGN
830 NORTH ALAMO STRET
SAN ANTONIO, TEXAS 78215
PHONE: 210.592.9221

REGISTERED ARCHITECT · GABRIEL DURAND HOLLIS JR · 10801-1 · STATE OF TEXAS
5.25.2018

STATE OF TEXAS · DONALD N. DACUS · 85425 · LICENSED · PROFESSIONAL ENGINEER
5/25/18

STATE OF TEXAS · RALPH E. MARTIN, JR. · 28858 · REGISTERED · PROFESSIONAL ENGINEER
5/25/2018

STATE OF TEXAS · MEHDI J. MIRMOMENI · 113121 · LICENSED · PROFESSIONAL ENGINEER
5/25/18

REGISTERED LANDSCAPE ARCHITECT · LAWRENCE C. CLARK · 1211 · STATE OF TEXAS
5/29/2018

San Antonio Housing Authority (SAHA)
Victoria Plaza Modernization
San Antonio, Texas 78210

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END OF LIST OF DRAWINGS

00 31 26 - ASBESTOS ABATEMENT SPECIFICATIONS

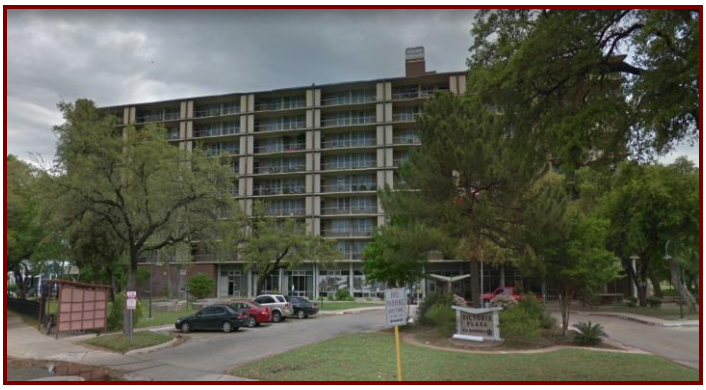
VICTORIA PLAZA MODERNIZATION

411 BARRERA STREET

SAN ANTONIO, TEXAS

Terracon Project No. 90187117

May 8, 2018



Prepared For:
San Antonio Housing Authority
San Antonio, Texas

Prepared by:
Terracon Consultants, Inc.
San Antonio, Texas
TDSHS Consultant Agency License No. 100157

Will C. DeVeau
Individual Asbestos Consultant
TDSHS License No. 105734
Expires 03/10/2019

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Attachments:

Abatement Drawings

Will C. DeVeau / TDSHS IAC # 105734
Expiration Date: 03/10/2019

SCOPE OF WORK - ASBESTOS ABATEMENT

Project: Victoria Plaza Modernization
411 Barrera Street
San Antonio, Texas
Terracon Project No. 90187117

Asbestos abatement will be accomplished in one phase. Asbestos abatement is to be conducted in interior and exterior spaces to accommodate proposed renovation/demolition activities.

I. Material, Quantity and Location

The work will consist of the removal of the following materials in the approximate quantities listed at the site. All work will be conducted by properly licensed personnel in accordance with applicable Federal, State and Municipal regulations. ***(Note: The material quantities listed below are estimates only. The Contractor is responsible for verifying material quantities and locations prior to submission of the price quote to the Owner. The Contractor will perform work for the materials indicated, regardless of actual quantities. Please see the attached drawings for approximate locations.)***

Victoria Plaza:

- Resilient Floor Tile And Associated Mastic (1 - 2 layers) – The multi-colored 1' x 1' and 9" x 9" floor tile materials with black mastic (various areas beneath carpet and/or ceramic tile) utilized as flooring throughout the units (except restrooms) and maintenance office / adjacent areas were previously identified by PSI to contain 2% - 3% Chrysotile asbestos in the floor tile and <1% - 3% Chrysotile asbestos in the black mastic. The asbestos-containing flooring materials identified were noted to be in good condition and were assessed as being non-friable. It is estimated that approximately 116,320 square feet of these materials will be abated from the above listed areas.
- HVAC Duct Mastic – The black mastic materials utilized on the HVAC duct seams in the 1st Floor Mechanical Room were previously identified by PSI to contain 7% Chrysotile asbestos. The asbestos-containing HVAC duct mastic materials identified were noted to be in good condition and were assessed as being non-friable. It is estimated that there exists approximately 15 square feet of this materials in the above listed areas.
- Exterior Door Frame Caulking - The brown door frame caulking material utilized around the exterior metal door frames throughout were previously identified by PSI to contain 2% Chrysotile asbestos. The asbestos-containing door frame caulking materials identified were noted to be in a good condition and were assessed as being non-friable. It is estimated that there exists approximately 5,000 linear feet of this materials in the above listed areas.

Will C. DeVeau / TDSHS IAC # 105734
Expiration Date: 03/10/2019

- Exterior Door Frame Caulking - The brown door frame caulking material utilized around the exterior metal door frames throughout were previously identified by PSI to contain 2% Chrysotile asbestos. The asbestos-containing door frame caulking materials identified were noted to be in a good condition and were assessed as being non-friable. It is estimated that there exists approximately 5,000 linear feet of this materials in the above listed areas.

- Exterior Window Frame Caulking - The gray window frame caulking material utilized around the exterior metal window frames throughout (except stairwell) were previously identified by PSI to contain 2% Chrysotile asbestos. The asbestos-containing window frame caulking materials identified were noted to be in a good condition and were assessed as being non-friable. It is estimated that there exists approximately 24,000 linear feet of this materials in the above listed areas.

- Fiber Cement Panels – The gray fiber cement panels utilized on the exterior walkway guard rails (2nd -9th Floors) were previously identified by PSI to contain 15% Chrysotile asbestos. The asbestos-containing fiber cement panel materials identified were noted to be in good condition and were assessed as being non-friable. It is estimated that there exists approximately 3,650 square feet of this materials in the above listed areas.

- Vibration Dampener – The white vibration dampener materials utilized on the roof exhaust vent (near access door) were found to contain 90% Chrysotile asbestos. The asbestos-containing vibration dampener materials identified were noted to be in good condition and were assessed as being friable. It is estimated that there exists approximately 15 linear feet of this material in the above listed area.

- Thermal System Insulation (Mudded Fittings) - The white thermal system insulation (TSI) fitting materials utilized on pipes within walls, above the first floor ceiling grid, and in the basement and crawlspace were found to contain 5% Chrysotile asbestos. The asbestos-containing thermal system insulation fitting materials identified were noted to be in good condition and were assessed as being friable. Due to the scope of the asbestos survey, total quantities of TSI materials located in the building are undetermined.

- Interior Window Frame Caulking - The white window frame caulking material utilized around the interior metal window frames in the stairwell (2nd-9th floors) was found to contain 5% Chrysotile asbestos. The asbestos-containing window frame caulking materials identified were noted to be in a good condition and were assessed as being non-friable. It is estimated that there exists approximately 200 linear feet of this materials in the above listed areas.

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- HVAC Duct Mastic – The white and gray mastic materials utilized on the HVAC and AHU seams in Mechanical Rooms #1 and #2 were found to contain 10% Chrysotile asbestos. The asbestos-containing HVAC duct mastic materials identified were noted to be in good condition and were assessed as being non-friable. It is estimated that there exists approximately 650 square feet of these materials in the above listed areas.

- HVAC Duct Mastic – The black mastic materials utilized on the HVAC duct seams throughout the first floor (above the ceiling grid) renovation area were found to contain 10% Chrysotile asbestos. The asbestos-containing HVAC duct mastic materials identified were noted to be in good condition and were assessed as being non-friable. It is estimated that there exists approximately 2,140 square feet of this materials in the above listed areas

- Thermal System Insulation and Mastic - The white/tan thermal system insulation and black mastic materials utilized on the insulated pipes in the crawlspace were found to contain 20% Chrysotile asbestos in the insulation and 10% Chrysotile asbestos in the black mastic. The asbestos-containing thermal system insulation and mastic materials identified were noted to be in good condition and were assessed as being friable. Due to the scope of the asbestos survey, total quantities of TSI and mastic materials located in the building are undetermined.

- Fiber Cement Panels – The gray fiber cement wall spandrel panels utilized on the lower portion of walls in the North Crawlspace (except south wall), East Crawlspace (except west wall), and West Crawlspace (except east wall) were found to contain 15% Chrysotile asbestos. The asbestos-containing fiber cement panel materials identified were noted to be in good condition and were assessed as being non-friable. It is estimated that there exists approximately 3,400 square feet of this materials in the above listed areas. ***(Additional areas of these asbestos-containing Fiber Cement Panel materials may exist beneath the soil around the perimeter of the Crawlspace.)***

- Moisture Barrier Mastic – The black moisture barrier mastic materials utilized on the lower portion of walls in the North Crawlspace (south wall), East Crawlspace (west wall), and West Crawlspace (east wall) were found to contain 10% Chrysotile asbestos. The asbestos-containing moisture barrier mastic materials identified were noted to be in good condition and were assessed as being non-friable. It is estimated that there exists approximately 510 square feet of these materials in the above listed areas

- Fiber Cement Panels – The gray fiber cement wall panels utilized as the front entry mosaic deco wall were found to contain 15% Chrysotile asbestos. The asbestos-containing fiber cement panel materials identified were noted to be in good condition and were assessed as being non-friable. It is estimated that there exists approximately 270 square feet of this materials in the above listed area.

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Note: The non-asbestos multi-colored ceramic tile with mortar and grout present in all bathrooms (flooring and partial walls) and in the 1st Floor Back Office (wall) contains detectable levels of lead and will be removed within the asbestos containment and be disposed of as asbestos-containing debris. It is estimated that approximately 31,265 square feet of these materials will be removed from the above listed areas.

II. Work Practices

A. Respiratory Protection:

During the removal of any asbestos-containing resilient floor tile and mastic, door/window caulking, vibration dampener, Thermal System Insulation (TSI) with mudded fittings, HVAC duct mastic, TSI and mastic, fiber cement panels, and moisture barrier materials from the building, half-face respirators, equipped with filter cartridges designed for asbestos-containing dusts and mists, vapors, and color coded in accordance with ANSI Z228.2 (1980), will be employed by all workers working within the regulated area(s). Certification that the workers have been fit tested in accordance with current OSHA guidelines will be provided as part of Worker Documentation. **The Abatement Contractor shall ensure use of the appropriate respiratory protection for the work being performed and recognizes that these requirements are only minimum acceptable standards.** The **Contractor** will furnish respirator filter cartridges as required by the **Consultant**.

B. Protective Clothing

During removal within the interior resilient floor tile and mastic, window frame caulking, TSI with mudded fittings, and HVAC duct mastic; single protective suits, as a minimum, will be worn by the workers and boots, gloves, eye protection and hard hats will be available to each worker as needed. Each suit will be properly disposed of at the conclusion of each work period. The **Contractor** will furnish protective suits for the **Consultant's** use during the project. The workers performing the abatement will decontaminate through a three-chambered wet decontamination system which will be constructed as an integral part of the containment.

During removal of the exterior window/door frame caulking, vibration dampener, fiber cement panels, the interior TSI materials (glove bag method only), and the crawlspace moisture barrier, TSI with mudded fittings / mastic, and fiber cement panels, double protective suits will be worn by the workers and boots and gloves will be available to each worker as needed. The workers will remove the outer suit within the regulated work area and will proceed directly to the decontamination area. Each suit will be properly disposed of at the conclusion of the work period. The workers

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performing the abatement will decontaminate through a single-chambered (three chamber at crawlspace entry) wet decontamination system which will be constructed in a remote location easily accessible by workers who will proceed to the decontamination area after removing the outer suit within the regulated work area.

C. Containment/Temporary Facilities

The interior asbestos containing materials (resilient floor tile and mastic, HVAC duct mastic, and TSI with mudded fittings) materials are intended to be removed using wet removal techniques under negative pressure within a contained area which has an integral three-chamber wet decontamination unit. The full containment will consist of a double layer of 4-mil poly covering all walls not scheduled for removal and a double layer of 6-mil poly covering all floor areas not scheduled for removal within the contained area. A single layer of 6-mil polyethylene shall be secured with tape and/or spray adhesive atop any areas of floor tile scheduled for removal in the vicinity of the HVAC duct mastic, TSI with mudded fittings, and ceramic tile removal (as a drop sheet). If there are areas where the only materials to be removed are flooring and the walls are moisture resistant and may be wet wiped, a modified containment may be utilized. The containment will consist of a single layer of 6-mil poly covering the lower five (5) feet of all wall areas within the contained area. Critical barriers consisting of 6-mil poly will be installed on all building openings. Secondary prep will be required for bathroom walls (ceramic tile removal areas) and negative pressure (minimum of –0.020 in/H^2O) will be maintained in all work areas. A functioning manometer will be required to show proof of appropriate pressure. Any remaining furnishings and/or contents will be removed from the work area prior to commencement of work.

The **Contracto**r will construct a three-chambered wet decontamination system consisting of a serial arrangement of connected rooms or spaces (Changing Room, Shower Room, and Equipment Room), with overlapping door flaps, constructed as an integral part of any containment. The Decontamination System shower chamber will consist of a hard enclosure with drain and water supply fittings designed for the purpose rather than a disposable/pop up chamber. Disposable/pop up chamber units are acceptable for the clean and dirty room portions of the decontamination system. The **Contracto**r shall require all persons without exception to pass through this decontamination unit for entry into and exiting from the work area for any purpose. Do not allow parallel routes for entry or exit.

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Changing Room (clean room): Provide a room that is physically and visually separated from the rest of the building for the purpose of changing into protective clothing. Construct using polyethylene sheeting, at least 6 mil in thickness, to provide an airtight seal between the Changing Room and the rest of the building. Locate so that access to Work Area from Changing Room is through Shower Room. Separate Changing Room from the building by a polyethylene overlapping flapped doorway. Maintain the floor of the changing room in a dry and clean condition at all times. Do not allow overflow water from shower to wet the floor in the changing room. Damp wipe all surfaces twice after each shift change with a disinfectant solution.

Provide a continuously adequate supply of disposable bath towels.

Provide all mandated warning signage, and posted information for all emergency phone numbers and procedures.

Shower Room: Provide a completely water tight, design built operational shower to be used for transit by appropriately dressed workers heading into the Work Area from the Changing Room, or for showering by workers headed out of the Work Area after undressing in the Equipment Room.

Construct room by providing a shower pan and 2 shower walls in a configuration that will cause water running down walls to drip into pan. Install a freely draining floor in the shower pan at an elevation that is at the top of pan.

Separate this room from the Changing and Equipment Rooms with moveable overlapping flaps fabricated of 6 mil polyethylene.

Provide splash-proof entrances to Changing and Equipment Rooms with 2 doors arranged in the following configuration:

At each entrance to the Shower Room construct a doorframe out of lumber, PVC Pipe or equivalent. Attach to this door frame two overlapping flaps fastened at the head (top) and jambs (sides). Overlap the flaps that present a shingle-like configuration to the water stream from the shower. Arrange so that any air movement out of the Work Area will cause the flaps to seal against the door frame.

Provide shower head and controls. Provide temporary extensions of existing hot and cold water and drainage, as necessary for a complete and operable shower.

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Provide a continuously adequate supply of soap and maintain the area in a sanitary condition. Arrange so that water from showering does not splash into the Changing or Equipment Rooms.

Provide flexible hose showerhead. Pump wastewater to a sanitary sewer drain or to storage for use in amended water. If pumped to a sanitary sewer drain, provide 20 micron and 5 micron waste water filters in line to drain or waste water storage. Change filters daily or more often if necessary. Provide Hose Bib.

Equipment Room (contaminated area): Require work equipment, footwear and additional contaminated work clothing to be left here. This is a change and transit area for workers. Separate this room from the work area by a 6 mil polyethylene overlapping flap doorway. Separate this room from the rest of the building with airtight walls fabricated of 6 mil polyethylene. Separate this room from the Shower Room and Work Area with airtight walls fabricated of 6 mil overlapping flapped polyethylene.

Work Area: Separate work area from the Equipment Room by polyethylene barriers. If the airborne asbestos level in the work area is expected to be high, add an intermediate cleaning space between the Equipment room and the Work area. Damp wipe clean all surfaces after each shift change. Provide one additional floor layer of 6 mil polyethylene per shift change and remove contaminated layer after each shift.

Waste Load Out Area: where applicable, the **Contracto**r will construct a waste load out chamber separately from the three chambered personnel decontamination unit. The waste load out chamber will be connected to the work area, and ingress and egress will be through an overlapping flapped doorway constructed of six millimeter polyethylene sheeting. The exit of the waste load out area will also be constructed with six millimeter polyethylene overlapping flapped doorway. The water generated during the waste load out procedures as a result of cleaning the outside of the bags will be properly filtered and/or containerized prior to discharge into the sanitary sewer.

In Interior regulated areas (Glove-Bag method and component removal) and Exterior Locations Where Materials are to be removed (asbestos-containing window/door caulk, vibration dampener, fiber cement panels, moisture barrier, and TSI materials), the work area will be Regulated with appropriate barrier tape and the Contractor shall display all appropriate OSHA and TDSHS signage. The Workers shall be in proper protective equipment and decontaminate through a wet decontamination unit erected in a central location accessible to the workers. The

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materials will be removed in an interior and exterior regulated areas with a double layer of 6-mil polyethylene covering the area in the vicinity/below the work areas utilizing wet methods.

D. Removal

The **Contractor** will perform the removal and disposal in accordance with current local, state and federal regulations.

1. **Asbestos-Containing Resilient Floor Tile and/or Associated Mastic Materials:** Comply with wet removal procedures. Removal shall be accomplished under negative pressure within a contained area which has an integral three-chamber wet decontamination unit. The full containment will consist of a double layer of 4-mil poly covering all walls not scheduled for removal and a double layer of 6-mil poly covering all floor areas not scheduled for removal within the contained area. A single layer of 6-mil polyethylene shall be secured with tape and/or spray adhesive atop any areas of floor tile scheduled for removal in the vicinity of the HVAC duct, TSI with mudded fittings, and ceramic tile removal (as a drop sheet). **If there are areas where the only materials to be removed are flooring and the walls are moisture resistant and may be wet wiped, a modified containment may be utilized. The containment will consist of a single layer of 6-mil poly covering the lower five (5) feet of all wall areas within the contained area.** Critical barriers consisting of 6-mil poly will be installed on all building openings. Secondary prep will be required for bathroom walls (ceramic tile removal areas) and negative pressure (minimum of –0.020 in/H^2O) will be maintained in all work areas. A functioning manometer will be required to show proof of appropriate pressure. Any remaining furnishings and/or contents will be removed from the work area prior to commencement of work. If any carpeting is glued directly on floor tile and/or mastic, it will be treated as asbestos-containing materials. If any areas of carpeting are installed by tack strips and can be removed without disturbing the underlying floor tile and/or mastic, they can be removed as general construction debris prior to starting the abatement.

The flooring materials will be addressed as follows: Spray the asbestos- containing flooring materials with amended water or removal encapsulant. During the removal of the materials, continual wetting of the material will occur. Any mastic will be removed with the selected mastic remover and/or by manual methods. A buffer may be used to remove the mastic. The removed materials will be placed in disposable bags as soon as practical, and no later than the end of the work period. Loose (unbagged) waste materials will not remain in the work area after the end of the work shift. The clean surfaces will be encapsulated after passing a visual inspection conducted by a Terracon representative. The waste resulting from the removal operations will be double bagged, labeled and disposed of in accordance with the

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guidelines discussed in Item E of this section. If woven poly or burlap bags (onion sacks) are utilized for bagging of waste materials, the woven bags will be double bagged in proper poly disposal bags prior to loading into the waste receptacle.

RFCI OPTION

In areas where only small quantities of floor tile and mastic are present such as beneath the 3-stage decontamination unit, the abatement contractor may conduct removal utilizing the Resilient Floor Covering Institute (RFCI) removal protocol. The workers performing the RFCI Method removal shall have training in the method and be licensed Asbestos Abatement Workers. The workers shall conform to all respiratory protection and protective clothing requirements of the asbestos abatement specification and shall be required to follow typical remote decontamination protocol following removal in any area where the RFCI Method is performed.

2. **Asbestos-Containing HVAC Duct Mastic Materials:** Comply with wet removal procedures within a contained area as specified for resilient floor tile materials previously listed. Where specified for removal, these materials will be removed in their entirety and disposed of as ACM. **The ceiling tile and associated metal grid, (except perimeter room grid channeling) batt insulation, and blown-in insulation shall be removed and disposed of as normal construction debris, prior to the commencement of abatement work. Where specified for removal, the HVAC duct mastic materials will be removed in their entirety including all associated insulation, metal ducts, fastening devices/hangers and disposed of as ACM. Any residual black mastic observed on the substrate areas above the HVAC ducts will also be removed and disposed of as ACM.**

The HVAC duct mastic materials will be addressed as follows: Spray the asbestos-containing mastic materials with amended water or removal encapsulant. During the removal of the HVAC duct mastic materials, continual wetting of the material will occur. The clean surfaces will be encapsulated after passing a visual inspection conducted by a Terracon representative. The removed materials will be placed in disposable bags or wrapped in two layers of 6-mil poly as soon as practical, and no later than the end of the work period. Loose (unbagged) waste materials will not remain in the work area after the end of the work shift. The clean surfaces will be encapsulated after passing a visual inspection conducted by a Terracon representative. The waste resulting from the removal operations will be double-bagged, labeled and disposed of in accordance with the guidelines discussed in item E of this section.

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Added Procedure for Component Removal of HVAC Duct Mastic Materials: The Contractor may elect to wrap select asbestos-containing HVAC Duct insulation materials in two (2) layers of polyethylene and dismantle the HVAC Duct into manageable sections. All breaks in the HVAC Duct shall be made and within a negative pressure glove bag containment as specified above. The clean surfaces will be encapsulated after passing a visual inspection conducted by a Terracon representative. The waste resulting from the removal operations will be double wrapped and/or bagged, labeled and disposed of in accordance with the guidelines discussed in Item E of this section.

3. **Asbestos-Containing Thermal System Insulation with Mastic and/or Mudded Insulation (Pipe, Elbow/Joint) Materials**: Comply with wet removal procedures within a contained area as specified for resilient floor tile and mastic materials previously listed. Where specified for removal, the TSI with mastic and/or mudded fitting materials will be removed in their entirety and disposed of as **ACM**.

   The pipe/elbow/joint insulation with mastic and/or mudded insulation materials will be addressed as follows: Spray the asbestos-containing insulation with mastic and/or mudded fitting materials with amended water or removal encapsulant. During the removal of the insulation with mastic and/or mudded fitting materials, continual wetting of the materials will occur. The removed materials will be placed in disposable bags as soon as practical, and no later than the end of the work period. Loose (unbagged) waste materials will not remain in the work area after the end of the work shift. The clean surfaces will be encapsulated after passing a visual inspection conducted by a Terracon representative. The waste resulting from the removal operations will be double bagged for disposal of in accordance with the guidelines discussed in Item E of this section.

4. **Asbestos-Containing Thermal System Insulation with Mastic / Mudded Insulation (Pipe, Elbow/Joint) and HVAC Duct Mastic Materials (Glove-Bag Method):** It is intended that the cutting and/or removal of any pipe/elbow/joint insulation with mastic and/or mudded fittings and/or HVAC duct mastic will be conducted utilizing wet methods in manufactured Glove-bag enclosures within regulated areas and the material is to remain largely intact during the removal process. Negative pressure will not be maintained in the work areas; however, the Contractor shall utilize HEPA equipped air filtration equipment in the work areas for air scrubbing (if adequate space is available). A remote single-chamber (three-chamber decontamination system at crawlspace entry) wet decontamination system will be constructed in a central location accessible from the work area. Critical barriers consisting of 6-mil poly shall be installed on all building openings in the vicinity of the removal areas where applicable. Once the regulated work area has been established, the ground areas below and adjacent to the pipe runs shall be pre-

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cleaned prior to installation of the glove-bag enclosures and removal activities. A double layer of 6-mil polyethylene (drop cloth) shall be installed below all areas of pipe insulation and/or HVAC duct mastic which will be removed by the glove-bag method. The **Contractor** will not be responsible for capping any chilled water pipe fittings, as it is intended that removal operations shall not disturb any piping itself. All chilled water piping will remain intact until reused/terminated by others.

The Glove-bag removal work area(s) will be regulated with barrier tape and appropriate signage shall be placed on the work area entry.

Install critical barriers on windows and doors that will not be utilized during removal operations. Drop sheets will be installed in the areas below the pipe insulation / HVAC duct mastic which will be removed. Place drop sheets in a manner which will cover the area below the glove-bag(s) and any area where workers stand when working within the glove-bag.

Check pipe/ HVAC duct Insulation where the work will be performed. Wrap damaged (broken lagging, hanging, etc.), pipe insulation / HVAC duct mastic in 6 mil plastic and "candy-stripe" with adhesive tape. Place one layer of adhesive tape around undamaged insulation at each end where the Glove-bag will be attached. Glove-bags shall not be used when surface temperatures exceed 150 degrees F.

Slit top of the Glove-bag open (if necessary) and cut down the sides to accommodate the size of the pipe / HVAC Duct (about two inches longer than the pipe / HVAC Duct diameter). Place necessary tools into the pouch located inside the Glove-bag. This will usually include: bone saw, utility knife, rags, scrub brush, wire cutters, tin snips and pre-wetted cloth. Place one strip of adhesive tape along the edge of the open top slit of Glove-bag for reinforcement.

Place the Glove-bag around section of pipe / HVAC duct to be worked on, then staple top together through reinforcing adhesive tape. Next, adhesive tape the ends of Glove-bag to pipe / HVAC duct itself, where previously covered with plastic or adhesive tape.

Test the seal of each glove bag with a smoke tube and aspirator bulb. Place tube into water sleeve (two-inch opening to Glove-bag) squeezing bulb and filling bag with visible smoke. Remove smoke tube and twist water sleeve closed. While holding the water sleeve tightly, gently squeeze Glove-bag and look for smoke leaking out (especially at top and ends of the Glove-bag). If leaks are found, make repairs using adhesive tape and re-test.

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Remove pipe /HVAC duct insulation from inside the Glove-bag as follows:

Insert wand from garden sprayer through water sleeve. Adhesive tape water sleeve tightly around the wand to prevent leakage.

Two workers are required to operate each glove-bag. One person places his hands into the long-sleeved gloves while the second person directs garden sprayer at the work.

Thoroughly wet insulation with water or removal encapsulant and allow to soak in. Wet adequately to penetrate and soak material through to substrate. Use a bone saw, if required, to cut insulation at each end of the section to be removed. A bone saw is a serrated heavy gauge wire with ring-type handles at each end. Throughout this process, spray amended water or removal encapsulant on the cutting area to keep dust to a minimum. Remove insulation using putty knives, wire brushes or other tools. Place pieces of insulation in the bottom of bag without dropping.

Seal exposed ends of remaining pipe / HVAC duct insulation from inside the Glove-bag.

Rinse tools with water inside the bag and place back into pouch. Using scrub brush, rags and water, scrub and wipe down the exposed pipe. Remove water wand from water sleeve and attach the small nozzle from HEPA-filtered vacuum. Turn on the HEPA vacuum and fully collapse the glove-bag. Remove the vacuum nozzle, twist water sleeve closed and seal with adhesive tape.

From outside the Glove-bag, pull the tool pouch away from the bag. Place adhesive tape over twisted portion and then cut the tool bag from the Glove-bag, cutting through the twisted-taped section. Contaminated tools may then be placed directly into next Glove-bag without cleaning. Alternatively, tool pouch with the tools can be placed in a bucket of water, opened underwater, and tools cleaned and dried. Discard rags and scrub brush with asbestos waste.

Sliding a Glove-bag from one removal section to another is prohibited. If more than one adjacent section of pipe / HVAC duct insulation is to be removed, a new Glove-bag must be used for each section.

The removed Glove-bag shall be placed in a second disposal bag prior to being removed from the regulated work area. The bags shall have generator labels attached before being transferred to the prepared waste receptacle. All resulting waste will be disposed as described in item E of this section.

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5. **Asbestos-Containing Exterior Cement Fiber Board Removal:** These materials are intended to be removed with wet removal techniques and are to remain intact with as little disturbance as possible. Workers shall be in proper protective equipment and decontaminate through a single-chamber (3-chamber at crawlspace entry) wet decontamination unit erected in a central location accessible to the workers. The materials will be removed in an exterior regulated area with a double layer of 6-mil polyethylene covering the area in the vicinity/below the work areas.

   The material shall initially be sprayed with amended water or removal encapsulant. Allow time for amended water or removal encapsulant to saturate the material. Do not over saturate or cause excess dripping. Once saturated, the material attached to the structure shall be removed from the structure as intact as possible. The Contractor may elect to wrap the board in two (2) layers of polyethylene. All nails, fasteners, and underlying tar paper shall be removed and disposed of with the panels themselves. The debris which accumulates on the drop cloths shall be kept wet and placed into disposal bags as soon as practical. Any dust which remains on the substrate areas where the panels have been removed will be manually removed or sprayed with water. The removed materials will be placed in disposable bags or wrapped in two layers of 6-mil poly as soon as practical, and no later than the end of the work period. Loose (unbagged) waste materials will not remain in the work area after the end of the work shift. The clean surfaces will be encapsulated after passing a visual inspection conducted by a Terracon representative. The waste resulting from the removal operations will be double bagged or component wrapped in two layers of 6-mil poly, labeled and disposed of in accordance with the guidelines discussed in Item E of this section.

6. **Asbestos-Containing Window/Door Frame Caulk Materials:** Comply with wet removal procedures within an interior contained area as specified for resilient floor tile materials previously listed. Where specified for removal, these materials will be removed in their entirety and disposed of as ACM. Due to limited space availability at stairwell interior window containment areas, a single-chamber wet decontamination unit may be utilized.

   Exterior window/door frame caulk materials are intended to be removed with wet removal procedures in regulated work areas. **Workers shall wear proper protective equipment during removal and decontaminate through a remote single-chamber wet decontamination unit as a minimum, erected in a central location readily accessible to the workers.** The exterior regulated work area will consist of asbestos specific barrier tape, and a double layer of 6-mil polyethylene, as a **minimum,** extending out a **minimum** of eight feet (four feet on upper breezeway walkways) on the ground area in the vicinity of and below the window/door frame

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caulk materials to be removed. The edges of the poly covering the ground areas will be weighted or staked to insure that the poly remains in place during removal activities. A single layer of 6-mil polyethylene shall be installed on the inside of the window/door opening to act as a critical barrier.

The window/door frame caulk materials will be addressed as follows: Spray asbestos-containing materials with amended water or removal encapsulant. Manually remove the window/door caulk from the opening between the window/door frame component and the building substrate. Following removal of the window/door frame caulk, the window/door opening where removal has occurred shall be wet wiped and/or HEPA vacuumed until the substrate is clean. The removed materials will be placed in disposable bags or wrapped in two layers of 6-mil poly as soon as practical, and no later than the end of the work period. Loose (unbagged) waste materials will not remain in the work area after the end of the work shift. The clean surfaces will be encapsulated after passing a visual inspection conducted by a Terracon representative. The waste resulting from the removal operations will be double bagged or component wrapped in two layers of 6-mil poly, labeled and disposed of in accordance with the guidelines discussed in Item E of this section.

7. **Asbestos-Containing Exterior HVAC Vibration Dampener:** These materials are intended to be removed with wet removal techniques and remain intact with as little disturbance as possible. The HVAC vibration dampeners with the associated fasteners will be removed in their entirety and disposed of as ACM. The materials will be removed in a regulated area with a double layer of poly utilized on the floor area below the work area.

   The HVAC duct vibration dampener will be addressed as follows: Spray the asbestos-containing HVAC duct vibration dampener materials with amended water or removal encapsulant. During the removal of the HVAC duct vibration dampener, continual wetting of the material will occur. The HVAC duct vibration dampener will be removed with the associated flanges/fasteners by manual methods and any cuts required in the metal duct and/or other insulation materials shall be made in areas beyond HVAC duct vibration dampener. The removed materials will be placed in disposable bags or wrapped in poly as soon as practical, and no later than the end of the work period. Loose (unbagged) waste materials will not remain in the work area after the end of the work shift. The clean surfaces will be encapsulated after passing a visual inspection conducted by a Terracon representative. The waste resulting from the removal operations will be double bagged, labeled and disposed of in accordance with the guidelines discussed in Item E of this section.

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8. **Asbestos-Containing Moisture Barrier Mastic (Crawlspace):** These materials will be removed by wet methods and shall remain intact with as little disturbance as possible. The work area will be regulated with barrier tape and drop cloths shall be placed below the work area where these materials are to be removed. A remote three-chambered wet decontamination system will be constructed at the crawlspace entry.

   The moisture barrier mastic material shall initially be sprayed with amended water, removal encapsulant, or removal solvent as applicable. Allow time for amended water, removal encapsulant, or removal solvent to saturate the material. Do not over saturate or cause excess dripping. Once saturated, the material attached to the structure shall be manually removed from the substrate component as intact as possible. The debris which accumulates on the drop cloths shall be kept wet and placed into disposal bags as soon as practical. Any dust which remains on the substrate materials where the ACM has been removed will be sprayed with water and manually removed or removed with a HEPA vacuum. The removed materials will be placed in disposable bags or wrapped in poly as soon as practical, and no later than the end of the work period. Loose (unbagged) waste materials will not remain in the work area after the end of the work shift. The clean surfaces will be encapsulated after passing a visual inspection conducted by a Terracon representative. The waste resulting from the removal operations will be double bagged, labeled and disposed of in accordance with the guidelines discussed in Item E of this section.

E. Disposal

1. Once the ACM is removed (including containment construction materials, i.e., poly, tape, etc.) it will be double bagged or component wrapped in two layers of 6-mil poly and labeled in accordance with Texas Department of State Health Services (TDSHS) and OSHA guidelines. Pre-printed Generator Labels shall be affixed to each bag or wrapped component prior to being placed in the lined waste disposal dumpster or trailer.

2. All waste will be labeled in accordance with 29 CFR 1910.1200 (f) of OSHA's Hazard Communication standard, and will contain the following information:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

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3. The area between the bag-out area and the prepared waste receptacle shall be regulated with barrier tape during bag-out operations. The waste receptacle will have asbestos specific signage attached during loading and unloading activities. The waste dumpster or trailer shall remain secured during all other periods.

4. The waste will be disposed in an approved landfill. The waste will be transported to the landfill in a lined closed top receptacle. Verification of disposal at the landfill will be provided to the Owner by **Contractor** via the TDSHS Waste Manifest.

F. Clearance

Aggressive Phase-Contrast Microscopy (PCM) clearance sampling will be conducted in accordance with the NIOSH 7400 Method A, in any contained area in which abatement has occurred.

III. Contractor Submittals

Submittals required for proper execution include but are not limited to the following:

Pre-Construction Submittals (submitted to **Consultant**)

Regulatory Notification Information
Plan of Action
Fire Action Plan
Emergency Phone List
Project Schedule
Copy of Written Respirator Program which conforms to 29 CFR 1910.134(b)
OSHA Material Safety and Data Sheets (Product Handling)

Construction Submittals (submitted to **Consultant** before start of work on-site)

Licenses: Contractor, Supervisor, Transporter(s)
NESHAP Training Certificate
Personal Air Monitoring Lab Results
List of Workers
Worker Registration Certificates
Medical Examination Results
Worker Training Certificates
Respiratory Fit Test Certificate
Certificates of Worker Acknowledgement

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Project Closeout (**submitted to Consultant no later than ten (10) working days following completion of the project**)

Contractor's Daily Log
Waste Disposal Manifest Copies
Certificate of Completion (if required)
Releases, Occupancy Permits (if applicable)
Personal Air Monitoring Lab Results (If applicable)

RESUBMISSION:

Revise submittals as required and resubmit as specified for initial submittal. Indicate any changes which have been made other than those requested by **Consultant**.

CONTRACTOR RESPONSIBILITIES:

Illegible submittals will be rejected and returned for re-submittal.

Schedule submittals according to general flow of Work and so as to allow for adequate and timely review of submittals by **Consultant**.

Review submittals prior to submission and submit to **Consultant** in accordance with provisions herein.

Verify field measurements, construction criteria, catalog numbers and similar data.

Coordinate submittals with requirements of Work and Contract Documents.

Contractor's responsibility for errors or omissions is not relieved by **Consultant's** review. **Contractor's** responsibility for deviations from requirements of Contract Documents is not relieved by **Consultant's** review, unless **Consultant** is notified of deviations in writing at time of submittal, and gives written review of specific deviations.

Do not begin work which requires submittals until reviewed submittals have been reviewed and approved by **Consultant**.

If required, reproduce and distribute copies after **Consultant's** review.

CONSULTANT'S RESPONSIBILITIES:

Review submittals within two working days or indicate in writing reasons for reviews which require additional time.

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Review for conformance with design concept of project and information given in Contract Documents.

Indicate results of review and return submittals to **Contractor** for distribution.

Consultant is not responsible for verification of field measurements, construction criteria, catalog numbers and other similar data.

Review of separate items does not constitute review of an assembly in which items function.

IV. Construction Notes

No asbestos related activities will take place at the work site without prior notification to the **Consultant** by the **Contractor** and the presence of the **Consultant** at the work site.

The **Contractor** shall be responsible for submission of the TDSHS 10-day Asbestos/Demolition Notification Form. The **Owner** shall be responsible for payment of notification fees associated with the TDSHS 10-day Asbestos/Demolition Notification Form.

The **Contractor** or the **Owner**, at the **Owner's** discretion, will remove all movable items from the work areas prior to commencement of abatement activities.

During the pre-cleaning phase of abatement operations, all exposed non-movable equipment will be wet wiped, HEPA vacuumed and covered with six-mil polyethylene.

The **Contractor** will be responsible for providing water and electricity to the work areas and as needed by the Consultant. Water and electrical service are present at the site at this time, and will be available for Contractor use. All electrical connections and outlets shall be protected at all times by ground fault circuit interrupters.

The **Contractor** is to be current and in good standing on all asbestos abatement notification fees. The **Owner** reserves the right to verify **Contractor's** standing.

The **Contractor** shall maintain all records required by TDSHS Texas Asbestos Health Protection Rules Section 295.62 Operations: Recordkeeping

Contractor parking and disposal dumpster areas will be as designated by the **Owner**. The **Contractor** will keep work and parking areas clean.

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Prior to any asbestos abatement activities, the **Contractor** will provide a licensed electrician to provide power lock-out and tag-out of all circuits to be affected by the asbestos abatement activities. Lock-out/Tag-out must meet OSHA 1910.147 requirements. All electrical circuits in the regulated and/or contained area shall have ground-fault interrupter (GFCI) units installed outside the contained work area.

Exhaust negative pressure ventilation system to outside of building. Plywood inserts or a similar hard barrier shall be required for building security on any building openings used for exhaust purposes.

The **Contractor** shall arrange the use of on-site toilet facilities with the Owner or provide temporary self-contained toilet units for use by **Contractor**'s personnel throughout the duration of abatement activities.

The **Contractor** shall install one functioning fire extinguisher in the work area for each 1,000 square feet of work area or part thereof. Additional fire extinguishers shall be installed in the Equipment Room and Clean Room of the decontamination unit.

The **Contractor** shall conduct a safety meeting for **Contractor's** employees with emphasis on operation of fire extinguishers and emergency exits in case of fire.

Contractor shall have posted emergency phone numbers for the fire department and police.

Contractor shall store a minimum of volatile substances on the job site and in fire resistant containers only.

Contractor will furnish disposable suits, respirator filter cartridges and routing of water and GFCI-equipped electrical services for **Consultant's** use for the duration of the project.

Stop Work Order – The Owner or the Consultant may issue a verbal or written Stop Work Order when deemed necessary by the Owner or Consultant at any time during the abatement activities. When a Stop Work Order is issued, the Contractor will cease all activities requested, and shall not resume those activities until authorized by the Owner or Consultant.

V. Products

Amended Water: Provide water to which a surfactant has been added. Use a mixture of surfactant and water which results in wetting of the **ACM** and retardation of fiber release during disturbance of the material. As an option, the **Contractor** may utilize water to which a mild detergent has been added in lieu of a commercially available surfactant product.

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Disposal Bags: Provide as a minimum, individual, 6 mil thick, leak-tight, manufactured polyethylene bags.

Disposal Bag Labels: Provide labels with **Owner's** name, **Contractor's** name, Project site address and the following warnings and labels, in accordance with regulatory requirements. Labels shall be lettered with indelible ink.

First Label:

CAUTION
CONTAINS ASBESTOS FIBERS
AVOID OPENING OR BREAKING CONTAINER
BREATHING ASBESTOS IS HAZARDOUS TO YOUR HEALTH

Second Label: Provide in accordance with 29 CFR 1910.1200(f) of OSHA's Hazard Communication standard:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
BREATHING AIRBORNE ASBESTOS, TREMOLITE, ANTHOPHYLLITE, OR
ACTINOLITE FIBERS IS HAZARDOUS TO YOUR HEALTH

Third Label: Provide in accordance with U.S. Department of Transportation Regulation on hazardous waste marking. 49 CFR parts 171 and 172. Hazardous Substances: Final Rule:

RQ HAZARDOUS
SUBSTANCE,
CLASS 9,
NA 2212, PG III
(ASBESTOS)

Polyethylene Wrap: Provide minimum 6 mil polyethylene sheeting as a wrapping for large sections of rigid waste material and for construction of floors and critical barriers in the containment areas. Provide minimum 4 mil polyethylene sheeting for construction of walls of the containment.

Removal Encapsulant: Provide a penetrating type encapsulant designed specifically for removal of **ACM**. Utilize an encapsulant that will meet or exceed the results produced by use of Amended Water, as described above.

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Lockdown Encapsulant: Provide a tinted or untinted encapsulant designed specifically for lockdown of asbestos fibers.

Sprayer: Provide an airless-type sprayer suitable for the type and volume of work being performed. For small volume work, provide a hand pump type pressure-can sprayer fabricated out of either metal or plastic, equipped with a metal or plastic wand at the end of a hose that can deliver a stream or spray of liquid under pressure.

Mastic Remover/Solvent: Solvents with a flash point of 140 degrees Fahrenheit or below will not be used.

VI. Air Monitoring Services

The **Consultant** shall verify that the Work performed is in compliance with applicable regulations and that the building areas beyond the Work Area and the outside environment remain free of contamination. This section also sets forth airborne fiber levels both inside and outside the Work Area as action levels, and describes the action required by the **Contractor** if an action level is met or exceeded.

AIR MONITORING:
The **Consultant** will be conducting air monitoring throughout the course of the project.

Base Line Fiber Counts: The **Consultant** will monitor airborne fiber counts prior to start of Work. The purpose of this air monitoring will be to establish existing airborne fiber counts prior to beginning abatement operations.

Work Area Isolation: The **Consultant** will monitor airborne fiber counts outside the Work Area. The purpose of this air monitoring will be to detect faults in the Work Area isolation including, but not limited to, contamination of the building outside of the Work Area with airborne asbestos fibers, failure of filtration or rupture in the ventilation system, or contamination of the exterior of the building with airborne asbestos fibers.

Should any of the above occur, the **Contractor** shall immediately cease asbestos abatement activities until the fault is corrected. Work shall not recommence until authorized by the **Consultant**.

Work Area Airborne Fiber Count: The **Consultant** will monitor airborne fiber counts in the Work Area. The purpose of this air monitoring will be to detect airborne fiber counts which may significantly challenge the integrity of Work Area isolation procedures that protect the balance of the building or outside of the building from contamination by airborne fibers.

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Final Clearance: The **Consultant** will conduct Final Clearance air sampling in accordance with the Final Clearance Section of this Specification. Aggressive PCM clearance sampling will be conducted in accordance with the NIOSH 7400 Method A, in any contained area in which abatement has occurred. Three (3) clearance samples will be run for each contained work area at a minimum volume of 1,250 liters per sample. Clearance will be achieved if no sample is reported greater than 0.01 fibers per cubic centimeter (≤0.01 f/cc) by the analysis report from the TDSHS licensed laboratory.

AIRBORNE FIBER COUNTS:

Inside Work Area: Maintain an average airborne count in the Work Area of less than 0.2 fibers per cubic centimeter. If the fiber counts rise above this figure for any sample taken, revise work procedures to lower fiber counts. If the Time Weighted Average (TWA) fiber count for any Work shift or eight (8) hour period exceeds 0.2 fibers per cubic centimeter, stop Work and leave ventilation system in operation. Do not recommence Work until authorized by the **Consultant**.

Outside Work Area: Maintain an average airborne count outside the Work Area of less than or equal to Base Line.

If any air sample taken outside the Work Area exceeds the Base Line, immediately and automatically stop Work until the source of the high fiber readings can be determined by the **Consultant**. If no outside non-asbestos source can be located by the **Consultant** and if this air sample was taken inside the building and outside of Critical Barriers around the Work Area, immediately erect new Critical Barriers to isolate the affected area from the balance of the building or as instructed by the **Consultant**.

Erect Critical Barriers at the next existing structural isolation of the involved space (e.g. wall, ceiling, floor).

Decontaminate the affected area in accordance industry standard methods.

Respiratory protection as set forth in the Work Practices Section shall be worn in affected area until area is cleared for reoccupancy.

Leave Critical Barriers in place until completion of Work and insure that the operation of the negative pressure ventilation system in the Work Area results in a flow of air from the balance of the building into the affected area.

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If the exit from the clean room of the personnel decontamination unit enters the affected area, establish a new decontamination facility.

After visual inspection in the extended work area, remove Critical Barriers separating the work area from the affected area. Final Clearance air samples will be taken within the entire area.

Fiber Type Disputes: The following procedure will be used to resolve any disputes regarding fiber types when the Project has been stopped due to excessive airborne fiber counts:

Air samples will be secured in the same area by the **Consultant** for analysis by Transmission Electron Microscopy at the option of the **Consultant** and classified as retests and back charged to the **Contractor** in accordance with the procedures in this specification.

ANALYTICAL METHODS:

The following methods will be utilized at the discretion of the **Consultant** in collecting and analyzing air samples:

Phase Contrast Microscopy (NIOSH 7400 Method, Issue 2, Revision 3 or OSHA Reference Method)

Transmission Electron Microscopy (40 CFR Part 763, Subpart E, Appendix A)

SAMPLE PROTOCOLS:

General: The number and volume of air samples taken by the **Consultant** will generally be in accordance with the following schedule. Sample quantities, locations, volumes and methodologies may vary depending upon the analytical method, project layout, procedures used and at the discretion of the **Consultant**.

SCHEDULE OF AIR SAMPLES:

Base Line Sample Schedule: The **Consultant** will secure the following air samples to establish a Base Line before start of Work. The number of samples may vary according to site plan and on authorization of **Consultant**.

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Location Sampled	Minimum Number of Samples	Minimum Volume	Planned Analytical Method
Each Work Area	3	1250 Liters	PCM
Outside Each Work Area	1	1250 Liters	PCM
Outside Building	1	1250 Liters	PCM

Base Line Fiber Level: is an action level expressed in fibers per cubic centimeter which is the larger of either the average of the samples collected outside each work area or 0.01 fibers per cubic centimeter of air. The Base Line samples may be collected but archived (not read) at the discretion of the **CONSULTANT.**

Daily Sample Schedule (per 8-hour work period): The **Consultant** will generally take the following samples on a daily (8-hour work period) basis. The number of samples may vary according to site plan and on authorization of **Consultant**.

Location Sampled	Minimum Number of Samples	Minimum Volume	Planned Analytical Method
Each Work Area	2	500	PCM
Outside Each Work Area/Inside Building	2	500	PCM
Decon Clean Room	2	500	PCM
Output of Negative Pressure Ventilation System	2	500	PCM

If airborne fiber counts exceed baseline limits, additional samples will be taken (and classified as retests) as necessary to monitor fiber levels and confirm sources.

Final Clearance Schedule (per containment): The **Consultant** will collect the following samples after completing a visual inspection of the work area. The number of samples may vary according to site plan and on authorization of **Consultant**.

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Location Sampled	Minimum Number of Samples	Minimum Volume	Planned Analytical Method
Each Work Area	3	1,250 Liters	PCM

Release Criteria: Gross decontamination is complete when every Work Area sample is equal to or less than 0.01 fibers/cc. If any sample is above the limit indicated, then the gross decontamination is incomplete and recleaning by decontamination procedures and/or ventilation system cycling is required and primary containment barriers cannot be removed.

INSPECTIONS:

The **Consultant**, in addition to providing air monitoring services, will provide full-time, on-site inspection of Work activities. Work shall not proceed without prior notice to the **Consultant** and presence of the **Consultant** on the Work site (requires 48 hours advance notice of Work).

The **Consultant** will conduct the following key Project inspections and no work by the **Contractor** will proceed beyond these points until all discrepancies noted during the inspection have been corrected.

The **Consultant**'s inspections do not relieve the **Contractor** of Contract obligations and are not designed to locate all project discrepancies. The **Contractor** is responsible for project quality.

First Key Inspection:

Inspection of Work Area and Containments Prior to Start of Removal: Removal operations shall not proceed until the **Consultant** has completed inspection of the Work Area preparations and until all discrepancies noted have been corrected.

Second Key Inspection:

Inspection During Removal: Removal Work shall not be conducted unless the **Consultant** is on the Project site. Daily inspection of the Work Area and Work practices will be conducted; upon discovery and report of a discrepancy the **Contractor** shall immediately stop Work and correct the discrepancy.
Third Key Inspection:

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Expiration Date: 03/10/2019

Inspection of Work Area or Containment After Completion of Removal Work, but Prior to Encapsulation and Containment Disassembly: A visual inspection of the Work site and/or Containment areas and removal surfaces will be conducted at this point by the **Consultant** and encapsulation and/or containment disassembly shall not proceed until discrepancies noted have been corrected.

Fourth Key Inspection:

Final Clearance: After encapsulation and final clean-up of the Work Area, but prior to removal of Critical Barriers, the **Consultant** will conduct a visual inspection followed by final air tests. Final air sampling will be conducted in accordance with the Final Clearance Sections of this Specification.

Final Key Inspection:

Project Closeout Inspection: A final inspection will be conducted by the **Consultant** after the **Contractor** has removed Critical Barriers, equipment, and supplies. A Project "Punch List" will be provided of any items requiring correction or completion. Punch List items shall be completed prior to issuance of final completion notice by the **Contractor**.

Discrepancies or needed corrective measures observed by the **Consultant** will be reported to the **Contractor's** Superintendent on-site and shall be immediately corrected.

The above inspections are not necessarily single events. Failed inspections will be re-conducted and time classified as retests and charged back to the **Contractor** in accordance with the project documents.

Inspections will require 24 hours advance notice to the **Consultant**.

PERSONAL MONITORING:

The **Contractor** may perform air monitoring as required to meet OSHA requirements for maintenance of Time Weighted Average (TWA) and excursion limit fiber counts for types of respiratory protection provided. The **Consultant** and/or **Owner** will not be providing air monitoring services to meet these OSHA requirements. A listing of all personal monitoring results obtained during the project will be submitted to the **Consultant** with the **Contractor** closeout submittals.

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LABORATORY TESTING:

The **Consultant** will perform field analysis of the air samples. A microscope and field laboratory will be set up at the jobsite, at the option of the **Consultant**, so that verbal reports on air samples can be obtained promptly after collection.

Reports to the **Owner** by the **Consultant** will include air monitoring data and pertinent information on work being conducted such as: work hours, number of workers, procedures used, contractor discrepancies and corrective measures, containment methods and construction, and amount of **ACM** removed.

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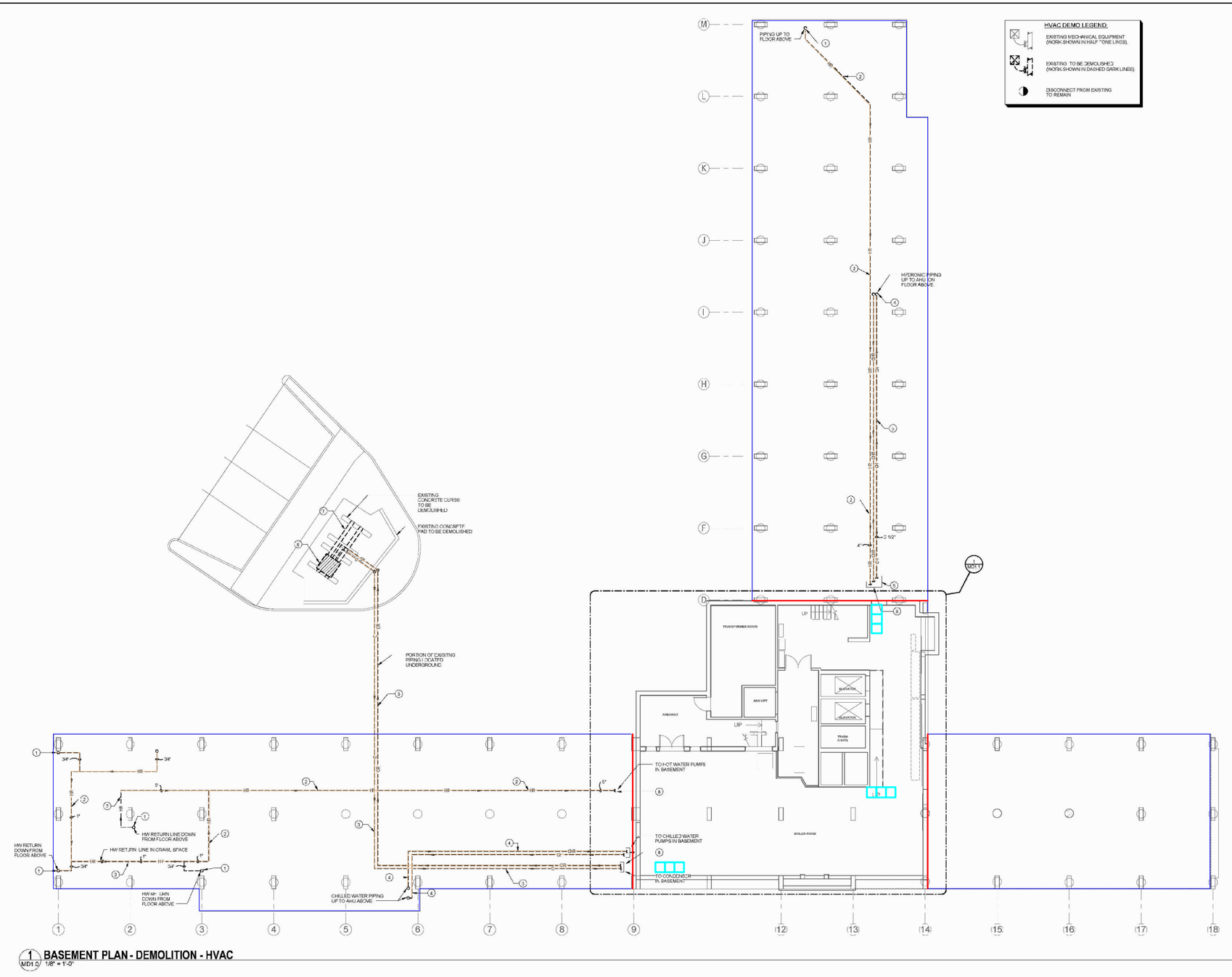
Expiration Date: 03/10/2019

General Abatement Locations

N



1 MD1.0 **BASEMENT PLAN - DEMOLITION - HVAC**
1/8" = 1'-0"

Will C. DeVeau
Individual Asbestos Consultant
TDSHS License No. 105734
Expires 03/10 /2019

LEGEND

- THOROUGHLY WET, REMOVE AND DISPOSE OF ASBESTOS CONTAINING FIBER CEMENT BOARD.
- THOROUGHLY WET, REMOVE AND DISPOSE OF ASBESTOS CONTAINING MOISTURE BARRIER.
- THOROUGHLY WET, REMOVE AND DISPOSE OF ASBESTOS CONTAINING THERMAL SYSTEM INSULATION WITH MASTIC AND/OR MUDDED FITTINGS UTILIZING GLOVE BAG METHOD.
- POTENTIAL LOCATION TO ESTABLISH 3-STAGE DECONTAMINATION CHAMBER.

Project Mngr:	WCD
Drawn By:	FM
Checked By:	RIH
Approved By:	WCD

Project No.	90187117
Scale:	N.T.S.
File No.	90187117
Date:	5-7-18

Terracon
Consulting Engineers and Scientists
6911 BLANCO RD SAN ANTONIO, TX 78216
PH. (210) 241-2112 TBPE F-3272 FAX. (210) 641-2124

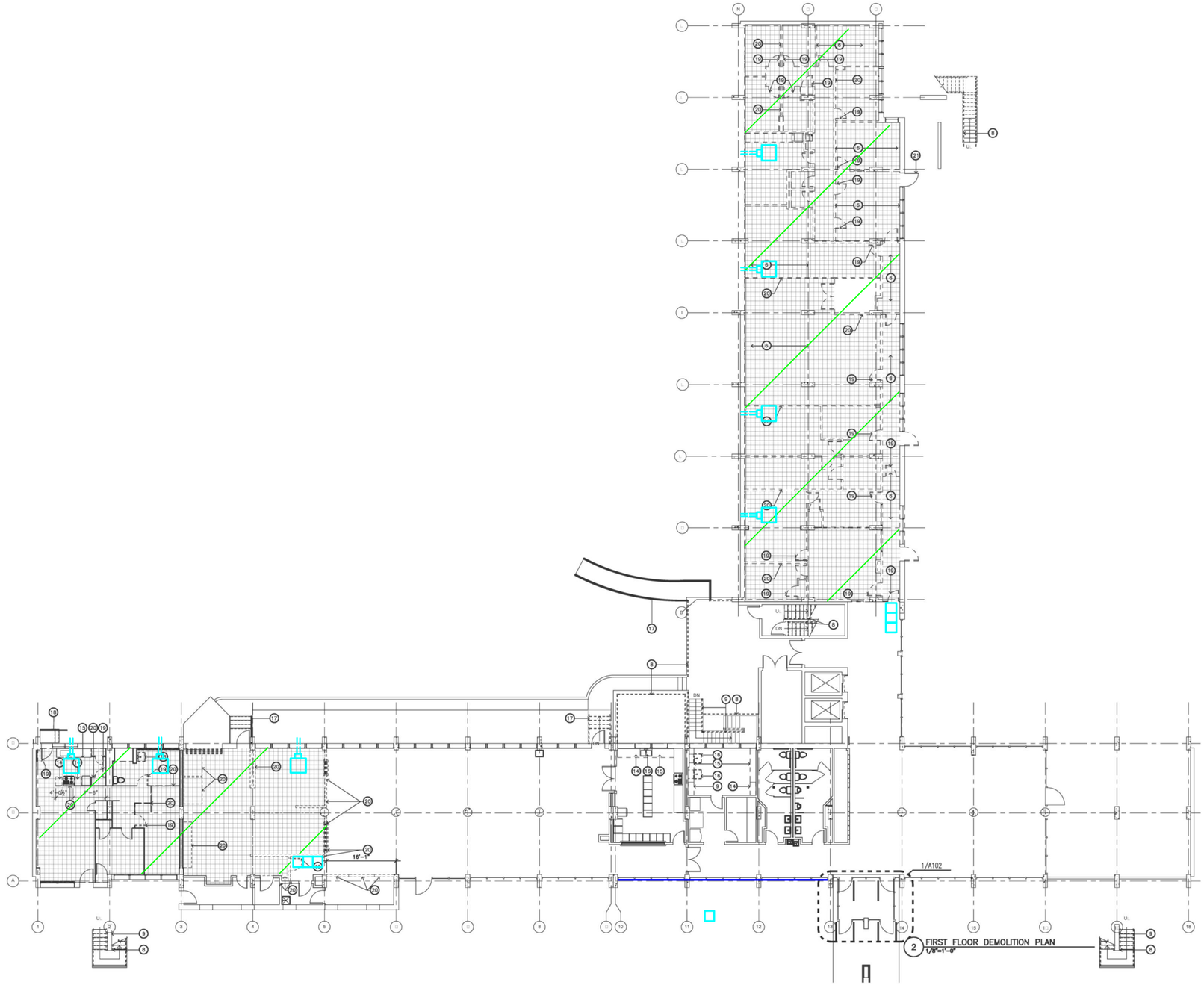
ASBESTOS ABATEMENT DRAWING

Victoria Plaza Modernization
411 Barrera St.
San Antonio, Texas

Figure

1

N



Will C. DeVeau
Individual Asbestos Consultant
TDSHS License No. 105734
Expires 03/10 /2019

LEGEND

- STRIP, REMOVE, AND DISPOSE OF ASBESTOS CONTAINING RESILIENT FLOOR TILE AND BLACK MASTIC. NOTE: FLOORING MAY BE PRESENT BENEATH CERAMIC TILE.
- THOROUGHLY WET, REMOVE AND DISPOSE OF ASBESTOS CONTAINING FIBER CEMENT BOARD.
- POTENTIAL LOCATION TO ESTABLISH 3-STAGE DECONTAMINATION CHAMBER.
- POTENTIAL LOCATION TO ESTABLISH 1-STAGE DECONTAMINATION CHAMBER.
- POTENTIAL LOCATION TO VENT HFU TO BUILDING EXTERIOR.

Project Mngr:	WCD
Drawn By:	FM
Checked By:	RIH
Approved By:	WCD

Project No.	90187117
Scale:	N.T.S.
File No.	90187117
Date:	5-7-18

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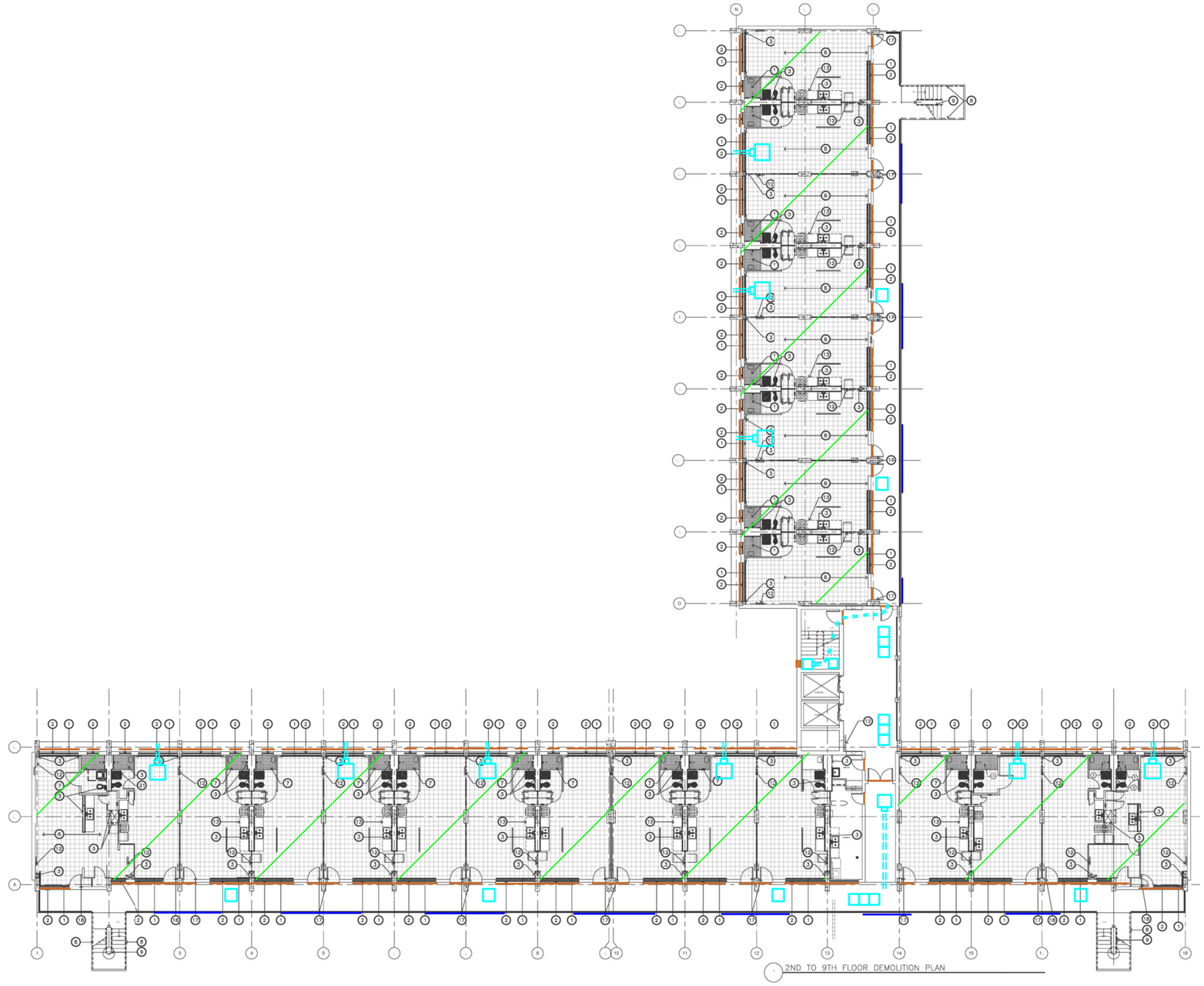
PH. (210) 241-2112 TBPE F-3272 FAX. (210) 641-2124

ASBESTOS ABATEMENT DRAWING

Victoria Plaza Modernization
411 Barrera St.
San Antonio, Texas

Figure
2

N



2ND TO 9TH FLOOR DEMOLITION PLAN

Will C. DeVeau
Individual Asbestos Consultant
TDSHS License No. 105734
Expires 03/10 /2019

LEGEND

- STRIP, REMOVE, AND DISPOSE OF ASBESTOS CONTAINING RESILIENT FLOOR TILE.
- THOROUGHLY WET, REMOVE AND DISPOSE OF ASBESTOS CONTAINING WINDOW/DOOR CAULK.
- THOROUGHLY WET, REMOVE AND DISPOSE OF ASBESTOS CONTAINING FIBER CEMENT BOARD.
- POTENTIAL LOCATION TO ESTABLISH 3-STAGE DECONTAMINATION CHAMBER.
- POTENTIAL LOCATION TO ESTABLISH 1-STAGE DECONTAMINATION CHAMBER.
- POTENTIAL LOCATION TO VENT HFU TO BUILDING EXTERIOR.

Project Mngr:	WCD
Drawn By:	FM
Checked By:	RIH
Approved By:	WCD

Project No.	90187117
Scale:	N.T.S.
File No.	90187117
Date:	5-7-18

Terracon
Consulting Engineers and Scientists
6911 BLANCO RD SAN ANTONIO, TX 78216
PH. (210) 241-2112 TBPE F-3272 FAX. (210) 641-2124

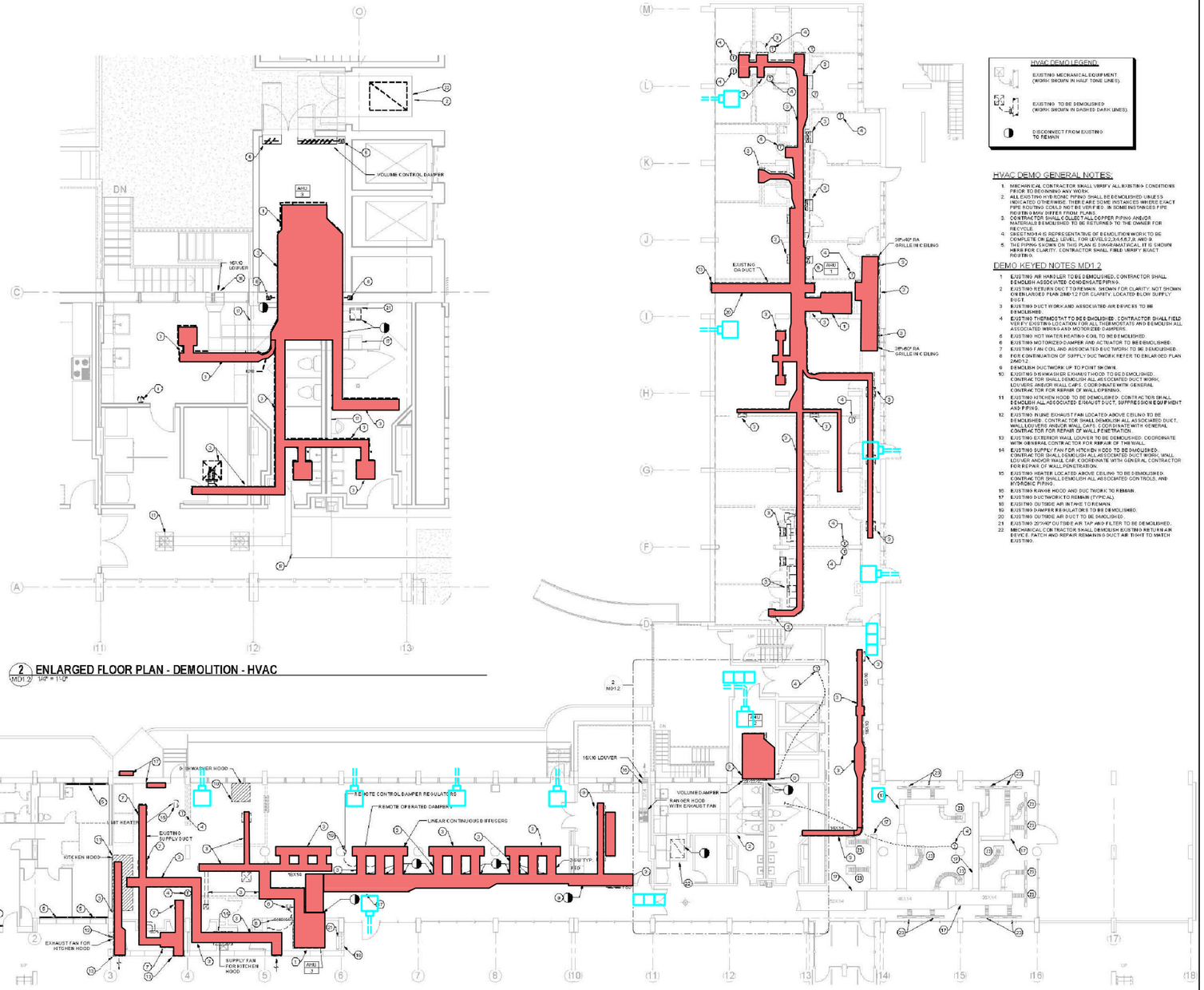
ASBESTOS ABATEMENT DRAWING

Victoria Plaza Modernization
411 Barrera St.
San Antonio, Texas

Figure

3

N



2 ENLARGED FLOOR PLAN - DEMOLITION - HVAC
MD1.2 1/4" = 1'-0"

1 FLOOR PLAN - DEMOLITION - LEVEL 1 - HVAC
MD1.2 1/8" = 1'-0"

HVAC DEMO LEGEND

- EXISTING MECHANICAL EQUIPMENT (WORK SHOWN IN HALF TONE LINES).
- EXISTING TO BE DEMOLISHED (WORK SHOWN IN DASHED DARK LINES).
- DISCONNECT FROM EXISTING TO REMAIN

HVAC DEMO GENERAL NOTES:

1. MECHANICAL CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS PRIOR TO BEGINNING ANY WORK.
2. ALL EXISTING HYDRONIC PIPING SHALL BE DEMOLISHED UNLESS INDICATED OTHERWISE. THERE ARE SOME INSTANCES WHERE EXACT PIPE ROUTING COULD NOT BE VERIFIED. IN SOME INSTANCES PIPE ROUTING MAY DIFFER FROM PLANS.
3. CONTRACTOR SHALL COLLECT ALL COPPER PIPING AND/OR MATERIALS DEMOLISHED TO BE RETURNED TO THE OWNER FOR RECYCLE.
4. THE FINISH PLAN IS REPRESENTATIVE OF DEMOLITION WORK TO BE COMPLETE ON EACH LEVEL FOR LEVELS 2,3,4,5,6,7,8, AND 9.
5. THE PIPING SHOWN ON THIS PLAN IS DIAGRAMATICAL IT IS SHOWN HERE FOR CLARITY. CONTRACTOR SHALL FIELD VERIFY EXACT ROUTING.

DEMO KEYED NOTES MD1.2

1. EXISTING AIR HANDLER TO BE DEMOLISHED; CONTRACTOR SHALL DEMOLISH ASSOCIATED CONDENSATE PIPING.
2. EXISTING RETURN DUCT TO REMAIN. SHOWN FOR CLARITY, NOT SHOWN ON ENLARGED PLAN 2/MD1.2 FOR CLARITY. LOCATED BLOW SUPPLY DUCT.
3. EXISTING DUCT WORK AND ASSOCIATED AIR DEVICES TO BE DEMOLISHED.
4. EXISTING THERMOSTAT TO BE DEMOLISHED. CONTRACTOR SHALL FIELD VERIFY EXISTING LOCATION FOR ALL THERMOSTATS AND DEMOLISH ALL ASSOCIATED WIRING AND MOTORIZED DAMPERS.
5. EXISTING HOT WATER HEATING COIL TO BE DEMOLISHED.
6. EXISTING MOTORIZED DAMPER AND ACTUATOR TO BE DEMOLISHED.
7. EXISTING FAN COIL AND ASSOCIATED DUCTWORK TO BE DEMOLISHED.
8. FOR CONTINUATION OF SUPPLY DUCTWORK REFER TO ENLARGED PLAN 2/MD1.2.
9. DEMOLISH DUCTWORK UP TO POINT SHOWN.
10. EXISTING DISHWASHER EXHAUST HOOD TO BE DEMOLISHED; CONTRACTOR SHALL DEMOLISH ALL ASSOCIATED DUCT WORK, LOUVERS AND/OR WALL CAPS. COORDINATE WITH GENERAL CONTRACTOR FOR REPAIR OF WALL OPENING.
11. EXISTING KITCHEN HOOD TO BE DEMOLISHED. CONTRACTOR SHALL DEMOLISH ALL ASSOCIATED EXHAUST DUCT, SUPPRESSION EQUIPMENT AND PIPING.
12. EXISTING INLINE EXHAUST FAN LOCATED ABOVE CEILING TO BE DEMOLISHED. CONTRACTOR SHALL DEMOLISH ALL ASSOCIATED DUCT, WALL LOUVERS AND/OR WALL CAPS. COORDINATE WITH GENERAL CONTRACTOR FOR REPAIR OF WALL PENETRATION.
13. EXISTING EXTERIOR WALL LOUVER TO BE DEMOLISHED. COORDINATE WITH GENERAL CONTRACTOR FOR REPAIR OF THE WALL.
14. EXISTING SUPPLY FAN FOR KITCHEN HOOD TO BE DEMOLISHED. CONTRACTOR SHALL DEMOLISH ALL ASSOCIATED DUCT WORK, WALL LOUVER AND/OR WALL CAP. COORDINATE WITH GENERAL CONTRACTOR FOR REPAIR OF WALL PENETRATION.
15. EXISTING HEATER LOCATED ABOVE CEILING TO BE DEMOLISHED. CONTRACTOR SHALL DEMOLISH ALL ASSOCIATED CONTROLS, AND HYDRONIC PIPING.
16. EXISTING RANGE HOOD AND DUCTWORK TO REMAIN.
17. EXISTING DUCTWORK TO REMAIN (TYPICAL).
18. EXISTING OUTSIDE AIR INTAKE TO REMAIN.
19. EXISTING DAMPER REGULATORS TO BE DEMOLISHED.
20. EXISTING OUTSIDE AIR DUCT TO BE DEMOLISHED.
21. EXISTING 20"X40" OUTSIDE AIR TAP AND FILTER TO BE DEMOLISHED.
22. MECHANICAL CONTRACTOR SHALL DEMOLISH EXISTING RETURN AIR DEVICE. PATCH AND REPAIR REMAINING DUCT AIR TIGHT TO MATCH EXISTING.

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Expires 03/10 /2019

LEGEND

- THOROUGHLY WET, REMOVE AND DISPOSE OF ASBESTOS CONTAINING HVAC DUCT MASTIC.
- POTENTIAL LOCATION TO ESTABLISH 3-STAGE DECONTAMINATION CHAMBER.
- POTENTIAL LOCATION TO ESTABLISH 1-STAGE DECONTAMINATION CHAMBER.
- POTENTIAL LOCATION TO VENT HFU TO BUILDING EXTERIOR.

Project Mngr:	WCD
Drawn By:	FM
Checked By:	RIH
Approved By:	WCD

Project No.	90187117
Scale:	N.T.S.
File No.	90187117
Date:	5-7-18

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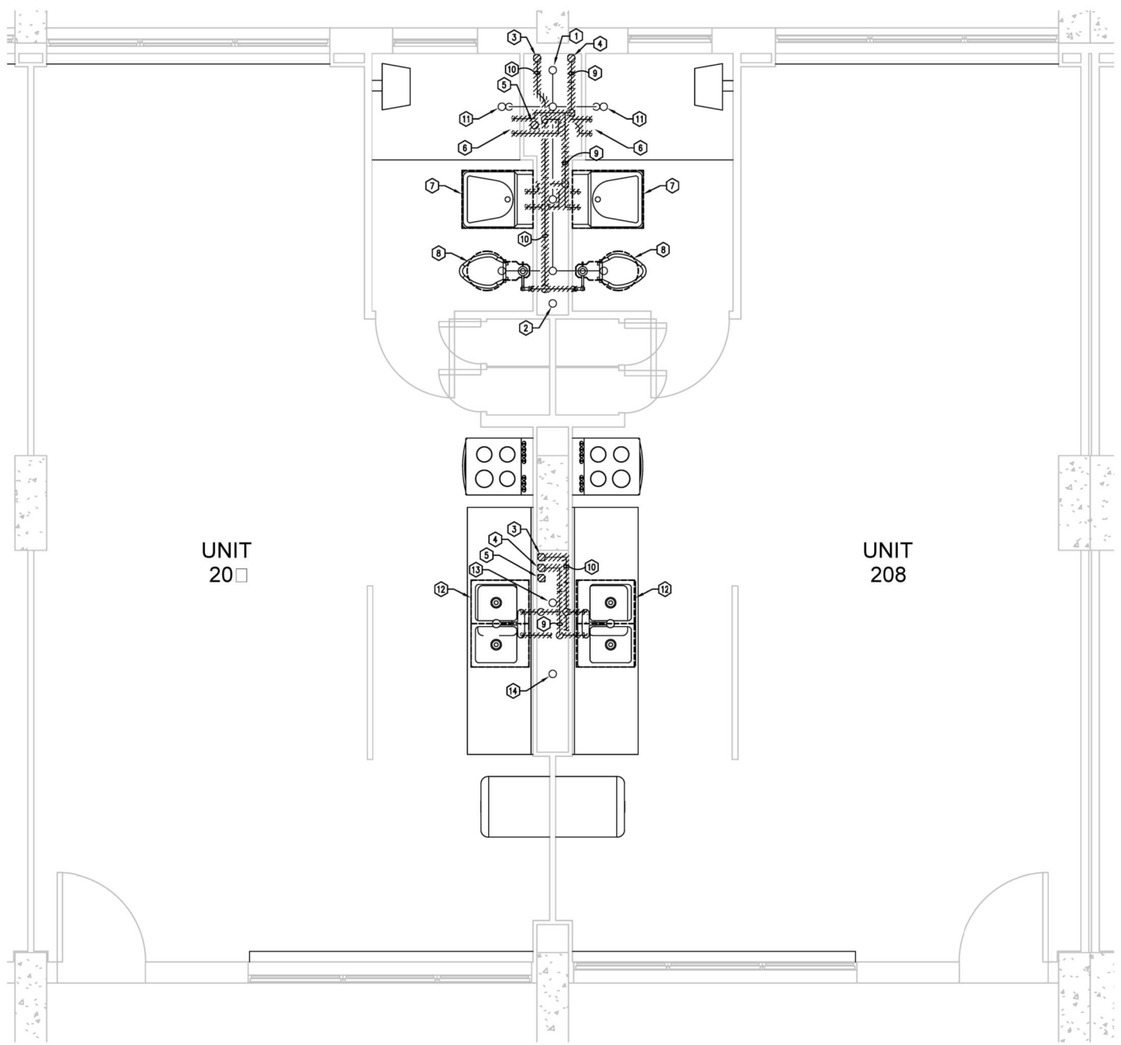
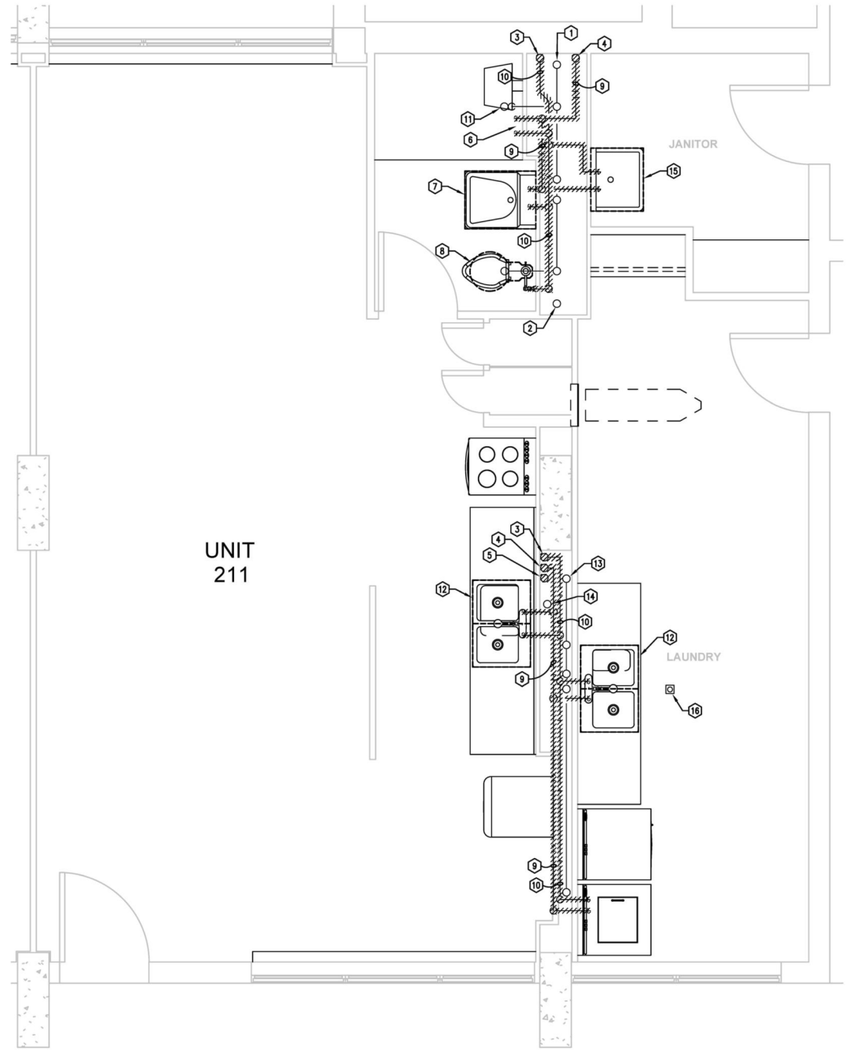
ASBESTOS ABATEMENT DRAWING

Victoria Plaza Modernization
411 Barrera St.
San Antonio, Texas

Figure 4



1 PD2.2 ENLARGED FLOOR PLAN – DEMOLITION – PLUMBING
SCALE: 1/2" = 1'-0"



2 PD2.2 ENLARGED FLOOR PLAN – DEMOLITION – PLUMBING
SCALE: 1/2" = 1'-0"

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LEGEND

- THERMAL SYSTEM INSULATION WITH MASTIC AND/OR MUDDED FITTINGS LOCATIONS COULD NOT BE VERIFIED. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING MATERIAL QUANTITIES AND LOCATIONS PRIOR TO SUBMISSION OF THE PRICE QUOTE TO THE OWNER.

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ASBESTOS ABATEMENT DRAWING

Victoria Plaza Modernization
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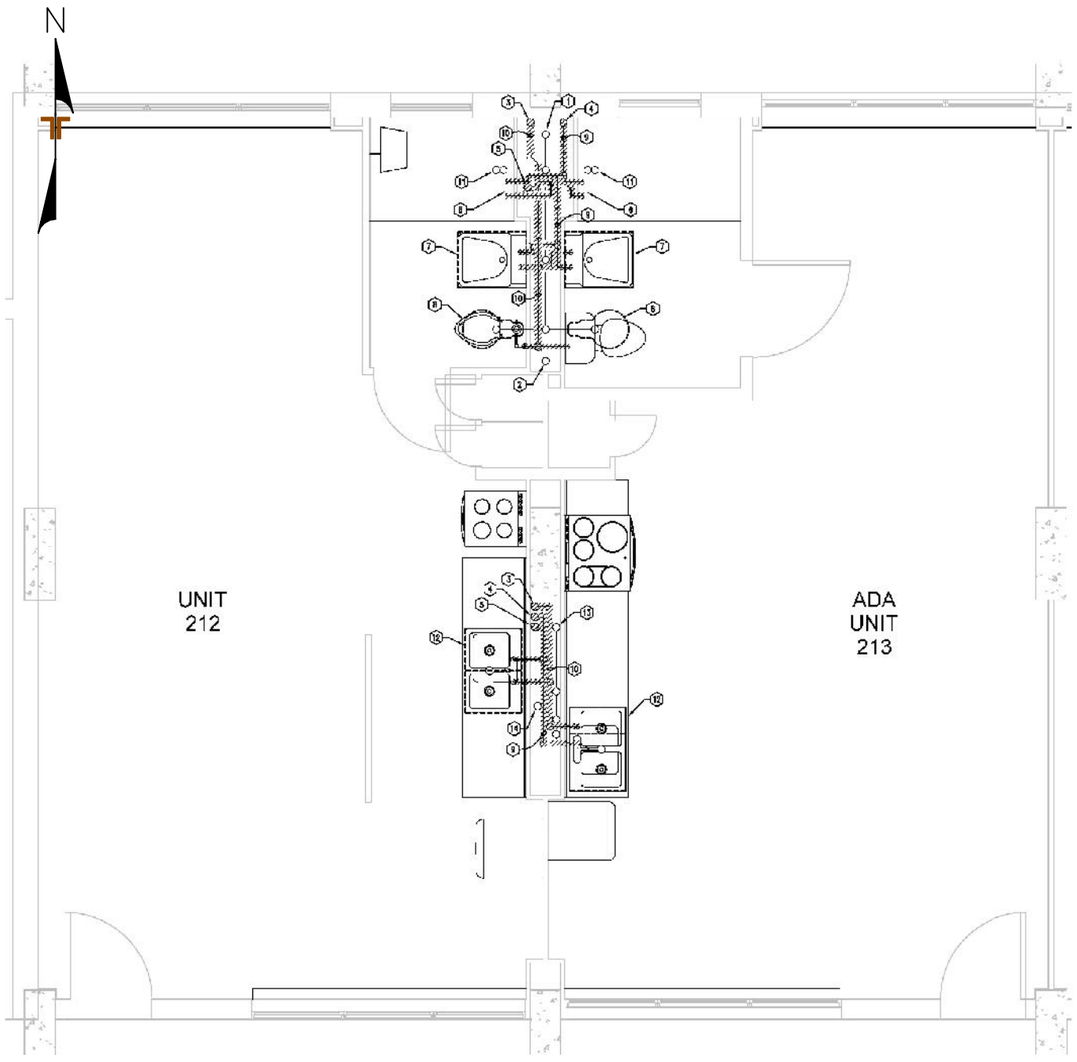
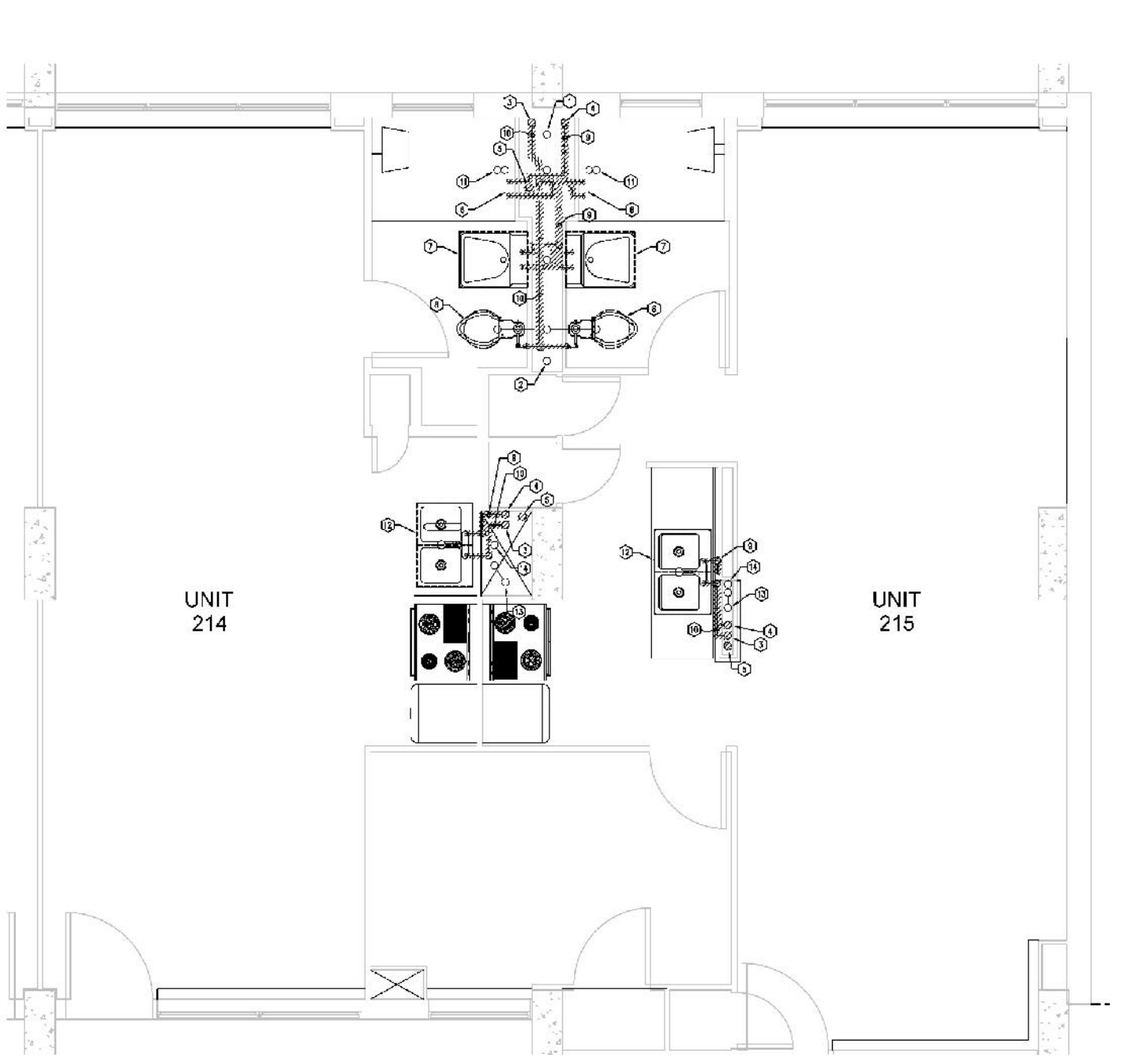
San Antonio, Texas

Figure
5



1 PD2.3 ENLARGED FLOOR PLAN – DEMOLITION – PLUMBING
SCALE: 1/2" = 1'-0"



2 PD2.3 ENLARGED FLOOR PLAN – DEMOLITION – PLUMBING
SCALE: 1/2" = 1'-0"

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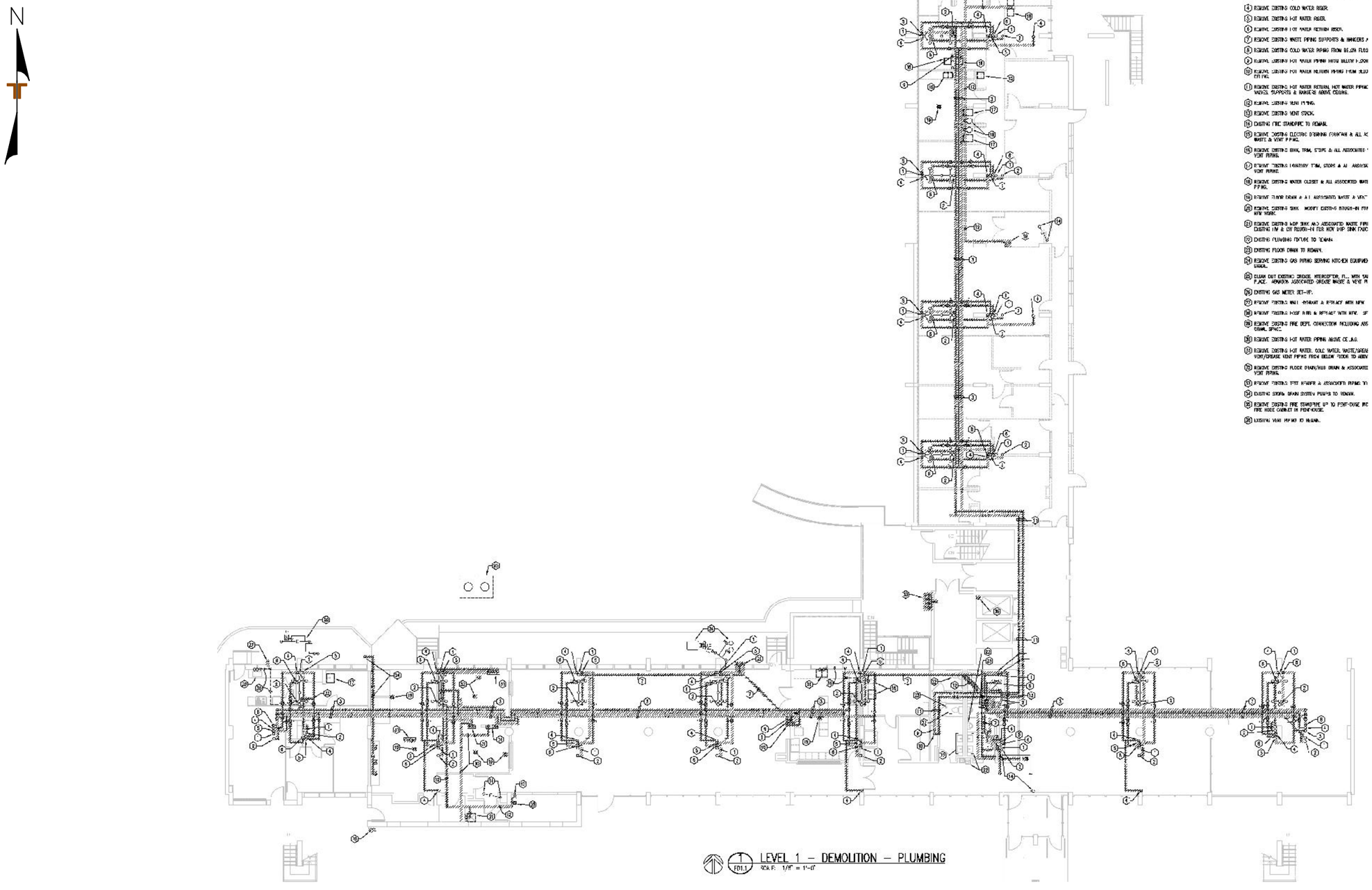
ASBESTOS ABATEMENT DRAWING

Victoria Plaza Modernization
411 Barrera St.
San Antonio, Texas

Figure
6



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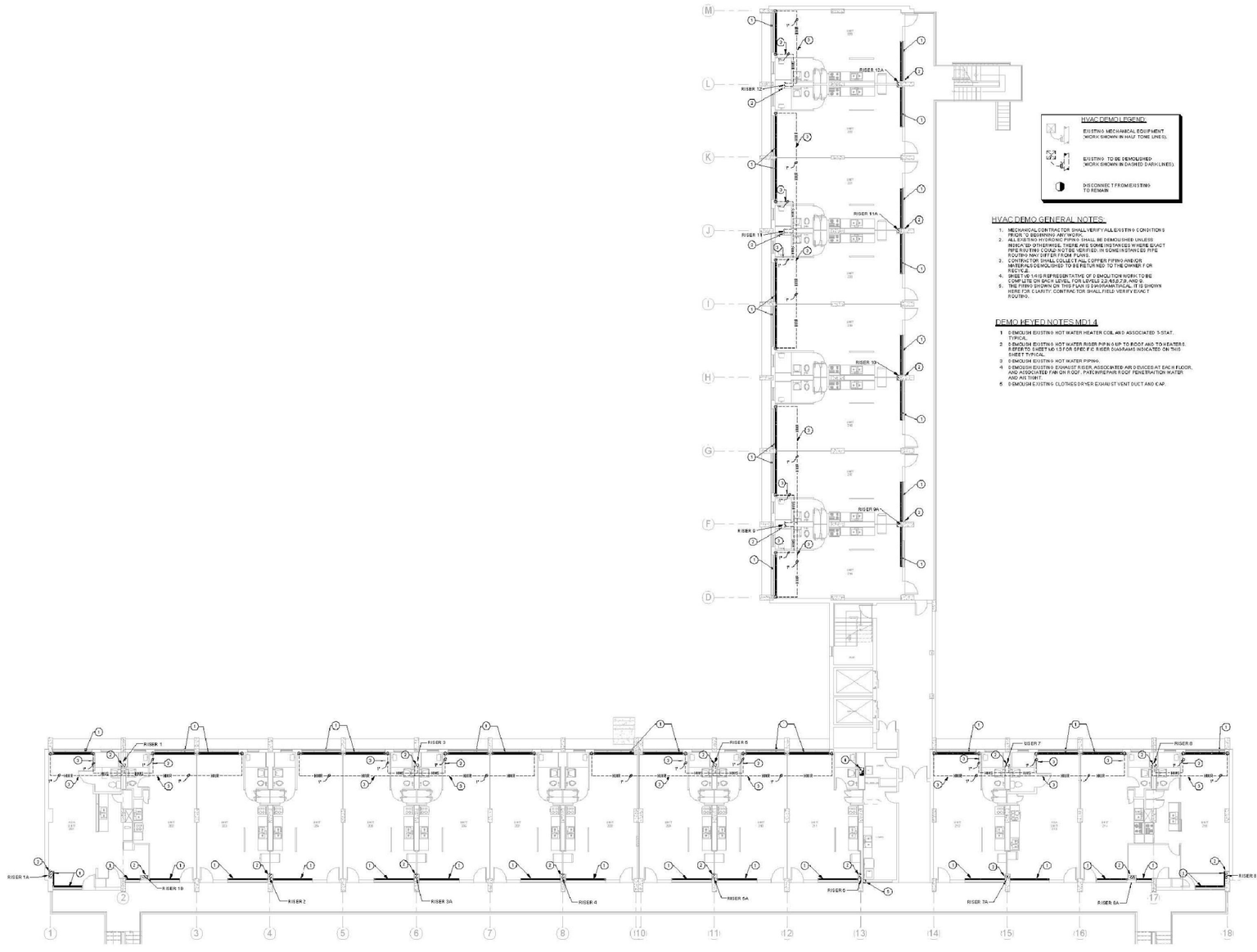
ASBESTOS ABATEMENT DRAWING

Victoria Plaza Modernization
411 Barrera St.
San Antonio, Texas

Figure

7

N



1 MD1.4 FLOOR PLAN - LEVEL 2 THRU 9 - DEMOLITION - HVAC
1/8" = 1'-0"

HVAC DEMO LEGEND:

EXISTING MECHANICAL EQUIPMENT. (WORK SHOWN IN HALF TONE LINES).

EXISTING TO BE DEMOLISHED (WORK SHOWN IN DASHED DARK LINES).

DISCONNECT FROM EXISTING TO REMAIN.

HVAC DEMO GENERAL NOTES:

1. MECHANICAL CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS PRIOR TO BEGINNING ANY WORK.
2. ALL EXISTING HYDRONIC PIPING SHALL BE DEMOLISHED UNLESS INDICATED OTHERWISE. THERE ARE SOME INSTANCES WHERE EXACT REMOVAL LOCATIONS ARE NOT NOTED. IN SOME INSTANCES PIPE ROUTING MAY DIFFER FROM PLANS.
3. CONTRACTOR SHALL COLLECT ALL COPPER PIPING AND/OR MATERIALS DEMOLISHED TO BE RETURNED TO THE OWNER FOR RECYCLE.
4. SHEET MD 1.4 IS REPRESENTATIVE OF DEMOLITION WORK TO BE COMPLETED ON EACH LEVEL FOR LEVELS 2,3,4,5,6,7,8, AND 9.
5. THE PIPING SHOWN ON THIS PLAN IS DIAGRAMATICAL. IT IS SHOWN HERE FOR CLARITY. CONTRACTOR SHALL FIELD VERIFY EXACT ROUTING.

DEMO KEYED NOTES MD1.4

1 DEMOLISH EXISTING HOT WATER HEATER COIL AND ASSOCIATED T-STAT, TYPICAL.
2 DEMOLISH EXISTING HOT WATER RISER PIPING UP TO ROOF AND TO HEATERS. REFER TO SHEET M0.1 FOR SPECIFIC RISER DIAGRAMS INDICATED ON THIS SHEET TYPICAL.
3 DEMOLISH EXISTING HOT WATER PIPING.
4 DEMOLISH EXISTING EXHAUST RISER, ASSOCIATED AIR DEVICES AT EACH FLOOR, AND ASSOCIATED FAN ON ROOF. PATCH/REPAIR ROOF PENETRATION WATER AND AIR TIGHT.
5 DEMOLISH EXISTING CLOTHES DRYER EXHAUST VENT DUCT AND CAP.

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LEGEND

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ASBESTOS ABATEMENT DRAWING

Victoria Plaza Modernization
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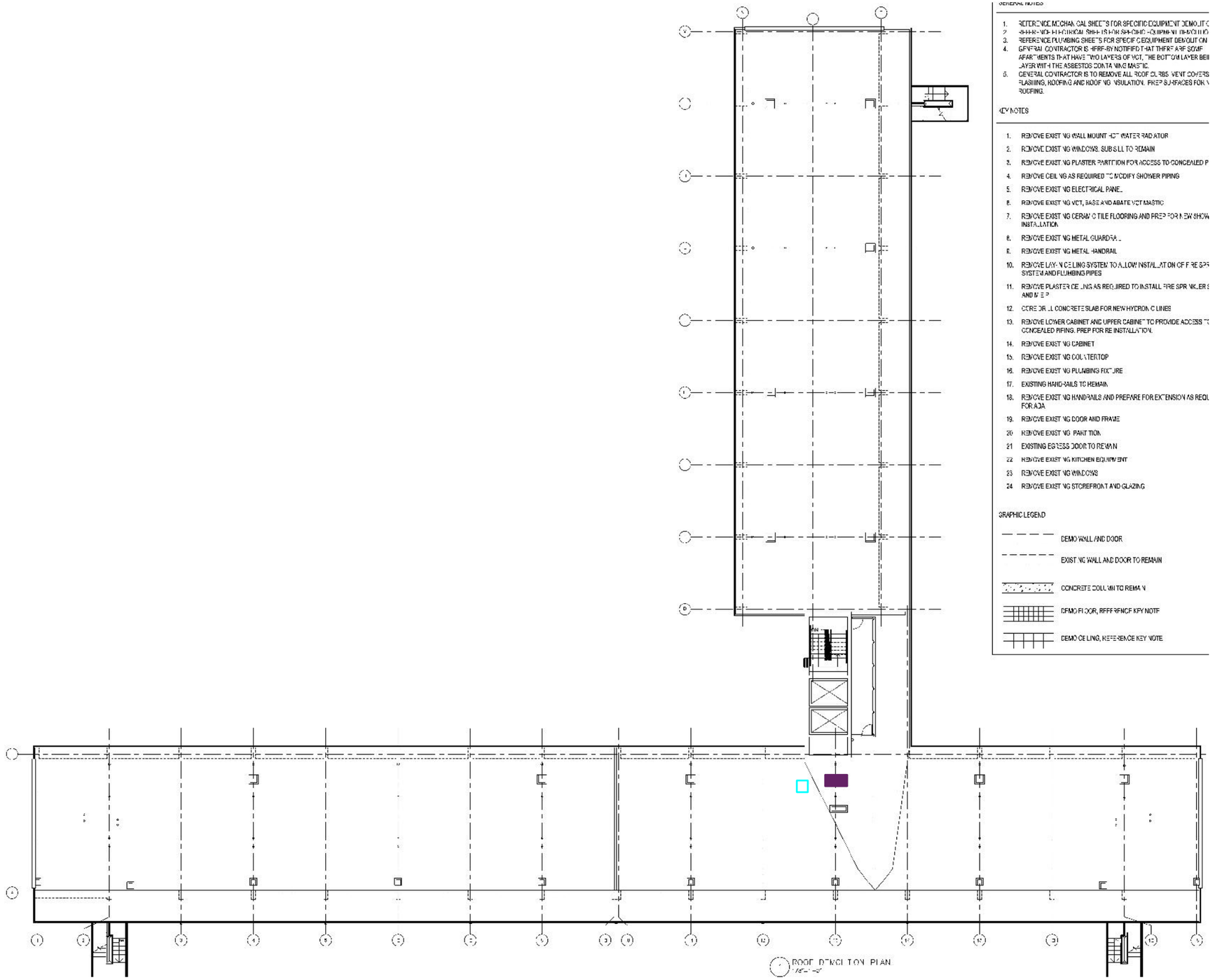
San Antonio, Texas

Figure
8

N



ROOF DEMOLITION PLAN

GENERAL NOTES

1. REFERENCE MECHANICAL SHEETS FOR SPECIFIC EQUIPMENT DEMOLITION
2. REFER TO ELECTRICAL SHEETS FOR SPECIFIC EQUIPMENT DEMOLITION
3. REFERENCE PLUMBING SHEETS FOR SPECIFIC EQUIPMENT DEMOLITION
4. GENERAL CONTRACTOR IS HEREBY NOTIFIED THAT THERE ARE SOME APARTMENTS THAT HAVE TWO LAYERS OF VCT, THE BOTTOM LAYER BEING LAYER WITH THE ASBESTOS CONTAINING MASTIC.
5. GENERAL CONTRACTOR IS TO REMOVE ALL ROOF CURBS, VENT COVERS, FLASHING, ROOFING AND ROOFING INSULATION. PREP SURFACES FOR NEW ROOFING.

KEY NOTES

1. REMOVE EXISTING WALL MOUNT HOT WATER RADIATOR
2. REMOVE EXISTING WINDOWS, SUB SILL TO REMAIN
3. REMOVE EXISTING PLASTER PARTITION FOR ACCESS TO CONCEALED P
4. REMOVE CEILING AS REQUIRED TO MODIFY SHOWER PIPING
5. REMOVE EXISTING ELECTRICAL PANEL.
6. REMOVE EXISTING VCT, BASE AND ABATE VCT MASTIC
7. REMOVE EXISTING CERAMIC TILE FLOORING AND PREP FOR NEW SHOWER INSTALLATION
8. REMOVE EXISTING METAL GUARDRAIL
9. REMOVE EXISTING METAL HANDRAIL
10. REMOVE LAY-IN CEILING SYSTEM TO ALLOW INSTALLATION OF FIRE SPRINKLER SYSTEM AND PLUMBING PIPES
11. REMOVE PLASTER CEILING AS REQUIRED TO INSTALL FIRE SPRINKLERS AND M.E.P.
12. CORE DRILL CONCRETE SLAB FOR NEW HYDRONIC LINES
13. REMOVE LOWER CABINET AND UPPER CABINET TO PROVIDE ACCESS TO CONCEALED PIPING. PREP FOR RE INSTALLATION.
14. REMOVE EXISTING CABINET
15. REMOVE EXISTING COUNTERTOP
16. REMOVE EXISTING PLUMBING FIXTURE
17. EXISTING HAND-RAILS TO REMAIN
18. REMOVE EXISTING HANDRAILS AND PREPARE FOR EXTENSION AS REQUIRED FOR ADA
19. REMOVE EXISTING DOOR AND FRAME
20. REMOVE EXISTING PARTITION
21. EXISTING EGRESS DOOR TO REMAIN
22. REMOVE EXISTING KITCHEN EQUIPMENT
23. REMOVE EXISTING WINDOWS
24. REMOVE EXISTING STOREFRONT AND GLAZING

GRAPHIC LEGEND

- DEMO WALL AND DOOR
- EXISTING WALL AND DOOR TO REMAIN
- CONCRETE COLUMN TO REMAIN
- DEMO FLOOR, REFERENCE KEY NOTE
- DEMO CEILING, REFERENCE KEY NOTE

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LEGEND

- THOROUGHLY WET, REMOVE AND DISPOSE OF ASBESTOS CONTAINING VIBRATION DAMPER.

- POTENTIAL LOCATION TO ESTABLISH SINGLE DECONTAMINATION CHAMBER.

Project Mngr:	WCD
Drawn By:	
Checked By:	RIH
Approved By:	WCD

Project No.	90187117
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ASBESTOS ABATEMENT DRAWING

Victoria Plaza Modernization
411 Barrera St.
San Antonio, Texas

SECTION 011000 - SUMMARY (REVISED)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Access to site.
4. Work restrictions.
5. Specification and Drawing conventions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

A. Project Identification: San Antonio Housing Authority – Victoria Plaza Modernization

1. Project Location: 411 Barrera, San Antonio, Texas 78210.

B. Owner: San Antonio Housing Authority, 818 S. Flores, San Antonio, Texas 78204.

1. Owner's Representative: Hector Martinez, Director of Construction Services and Sustainability.

C. Architect: DHR Architects, Inc..

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Modernization of 9 story, multi-housing building of approximately 117,360 square feet. Replacement of or improvements to all exterior metal handrails, roof systems and all windows. Replacement of interior acoustical ceilings, interior partial walls, select doors and frames replaced for accessibility, patch, repair and repainting of apartment units. Replacement of plumbing fixtures, domestic water/sewer lines. Removal and replacement of Central HVAC System and installation of four pipe air conditioning in the residential units. Removal and replacement of electrical service entry, distribution panels and light fixtures. Installation of new sprinkler system thru out the facility and other work indicated in the Contract Documents. This work also includes the abatement of existing asbestos and lead-based paint as specified.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.4 ACCESS TO SITE

A. General: Contractor shall assume responsibility of the site and building for the duration of the project, including physically securing the site and building at all times. Contractor shall utilize existing parking area and limit personnel vehicles to park on project premises only.

B. Use of Elevators: Contractor shall be allowed use of the building's elevators for personnel and small tools and materials only.Floor & Wall proper protection must be placed in elevators to prevent any damage. Contractor will be responsible for repairs. Coordinate with Owner if elevators will be repaired or upgraded under a separate contract during construction operations.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.5 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated.

C. Existing Utility Interruptions: Coordinate interrupt of utilities if needed.

1. Notify Architect and Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission if requested before proceeding with utility interruptions.

D. Restricted Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.6 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012100 – ALLOWANCES (REVISED)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:
   1. Lump-sum allowances.

1.2 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Owner from the designated supplier.

1.3 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.4 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 LUMP-SUM ALLOWANCES

A. Allowance shall include cost to Contractor to provide Allowance No. One (1). See Schedule below.

1.6 CONTINGENCY ALLOWANCES (NOT USED)

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES:

A. Allowance No. One (1):
1. Lump Sum Allowance of $1,400 for four (4) Ceiling Fans on 1st Floor, Manufacturer and Model to be selected by Owner. Installation (all labor and other materials) to be included in Base Bid.

END OF SECTION 012100

SECTION 012300 – ALTERNATES (REVISED)

PART 1 - GENERAL

1.1 SUMMARY

1. Section includes administrative and procedural requirements for Deduct Alternates.

1.2 DEFINITIONS

1. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
    1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
    2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

1. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
    1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

2. Execute accepted alternates under the same conditions as other work of the Contract.

3. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES.

A. Alternate No. 1: DEDUCT to Eliminate Downspout Replacement.
Refer to Drawings

B. Alternate No. 2: DEDUCT to Eliminate Stair Pressurization System & Enclosure

C. Alternate No. 3: DEDUCT for Elimination of Removal of Penthouse Screen as indicated, Refer to Detail 4, Sheet A195.

D. Alternate No. 4: DEDUCT to Preserve Existing Ladder and Cage.

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES (REVISED)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.
3. San Antonio Housing Authority (SAHA) is to be final authority on approval of substitutions

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed unless otherwise indicated.

C. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.

j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES (REVISED)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.4 CHANGE ORDER PROCEDURES

A. On approval of Owner's Contracting Office of a Work Change Proposal Request, Architect

will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.5 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: On approval of Owner's Contracting Officer, with the exception of an emergency, Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.6 WORK CHANGE DIRECTIVE

A. Work Change Directive: On approval of Owner's Contracting Officer, with the exception of an emergency, Architect may issue a Work Change Directive on EJCDC Document C-940. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES (REVISED)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

A. Separate Schedule of Values: Contractor to provide two separate Schedule of Values. One for general scope of work and another to track Energy Performance Contract (EPC) items. Each Schedule of Values is to be invoiced separately.

B. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Submit the Schedule of Values to Architect at earliest possible date, but no later than seven (7) days before the date scheduled for submittal of initial Application for Payment.
2. Coordinate line items in the Schedule of Values with items required to be indicated as separate activities in Contractor’s construction schedule

C. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Arrange schedule of values consistent with format of AIA Document G703.
2. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
3. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site.

4. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
5. Overhead Costs: Include total cost and proportionate share of general overhead and profit for each line item.
6. Overhead Costs: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
7. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
8. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.3 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Submit Application for Payment to Architect by the 25th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

F. Transmittal: Submit two signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment or subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Products list (preliminary if not final).
5. Sustainable design action plans, including preliminary project materials cost data.
6. Schedule of unit prices.
7. Submittal schedule (preliminary if not final).
8. List of Contractor's staff assignments.
9. List of Contractor's principal consultants.
10. Copies of building permits.
11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
12. Initial progress report.
13. Report of preconstruction conference.
14. Certificates of insurance and insurance policies.
15. Performance and payment bonds.
16. Data needed to acquire Owner's insurance.

I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706.
5. AIA Document G706A.
6. AIA Document G707.
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. RFIs.
4. Digital project management procedures.
5. Project meetings.

B. Related Requirements:

1. Section 011200 "Multiple Contract Summary" for a description of the division of work among separate contracts and responsibility for coordination activities not in this Section.
2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 019113 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.3 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on e ach other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on S hop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a s cale large enough to indicate and resolve conflicts. Do not base coordination drawings on s tandard printed data. Include the following information, as applicable:

a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
b. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Review: Architect will review coordination drawings to confirm that in general the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility.

1.7 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a d etailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. RFI Forms: AIA Document G716.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for approval of Contractor's means and methods.
d. Requests for coordination information already indicated in the Contract Documents.
e. Requests for adjustments in the Contract Time or the Contract Sum.
f. Requests for interpretation of Architect's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architectof additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Architect's Data Files Not Available: Architect will not provide Architect's BIM model or CAD drawing digital data files for Contractor's use during construction.

B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.9 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Responsibilities and personnel assignments.
    b. Tentative construction schedule.
    c. Phasing.
    d. Critical work sequencing and long lead items.
    e. Designation of key personnel and their duties.
    f. Lines of communications.
    g. Use of web-based Project software.
    h. Procedures for processing field decisions and Change Orders.
    i. Procedures for RFIs.
    j. Procedures for testing and inspecting.
    k. Procedures for processing Applications for Payment.
    l. Distribution of the Contract Documents.
    m. Submittal procedures.
    n. Sustainable design requirements.
    o. Preparation of Record Documents.
    p. Use of the premises[**and existing building**].
    q. Work restrictions.
    r. Working hours.
    s. Owner's occupancy requirements.
    t. Responsibility for temporary facilities and controls.
    u. Procedures for moisture and mold control.
    v. Procedures for disruptions and shutdowns.
    w. Construction waste management and recycling.
    x. Parking availability.
    y. Office, work, and storage areas.
    z. Equipment deliveries and priorities.
    aa. First aid.
    bb. Security.

cc. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Sustainable design requirements.
i. Review of mockups.
j. Possible conflicts.
k. Compatibility requirements.
l. Time schedules.
m. Weather limitations.
n. Manufacturer's written instructions.
o. Warranty requirements.
p. Compatibility of materials.
q. Acceptability of substrates.
r. Temporary facilities and controls.
s. Space and access limitations.
t. Regulations of authorities having jurisdiction.
u. Testing and inspecting requirements.
v. Installation procedures.
w. Coordination with other work.
x. Required performance results.
y. Protection of adjacent work.
z. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at regular intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

    b. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Resolution of BIM component conflicts.
        4) Status of submittals.
        5) Status of sustainable design documentation.
        6) Deliveries.
        7) Off-site fabrication.
        8) Access.
        9) Site use.
        10) Temporary facilities and controls.
        11) Progress cleaning.
        12) Quality and work standards.
        13) Status of correction of deficient items.
        14) Field observations.
        15) Status of RFIs.
        16) Status of Proposal Requests.
        17) Pending changes.
        18) Status of Change Orders.
        19) Pending claims and disputes.
        20) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's Construction Schedule.
2. Construction schedule updating reports.
3. Daily construction reports.
4. Site condition reports.

B. Related Requirements:

1. Section 011200 "Multiple Contract Summary" for preparing a combined Contractor's Construction Schedule.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. PDF file.
3. Two paper copies, of sufficient size to display entire period or schedule, as required.

B. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.

D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
3. Total Float Report: List of activities sorted in ascending order of total float.

E. Construction Schedule Updating Reports: Submit with Applications for Payment.

F. Daily Construction Reports: Submit at monthly intervals.

G. Site Condition Reports: Submit at time of discovery of differing conditions.

1.4 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

1. Use Microsoft Project, for current Windows operating system.

B. Time Frame: Extend schedule from date established for commencement of the Work to date of final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
5. Commissioning Time: Include no fewer than 15 days for commissioning.
6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
7. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
3. Work Restrictions: Show the effect of the following items on the schedule:

a. Coordination with existing construction.
b. Limitations of continued occupancies.
c. Uninterruptible services.
d. Partial occupancy before Substantial Completion.
e. Use-of-premises restrictions.
f. Provisions for future construction.
g. Seasonal variations.
h. Environmental control.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

G. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

H. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

I. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.6 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.7 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Work Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Contractor.
5. Name of firm or entity that prepared submittal.
6. Names of subcontractor, manufacturer, and supplier.
7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
8. Category and type of submittal.
9. Submittal purpose and description.

10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
11. Drawing number and detail references, as appropriate.
12. Indication of full or partial submittal.
13. Location(s) where product is to be installed, as appropriate.
14. Other necessary identification.
15. Remarks.
16. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Paper Submittals:

1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Action Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will return one copy.
4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
5. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using AIA Document G810 transmittal form.

E. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

F. Submittals for Web-Based Project Software: Prepare submittals as PDF files, or other format indicated by Project software website.

1.5 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email: Prepare submittals as PDF package, and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
2. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
3. Paper: Prepare submittals in paper form, and deliver to Architect.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Resubmittal Review: Allow 15 days for review of each resubmittal.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.6 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams that show factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 11 by 17 inches but no larger than 30 by 42 inches.

a. Two opaque (bond) copies of each submittal. Architect will return one copy(ies).

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

a. Project name and submittal number.
b. Generic description of Sample.
c. Product name and name of manufacturer.
d. Sample source.
e. Number and title of applicable Specification Section.
f. Specification paragraph number and generic name of each item.

3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.
4. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
5. Paper Transmittal: Include paper transmittal including complete submittal information indicated.

6. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

7. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

8. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit two sets of Samples. Architect will retain one Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.

        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

1.7 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and two paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.8 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.

1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action, as follows:

a. Insert description of each action indicated on Architect's stamp.

2. Paper Submittals: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:

a. Insert description of each action indicated on Architect's stamp.

3. Submittals by Web-Based Project Software: Architect will indicate, on Project software website, the appropriate action.

a. Actions taken by indication on P roject software website have the following meanings:

1) Insert description of each action indicated on Architect's stamp.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Architect will return without review submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

SECTION 013516 - ALTERATION PROJECT PROCEDURES (REVISED)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes special procedures for alteration work.

1.2 DEFINITIONS

A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.

B. Consolidate: To strengthen loose or deteriorated materials in place.

C. Design Reference Sample: A sample that represents the Architect's prebid selection of work to be matched; it may be existing work or work specially produced for the Project.

D. Dismantle: To remove by disassembling or detaching an item from a su rface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.

F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.

G. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.

H. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.

I. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.

J. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.

K. Retain: To keep existing items that are not to be removed or dismantled.

L. Strip: To remove existing finish down to base material unless otherwise indicated.

1.3 PROJECT MEETINGS FOR ALTERATION WORK

A. Preliminary Conference for Alteration Work: Before starting alteration work, conduct conference at Project site.

1. Attendees: In addition to representatives of Owner, Architect, and Contractor, Owner's insurer, testing service representative, and chemical-cleaner manufacturer(s) shall be represented at the meeting.
2. Agenda: Discuss items of significance that could affect progress of alteration work, including review of the following:

    a. Fire-prevention plan.
    b. Governing regulations.
    c. Areas where existing construction is to remain and the required protection.
    d. Hauling routes.
    e. Sequence of alteration work operations.
    f. Storage, protection, and accounting for salvaged and specially fabricated items.
    g. Existing conditions, staging, and structural loading limitations of areas where materials are stored.

3. Reporting: Record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.

B. Coordination Meetings: Conduct coordination meetings specifically for alteration work at bi-weekly or monthly intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of alteration work. Include topics for discussion as appropriate to status of Project.
2. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.4 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.

1.5 INFORMATIONAL SUBMITTALS

A. Alteration Work Program: Submit 30 days before work begins.

B. Fire-Prevention Plan: Submit 30 days before work begins.

1.6 QUALITY ASSURANCE

A. Title X Requirement: Each firm conducting activities that disturb painted surfaces shall be a "Lead-Safe Certified Firm" according to 40 CFR 745, Subpart E, and use only workers that are trained in lead-safe work practices.

B. Alteration Work Program: Prepare a written plan for alteration work for whole Project, including each phase or process and protection of surrounding materials during operations. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project alteration work program with specific requirements of programs required in other alteration work Sections.

1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.

C. Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-control devices during each phase or process. Coordinate plan with Owner's fire-protection equipment and requirements. Include fire-watch personnel's training, duties, and authority to enforce fire safety.

D. Safety and Health Standard: Comply with ANSI/ASSE A10.6.

1.7 STORAGE AND HANDLING OF SALVAGED MATERIALS

A. Salvaged Materials:

1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.

5. Protect items from damage during transport and storage.

B. Salvaged Materials for Reinstallation:

1. Repair and clean items for reuse as indicated.
2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.

C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.

D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.

1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
2. Secure stored materials to protect from theft.
3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F or more above the dew point.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.

1. Use only proven protection methods, appropriate to each area and surface being protected.
2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
3. Erect temporary barriers to form and maintain fire-egress routes.
4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
8. Provide supplemental sound-control treatment to isolate demolition work from other areas of the building.

B. Temporary Protection of Materials to Remain:

1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.

C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

D. Utility and Communications Services:

1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.

E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.

1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

3.2 PROTECTION FROM FIRE

A. General: Follow fire-prevention plan and the following:

1. Comply with NFPA 241 requirements unless otherwise indicated.
2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.

    a. If combustible material cannot be removed, provide fire blankets to cover such materials.

B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:

1. Obtain Owner's approval for operations involving use of welding or other high-heat equipment. Use of open-flame equipment is not permitted. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
2. As far as p racticable, restrict heat-generating equipment to shop areas or outside the building.
3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.

6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:

    a. Train each fire watch in the proper operation of fire-control equipment and alarms.
    b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
    c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
    d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
    e. Maintain fire-watch personnel at each area of Project site until two hours after conclusion of daily work.

C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.

D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.

1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

3.3 PROTECTION DURING APPLICATION OF CHEMICALS

A. Protect motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.

B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.

C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.

D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.

E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.4 GENERAL ALTERATION WORK

A. Record existing work before each procedure (preconstruction), and record progress during the work.

B. Perform surveys of Project site as t he Work progresses to detect hazards resulting from alterations.

C. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.

1. Do not proceed with the work in question until directed by Architect.

END OF SECTION 013516

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
2. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

D. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as freestanding temporary built elements or as part of permanent construction, consisting of multiple products, assemblies, and subassemblies.

E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

F. Product Tests: Tests and inspections that are performed by a n ationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.3 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1.4 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for direction before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

A. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

C. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Statement on condition of substrates and their acceptability for installation of product.
2. Statement that products at Project site comply with requirements.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Statement that equipment complies with requirements.
2. Results of operational and other tests and a statement of whether observed performance complies with requirements.
3. Other required items indicated in individual Specification Sections.

1.8 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

    a. Provide test specimens representative of proposed products and construction.
    b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    d. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a cer tified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain Architect's approval of mockups before starting corresponding work, fabrication, or construction.

a. Allow seven days for initial review and each re-review of each mockup.

7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
8. Demolish and remove mockups when directed unless otherwise indicated.

L. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.

1.9 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Engage a qualified testing agency to perform quality-control services.

a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
3. Where quality-control services are indicated as C ontractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a f actory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Associated Contractor Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
6. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in the Statement of Special Inspections attached to this Section, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.

2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.
7. .

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.

34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
40. AWPA - American Wood Protection Association; www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI - BICSI, Inc.; www.bicsi.org.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
49. CDA - Copper Development Association; www.copper.org.
50. CE - Conformite Europeenne; http://ec.europa.eu/growth/single-market/ce-marking/
51. CEA - Canadian Electricity Association; www.electricity.ca.
52. CEA - Consumer Electronics Association; www.ce.org.
53. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CGA - Compressed Gas Association; www.cganet.com.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
57. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
58. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CPA - Composite Panel Association; www.pbmdf.com.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRRC - Cool Roof Rating Council; www.coolroofs.org.
63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
64. CSA - Canadian Standards Association; www.csa.ca.
65. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
66. CSI - Construction Specifications Institute (The); www.csinet.org.
67. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
69. CWC - Composite Wood Council; (See CPA).
70. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
71. DHI - Door and Hardware Institute; www.dhi.org.
72. ECA - Electronic Components Association; (See ECIA).
73. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
74. ECIA - Electronic Components Industry Association; www.eciaonline.org.
75. EIA - Electronic Industries Alliance; (See TIA).
76. EIMA - EIFS Industry Members Association; www.eima.com.
77. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
78. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org .
79. ESTA - Entertainment Services and Technology Association; (See PLASA).
80. ETL - Intertek (See Intertek); www.intertek.com.

81. EVO - Efficiency Valuation Organization; www.evo-world.org.
82. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
83. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
84. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
85. FM Approvals - FM Approvals LLC; www.fmglobal.com.
86. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
87. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
88. FSA - Fluid Sealing Association; www.fluidsealing.com.
89. FSC - Forest Stewardship Council U.S.; www.fscus.org.
90. GA - Gypsum Association; www.gypsum.org.
91. GANA - Glass Association of North America; www.glasswebsite.com.
92. GS - Green Seal; www.greenseal.org.
93. HI - Hydraulic Institute; www.pumps.org.
94. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
95. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
96. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
97. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
98. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
99. IAS - International Accreditation Service; www.iasonline.org.
100. IAS - International Approval Services; (See CSA).
101. ICBO - International Conference of Building Officials; (See ICC).
102. ICC - International Code Council; www.iccsafe.org.
103. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
104. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
105. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
106. IEC - International Electrotechnical Commission; www.iec.ch.
107. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
108. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
109. IESNA - Illuminating Engineering Society of North America; (See IES).
110. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
111. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
112. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
113. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
114. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
115. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
116. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
117. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
118. ISO - International Organization for Standardization; www.iso.org.
119. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
120. ITU - International Telecommunication Union; www.itu.int/home.
121. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
122. LMA - Laminating Materials Association; (See CPA).
123. LPI - Lightning Protection Institute; www.lightning.org.

124. MBMA - Metal Building Manufacturers Association; www.mbma.com.
125. MCA - Metal Construction Association; www.metalconstruction.org.
126. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
127. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
128. MHIA - Material Handling Industry of America; www.mhia.org.
129. MIA - Marble Institute of America; www.marble-institute.com.
130. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
131. MPI - Master Painters Institute; www.paintinfo.com.
132. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
133. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
134. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
135. NADCA - National Air Duct Cleaners Association; www.nadca.com.
136. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
137. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
138. NBI - New Buildings Institute; www.newbuildings.org.
139. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
140. NCMA - National Concrete Masonry Association; www.ncma.org.
141. NEBB - National Environmental Balancing Bureau; www.nebb.org.
142. NECA - National Electrical Contractors Association; www.necanet.org.
143. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
144. NEMA - National Electrical Manufacturers Association; www.nema.org.
145. NETA - InterNational Electrical Testing Association; www.netaworld.org.
146. NFHS - National Federation of State High School Associations; www.nfhs.org.
147. NFPA - National Fire Protection Association; www.nfpa.org.
148. NFPA - NFPA International; (See NFPA).
149. NFRC - National Fenestration Rating Council; www.nfrc.org.
150. NHLA - National Hardwood Lumber Association; www.nhla.com.
151. NLGA - National Lumber Grades Authority; www.nlga.org.
152. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
153. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
154. NRCA - National Roofing Contractors Association; www.nrca.net.
155. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
156. NSF - NSF International; www.nsf.org.
157. NSPE - National Society of Professional Engineers; www.nspe.org.
158. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
159. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
160. NWFA - National Wood Flooring Association; www.nwfa.org.
161. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
162. PDI - Plumbing & Drainage Institute; www.pdionline.org.
163. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); http://www.plasa.org.
164. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
165. RFCI - Resilient Floor Covering Institute; www.rfci.com.
166. RIS - Redwood Inspection Service; www.redwoodinspection.com.
167. SAE - SAE International; www.sae.org.
168. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
169. SDI - Steel Deck Institute; www.sdi.org.
170. SDI - Steel Door Institute; www.steeldoor.org.

171. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
172. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
173. SIA - Security Industry Association; www.siaonline.org.
174. SJI - Steel Joist Institute; www.steeljoist.org.
175. SMA - Screen Manufacturers Association; www.smainfo.org.
176. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
177. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
178. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
179. SPIB - Southern Pine Inspection Bureau; www.spib.org.
180. SPRI - Single Ply Roofing Industry; www.spri.org.
181. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
182. SSINA - Specialty Steel Industry of North America; www.ssina.com.
183. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
184. STI - Steel Tank Institute; www.steeltank.com.
185. SWI - Steel Window Institute; www.steelwindows.com.
186. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
187. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
188. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
189. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
190. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
191. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
192. TMS - The Masonry Society; www.masonrysociety.org.
193. TPI - Truss Plate Institute; www.tpinst.org.
194. TPI - Turfgrass Producers International; www.turfgrasssod.org.
195. TRI - Tile Roofing Institute; www.tileroofing.org.
196. UL - Underwriters Laboratories Inc.; http://www.ul.com.
197. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
198. USAV - USA Volleyball; www.usavolleyball.org.
199. USGBC - U.S. Green Building Council; www.usgbc.org.
200. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
201. WASTEC - Waste Equipment Technology Association; www.wastec.org.
202. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
203. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
204. WDMA - Window & Door Manufacturers Association; www.wdma.com.
205. WI - Woodwork Institute; www.wicnet.org.
206. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
207. WWPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.

4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov/fdsys.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.

    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.

6. MILSPEC - Military Specification and Standards; (See DOD).

7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservice.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS (REVISED)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use with metering and with payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use with metering and with payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Moisture-and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold.

E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:

1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste-handling procedures.
5. Other dust-control measures.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a co nstruction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no f ewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
3. Drinking water and private toilet.
4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction. and clean HVAC system as required in Section 017700 "Closeout Procedures."

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service underground unless otherwise indicated.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated within construction limits indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touch up signs so they are legible at all times.

G. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

J. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including if required replacing worn cables, guide shoes, and similar items of limited life.

1. Do not load elevators beyond their rated weight capacity.
2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

K. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Temporary Erosion and Sedimentation Control: Comply with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 311000 "Site Clearing."

D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings, requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

E. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

F. Tree and Plant Protection: Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."

G. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

H. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control

procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

I. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations and as indicated on Drawings.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

J. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

K. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

L. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

M. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

N. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas when needed from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
3. Provide walk-off mats at each entrance through temporary partition.

O. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a seq uence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

1.2 DEFINITIONS

A. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

B. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, and locations of protection-zone fencing and signage, showing relation of equipment-movement routes and material storage locations with protection zones.

C. Samples: For each type of the following:

1. Organic Mulch: Sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
2. Protection-Zone Fencing: Assembled Samples.
3. Protection-Zone Signage: Full-size Samples.

D. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

1.5 INFORMATIONAL SUBMITTALS

A. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

B. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

C. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1.6 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA, licensed arborist in jurisdiction where Project is located, current member of ASCA, or registered Consulting Arborist as designated by ASCA.

1.7 FIELD CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Moving or parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill Soil: Stockpiled soil mixed with planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

1. Mixture: Well-blended mix of two parts stockpiled soil to one part planting soil.

B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood.

C. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements: Previously used materials may be used when approved by Architect.

1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch opening, 0.148-inch-diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch-OD line posts, and 2-7/8-inch-OD corner and pull posts; with 1-5/8-inch-OD top rails and 0.177-inch-diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.

a. Height: 96 inches.

2. Gates: Swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones.

D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

3.2 PREPARATION

A. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

B. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.

1. Apply 4-inch uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.

3.3 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones in a manner that will prevent people from easily entering protected areas except by entrance gates.

1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
2. Access Gates: Install where indicated.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect.

C. Maintain protection zones free of weeds and trash.

D. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.

3.4 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.

B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning.

C. Do not allow exposed roots to dry out before placing permanent backfill.

3.5 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

C. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with backfill soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

3.6 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.7 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.

1. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
2. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 2-inch uniform thickness to remain.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 015639

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for requests for substitutions.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

    a. Form of Architect's Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
    b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

6. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a w ritten document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: …"

2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

   a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with requirements, provide products by the following: …"

3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

   a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: …"

4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, which complies with requirements.

   a. Non-limited list of products is indicated by the phrase: "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following: …"

5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

   a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: …"

6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, which complies with requirements.

   a. Non-limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following: …"

7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

C. Visual Matching Specification: Where Specifications require "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no pr oduct available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
2. Evidence that proposed product provides specified warranty.
3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
4. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION (REVISED)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.

1.2 INFORMATIONAL SUBMITTALS

A. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.

B. Landfill Receipts: Submit copy of receipts issued by a l andfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

C. Certified Surveys: Submit two copies signed by land surveyor or professional engineer.

D. Final Property Survey: Submit 3 copies showing the Work performed and record survey data.

1.3 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding.

Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services; and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor or professional engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Remove and replace damaged, defective, or non-conforming Work.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cu tting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

F. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall

coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

G. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls." And Section 017419 "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017700 - CLOSEOUT PROCEDURES (REVISED)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
2. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
3. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at final completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
5. Submit testing, adjusting, and balancing records.
6. Submit sustainable design submittals not previously submitted.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1.5 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1.6 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Submit list of incomplete items in the following format:

    a. MS Excel electronic file. Architect will return annotated file.
    b. PDF electronic file. Architect will return annotated file.

1.7 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: All warranties start on date of Final Acceptance only. Submit written warranties on request of Architect for designated portions of the Work.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit by email to Architect.

D. Warranties in Paper Form:

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

E. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
c. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
d. Sweep concrete floors broom clean in unoccupied spaces.

e. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
f. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
g. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
h. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
i. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls." and Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations, before requesting inspection for determination of Substantial Completion.

B. Repair, or remove and replace, defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory manuals.
2. Emergency manuals.
3. Systems and equipment operation manuals.
4. Systems and equipment maintenance manuals.
5. Product maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect and Commissioning Authority will comment on whether content of operation and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:

1. Pre-Submit one bound paper copy for Architect’s review. Enable reviewer comments on draft submittals.

C. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

D. Final Manual Submittal: Submit 3 paper copies each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1.3 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
2. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.4 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no de signation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.5 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds, as described below.

C. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

    a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.

2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

H. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1.7 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Requirements:

1. Section 017300 "Execution" for final property survey.
2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.
2. Number of Copies: Submit copies of record Drawings as follows:

a. Initial Submittal:
   1) Submit PDF electronic files of scanned record prints and one paper copy set.
   2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:
   1) Print each drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one paper copy and annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy and annotated PDF electronic files and directories of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, no marked-up Product Data is required.

1.3 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on c oncealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Format: Annotated PDF electronic file with comment function enabled.

3. Incorporate changes and additional information previously marked on r ecord prints. Delete, redraw, and add details and notations where applicable.
4. Refer instances of uncertainty to Architect for resolution.
5. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.

    a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
    b. Architect will provide data file layer information. Record markups in separate layers.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

1.4 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on c oncealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as an notated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Specifications.

1.5 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on c oncealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

C. Format: Submit record Product Data as annotated PDF electronic file paper copy or scanned PDF electronic file(s) of marked-up paper copy of Product Data.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

1.6 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store record documents in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017839

01 90 00 - LEAD-BASED PAINT REMOVAL AND DISPOSAL SPECIFICATION

VICTORIA PLAZA MODERNIZATION
411 BARRERA STREET
SAN ANTONIO, TEXAS

May 18, 2018
Terracon Project No. 96187406

Prepared for:
San Antonio Housing Authority
San Antonio, Texas

Prepared by:
Terracon Consultants, Inc.
San Antonio, Texas

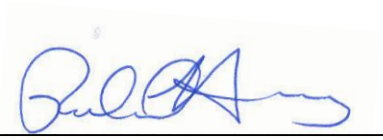
6911 Blanco Road
San Antonio, TX 78216
(210)641-2112
terracon.com

DIVISION 1 - GENERAL REQUIREMENTS

01920 Summary of Work – Lead (Pb) Based Materials
01921 - Project Coordination – Lead (Pb) Based Materials
01922 - Reference Standards and Definitions– Lead (Pb) Based Materials
01923 - Codes, Regulations, and Standards – Lead (Pb) Based Materials
01924 - Submittals - Lead (Pb) Based Materials
01925 - Test Laboratory Services - Lead (Pb) Based Materials
01926 - Project Clearance - Lead (Pb) Based Materials
01927 Remediation Facilities and Temporary Controls - Lead (Pb) Based Materials
01928 - Exterior Regulated Areas - Lead (Pb) Based Materials
01931 - Worker Protection - Lead (Pb) Based Materials
01932 - Respiratory Protection - Lead (Pb) Based Materials
01934 - Project Closeout - Lead (Pb) Based Materials
01935 Project Decontamination - Lead (Pb) Based Materials

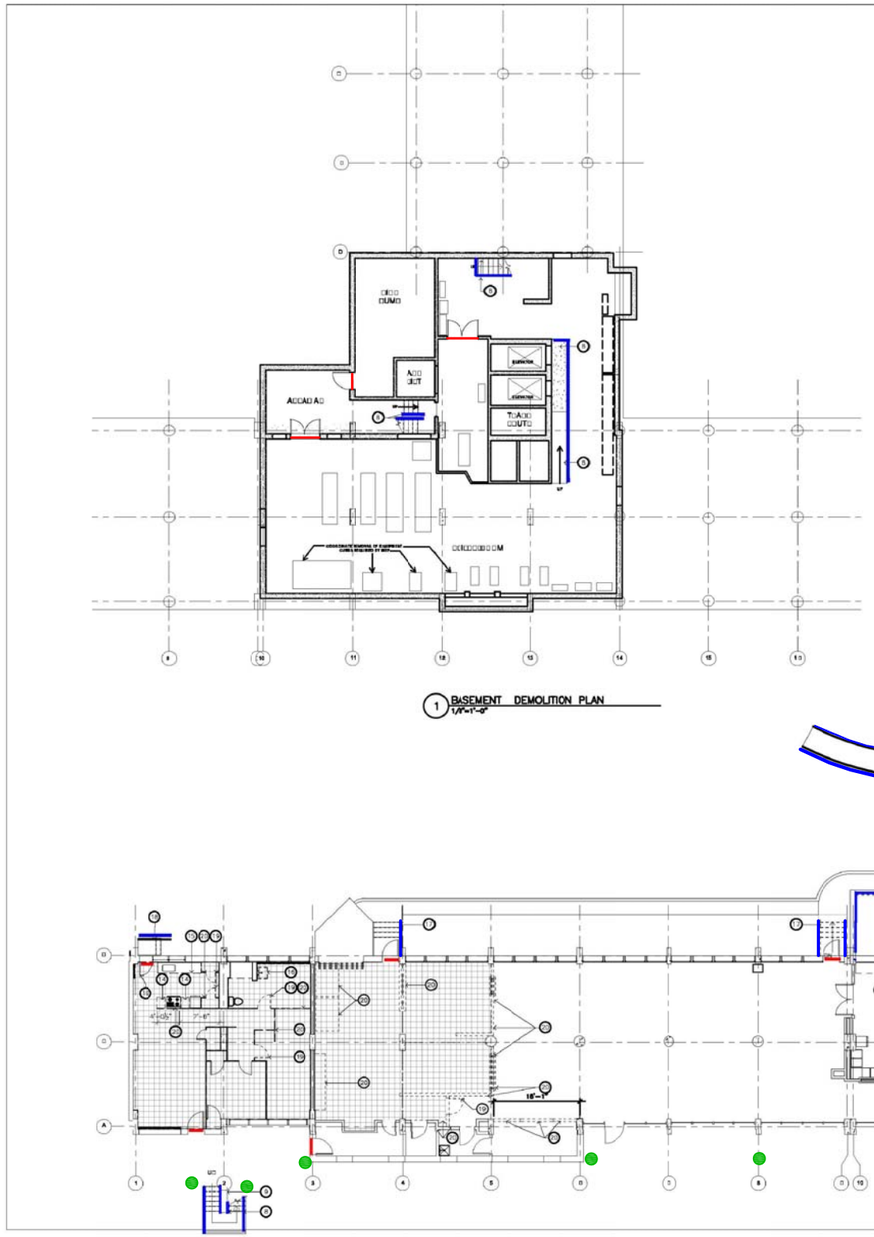
DIVISION 2 - SITE WORK

01937 Remediation of Lead (Pb) Contaminated Soil
01938 Disposal of Waste Materials - Lead (Pb) Based Materials
01947 Encapsulation of Lead (Pb) Based Materials
01948 Chemical Stripping of Lead (Pb) Based Materials

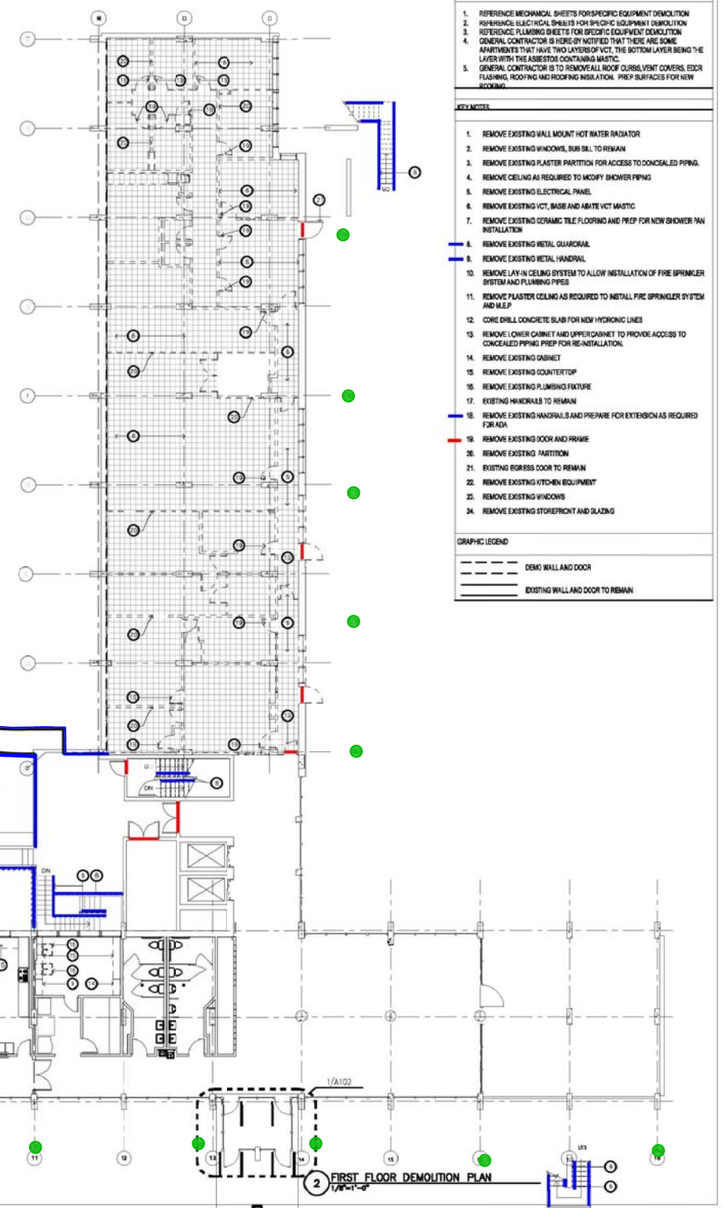


Richard Ian Howes, Project Designer

Certified Lead Abatement Project Designer
Certification Number: 2090034
Expiration Date: 11-19-19



1 BASEMENT DEMOLITION PLAN
1/8"=1'-0"



2 FIRST FLOOR DEMOLITION PLAN
1/8"=1'-0"

GENERAL NOTES

1. REFERENCE MECHANICAL SHEETS FOR SPECIFIC EQUIPMENT DEMOLITION
2. REFERENCE ELECTRICAL SHEETS FOR SPECIFIC EQUIPMENT DEMOLITION
3. REFERENCE PLUMBING SHEETS FOR SPECIFIC EQUIPMENT DEMOLITION
4. GENERAL CONTRACTOR IS HERE-BY NOTIFIED THAT THERE ARE SOME APARTMENTS THAT HAVE TWO LAYERS OF VCT, THE BOTTOM LAYER BEING THE LAYER WITH THE ASBESTOS CONTAINING MASTIC.
5. GENERAL CONTRACTOR IS TO REMOVE ALL ROOF CURBS, VENT COVERS, EDGE FLASHING, ROOFING AND ROOFING INSULATION. PREP SURFACES FOR NEW ROOFING.

KEY NOTES

1. REMOVE EXISTING WALL MOUNT HOT WATER RADIATOR
2. REMOVE EXISTING WINDOWS, SUB SILL TO REMAIN
3. REMOVE EXISTING PLASTER PARTITION FOR ACCESS TO CONCEALED PIPING.
4. REMOVE CEILING AS REQUIRED TO MODIFY SHOWER PIPING
5. REMOVE EXISTING ELECTRICAL PANEL
6. REMOVE EXISTING VCT, BASE AND ABATE VCT MASTIC
7. REMOVE EXISTING CERAMIC TILE FLOORING AND PREP FOR NEW SHOWER PAN INSTALLATION
8. REMOVE EXISTING METAL GUARDRAIL
9. REMOVE EXISTING METAL HANDRAIL
10. REMOVE LAY-IN CEILING SYSTEM TO ALLOW INSTALLATION OF FIRE SPRINKLER SYSTEM AND PLUMBING PIPES
11. REMOVE PLASTER CEILING AS REQUIRED TO INSTALL FIRE SPRINKLER SYSTEM AND M.E.P
12. CORE DRILL CONCRETE SLAB FOR NEW HYDRONIC LINES
13. REMOVE LOWER CABINET AND UPPER CABINET TO PROVIDE ACCESS TO CONCEALED PIPING. PREP FOR RE-INSTALLATION.
14. REMOVE EXISTING CABINET
15. REMOVE EXISTING COUNTERTOP
16. REMOVE EXISTING PLUMBING FIXTURE
17. EXISTING HANDRAILS TO REMAIN
18. REMOVE EXISTING HANDRAILS AND PREPARE FOR EXTENSION AS REQUIRED FOR ADA
19. REMOVE EXISTING DOOR AND FRAME
20. REMOVE EXISTING PARTITION
21. EXISTING EGRESS DOOR TO REMAIN
22. REMOVE EXISTING KITCHEN EQUIPMENT
23. REMOVE EXISTING WINDOWS
24. REMOVE EXISTING STOREFRONT AND GLAZING

GRAPHIC LEGEND

- DEMO WALL AND DOOR
- EXISTING WALL AND DOOR TO REMAIN

DURAND-HOLLIE RUPE ARCHITECTS, INC.
14603 HUEBNER ROAD
BUILDING 19
SAN ANTONIO, TEXAS
78230
TEL. 210 308-0060
FAX. 210 697-3329

OWNER:
SAHA
SAN ANTONIO HOUSING AUTHORITY
818 SOUTH FLORES STREET
SAN ANTONIO, TX 78204
T. 210-477-6363

SAN ANTONIO HOUSING AUTHORITY VICTORIA PLAZA MODERNIZATION-PHASE 1
411 BARRERA ST, SAN ANTONIO, TX 78210

LOCATION:

REVISIONS
ISSUE DESCRIPTION DATE

11/08/18

PROJECT ARCHITECT

FIRST FLOOR DEMOLITION PLAN

SHEET NUMBER
D-101

- 8. REMOVE EXISTING METAL GUARDRAIL/HANDRAILS
- 9. REMOVE EXISTING PAINT/COATINGS FROM METAL PORCH RAILINGS, POLES, AND OTHER COMPONENTS
- 18. REMOVE EXISTING HANDRAILS AND PREPARE FOR EXTENSION AS REQUIRED FOR ADA
- 19. REMOVE EXISTING DOORS & FRAMES AT ALL ACCESSIBLE UNITS AND PREPARE ALL < 36" OPENINGS FOR NEW 36" DOORS. CHEMICALLY REMOVE PAINT FROM 36" DOORS/FRAMES

Project Mngr:	RIH
Drawn By:	NJM
Checked By:	RIH
Approved By:	RIH

Project No.	96187406
Scale:	N.T.S.
File No.	96187406
Date:	5-18-18

Terracon
Consulting Engineers and Scientists
6911 BLANCO RD SAN ANTONIO, TX 78216
PH. (210) 241-2112 TBPE F-3272 FAX. (210) 641-2124

LEAD ABATEMENT DRAWING- BASEMENT & FIRST FLOOR

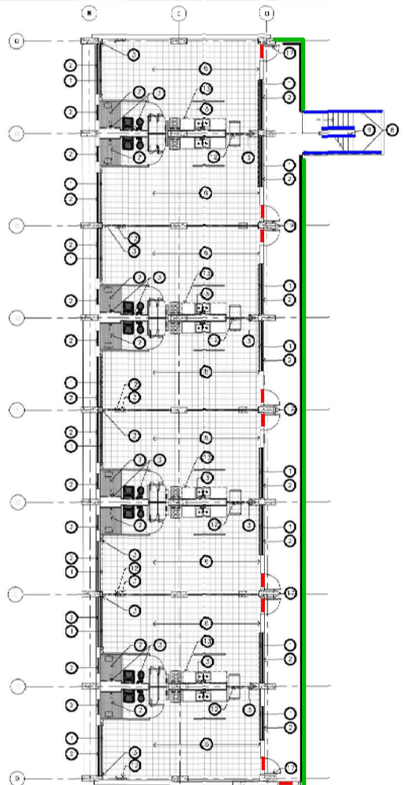
Victoria Plaza Modernization
411 Barrera St.
San Antonio, Texas

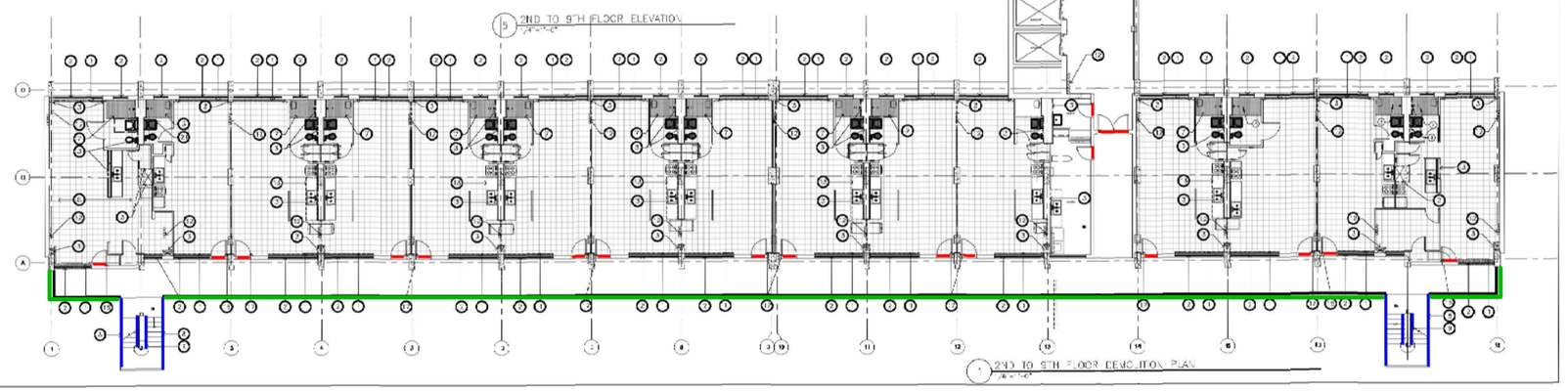
Figure
1

2 2ND TO 9TH FLOOR ELEVATION

3 2ND TO 9TH FLOOR ELEVATION

4 2ND TO 9TH FLOOR ELEVATION





5 2ND TO 9TH FLOOR ELEVATION

1 2ND TO 9TH FLOOR DEMOLITION PLAN

GENERAL NOTES

1. REFERENCE MECHANICAL SHEETS FOR SPECIFIC EQUIPMENT DEMOLITION
2. REFERENCE ELECTRICAL SHEETS FOR SPECIFIC EQUIPMENT DEVOLUTION
3. REFERENCE PLUMBING SHEETS FOR SPECIFIC EQUIPMENT DEMOLITION
4. GENERAL CONTRACTOR IS HEREBY NOTIFIED THAT THERE ARE SOME APARTMENTS THAT HAVE TWO LAYERS OF VCT, THE BOTTOM LAYER BEING THE LAYER WITH THE ASBESTOS CONTAINING MASTIC.
5. GENERAL CONTRACTOR IS TO REMOVE ALL ROOF CURBS, VENT COVERS, EBCR FLASHING, ROOFING AND ROOFING INSULATION. PREP SURFACES FOR NEW ROOFING.
6. REMOVE EXISTING DOORS & FRAMES AT ALL ACCESSIBLE UNITS AND PREPARE ALL OPENINGS FOR NEW 36" DOORS WITH TRANSOM, REF. A-401

KEY NOTES

1. REMOVE EXISTING WALL MOUNT HOT WATER RADIATOR
2. REMOVE EXISTING WINDOWS, SILLS TO REMAIN
3. REMOVE EXISTING PLASTER PARTITION FOR ACCESS TO CONCEALED PIPING
4. REMOVE CEILING AS REQUIRED TO MODIFY SHOWER PIPING
5. REMOVE EXISTING ELECTRICAL PANEL
6. REMOVE EXISTING VCT, BASE AND ASBESTOS VCT MASTIC
7. REMOVE EXISTING CERAMIC TILE FLOORING AND PREP FOR NEW SHOWER PAN INSTALLATION
8. REMOVE EXISTING METAL GUARDRAIL
9. REMOVE EXISTING METAL HANDRAIL
10. REMOVE LAY-IN CEILING SYSTEM TO ALLOW INSTALLATION OF FIRE SPRINKLER SYSTEM AND PLUMBING PIPES
11. REMOVE PLASTER CEILING AS REQUIRED TO INSTALL FIRE SPRINKLER SYSTEM AND M.E.P.
12. CORE DRILL CONCRETE SLAB FOR NEW HYDRONIC LINES
13. REMOVE LOWER CABINET AND UPPER SHELVES TO PROVIDE ACCESS TO CONSULTANT M.E.P. FIRE FOR RE-INSTALLATION.
14. REMOVE EXISTING CABINET
15. REMOVE EXISTING COUNTERTOP
16. REMOVE EXISTING PLUMBING FIXTURE
17. REMOVE EXISTING GLAZING ABOVE DOOR, EXISTING SCREEN DOOR, DOOR, HOLLOW METAL, FRAME TO REMAIN
18. REMOVE PLASTER TO REROUTE ELECTRICAL CONDUIT
19. REMOVE ALL PLUMBING FIXTURE AS NOTED
20. ABATE LEAD BASED PAINT @ EXISTING GUARDRAILS AND PREPARE FOR ALTERATION

GRAPHIC LEGEND

- DEMO WALL AND DOOR
- EXISTING WALL AND DOOR TO REMAIN
- CONCRETE COLUMN TO REMAIN
- DEMO FLOOR, REFERENCE KEY NOTE
- DEMO CEILING, REFERENCE KEY NOTE

DHR ARCHITECTURE

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BUILDING 18
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TEL 210 308-0080
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OWNER
SAHA SAN ANTONIO HOUSING AUTHORITY
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T. 210.477.4283

SAN ANTONIO HOUSING AUTHORITY VICTORIA PLAZA MODERNIZATION-PHASE 1
411 BARRERA, SAN ANTONIO, TEXAS 78210

LOCATION

REVISIONS

NUM	DESCRIPTION	DATE

01/08/19

PROJECT ARCHITECT

2ND - 9TH FLOOR DEMOLITION PLAN

SHEET NUMBER
D-102

- 6. REMOVE EXISTING DOORS & FRAMES AT ALL ACCESSIBLE UNITS AND PREPARE ALL < 36" OPENINGS FOR NEW 36" DOORS. CHEMICALLY REMOVE PAINT FROM 36" DOORS/FRAMES
- 8. REMOVE EXISTING METAL GUARDRAIL/HANDRAILS
- 9. REMOVE PAINT/COATINGS FROM METAL PORCH RAILINGS, POLES, AND OTHER COMPONENTS

Project Mngr:	RIH
Drawn By:	NJM
Checked By:	RIH
Approved By:	RIH

Project No.	96187406
Scale:	N.T.S.
File No.	96187406
Date:	5-18-18

Terracon
Consulting Engineers and Scientists
6911 BLANCO RD SAN ANTONIO, TX 78216
PH. (210) 241-2112 TBPE F-3272 FAX. (210) 641-2124

LEAD ABATEMENT DRAWING-LEVELS 2-9

Victoria Plaza Modernization
411 Barrera St.
San Antonio, Texas

Figure
2

SECTION 01920 - SUMMARY OF WORK – LEAD (PB) BASED MATERIALS

PART 1 – GENERAL: THIS PROJECT IS TO BE CONDUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF TAC 25, SECTION 15, ARTICLE 4477-3A AND 29 CFR 1926.1101.

The location and approximate quantities of lead (Pb) containing paint materials which will ultimately be removed is provided in Section 1.07 of these specifications but the intent of this project is that:

1) the white paint/coatings applied to all ADA compliant (36" opening) exterior door frames (Basement to 9th Floor) will be removed down to clean metal,
2) all exterior doors and door frames which are not ADA compliant (<36" opening) shall be removed as a component and recycled,
3) all metal stairwell handrail/railing components shall be removed as components and recycled,
4) the black/oxide paint/coatings applied to all exterior porch handrails, railings, porch poles, and other components on the south and east elevations shall be removed down to clean metal,
5) select exterior railing sections within and adjacent to the building shall be removed as components and recycled,
6) the black/oxide paint/coatings applied to select exterior railing sections adjacent to the building which are ADA compliant shall be removed down to clean metal.

Interior ceramic tile materials which contain levels of lead above 1 microgram per square centimeter (<1 mg/cm^2) are present in each apartment unit and these materials shall be removed and disposed of by others as part of an asbestos-abatement project which is to be conducted within the structure.

The majority of the 1st Floor hand railing sections, all stairwell handrails and railings which are not ADA compliant (Basement to Level 9), and exterior door/door frame components which are not ADA compliant (<36" opening) will be removed as components and recycled.

The majority of the exterior door frames, porch railings, porch support poles, etc.) will be chemically or manually deleaded, and left in a condition which allows for applications of new coatings, repair or additional manipulation by other trades. Chemical stripping or manual removal methods (wet scrapping, heat gun removal, etc.) may be employed when conditions dictate that the component is to remain but lead-based paint coatings are present.

The Contractor shall field verify for actual quantities which these plans and specifications represent. No additional compensation will be made to the Contractor(s) for differences between the estimated quantities and the actual quantities unless prior written approval is obtained from the Owner or his representative.

HUD has issued guidelines titled *Guidelines For the Evaluation and Control of Lead-Based Paint Hazard in Housing* (Chapter 7 – Lead-Based Paint Inspection) pursuant to Title X of the Housing and Community Development Act of 1992. The US Environmental Protection Agency (EPA)/HUD action level for lead-based painted surfaces is 1 mg/cm^2 by XRF testing or 5,000

parts per million (ppm) or 0.5% dry weight using the atomic absorption analytical method.

The Occupational Safety and Health Administration (OSHA) considers paint containing any level of lead above the analytical method detection limit a potential hazard which should be communicated to any employees or contractors who may disturb the materials in the course of their assigned work.

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. **The Project** consists of Lead (Pb) Based Paint Removal to facilitate installation of new exterior doors/door frames, installation of new stairwell handrails, and installation of new sections of porch railings as needed at the facility. The removal of the asbestos containing materials is not included as part of the work of this document. If any suspect materials are identified by the Contractor, the Owner must be contacted immediately so analytical analysis of the suspect materials can be completed prior to disturbance of the suspect material(s).

1. **Project Location:** Victoria Plaza Apartments, San Antonio, Texas
2. **Owner:** San Antonio Housing Authority
3. **Physical Structure:** Nine-story apartment structure (housing for the elderly)

Lead-Related Work shall include, but is not necessarily limited to, the following:

- Remove and recycle select sections of existing stairwell railings, grounds/patio guardrails, and stairwell handrails.
- Remove and recycle exterior doors and door frames in locations where the opening is not ADA compliant.
- Strip paint from all exterior porch railing, support poles, handrails, etc. on the south and east elevations. Extra care should be taken not to damage the metal railing components while removing the paint.
- At all locations where paint/coatings are removed with chemical stripper, the Contractor is responsible for properly neutralizing the surface(s) so that replacement paint/coatings will adhere.
- The Contractor shall be responsible for waste minimization and segregation into categories which result in a minimum of hazardous waste being generated.
- The Contractor is responsible for appropriate transport and disposal of all waste and proper handling and recycling of all metal components.
- The Contractor is responsible for maintaining and providing the Owner proper documentation of all waste and/or recycling activities.

- The Contractor shall provide any fall protection apparatus and/or scaffolding needed to access the outer railings and other surfaces.

B. ***Salvage of any materials shall not be allowed.***

C. The Contractor shall adequately staff this project such that it will be completed in the period indicated in the other bidding documents. ***The work hours for this project shall be from 7:00 a.m. to 6:00 pm.*** Arrangements for other work hours shall be coordinated with the Owner and Owner's Representative.

D. **It is intended that the Contractor, as a minimum, shall use personnel who are propertly trained as Lead Workers (8-hour training) and/or Lead Supervisors (40-hour training) and are able to recognize lead hazards, however State of Texas Certification as Lead Supervisors and/or Lead Workers shall not be required for this project.** All Contractor worker and supervisory personnel at the work site shall be properly trained, equipped and possess valid and current training certificates (See Section 1931 - Worker Protection - Lead (Pb) Based Materials). During all phases of this project, the Contractor project site supervisor shall be available at the project site during all work activities.

The Contractor shall submit the names and resumes (including pertinent project experience) of the properly trained Supervisors to be used to conduct these lead (Pb) related activities. If the supervisor(s) submitted are approved by the Owner, the Contractor shall ensure that at least one of these project supervisors are on site throughout the project including final tear down operations. The Contractor shall not substitute an approved project supervisor without the prior approval of the Owner.

To protect the general public safety, the Contractor shall secure the actual work area throughout the project and provide unrestrained access to the property to the Owner and Owner's Representatives.

The Lead (Pb) Based Paint Work consists of the dismantling/removal of any building components which are coated with Lead-Based Paint, removal of paint/coatings applied to select exterior railings, exterior door frames/trim, and other exterior components, and the segregation and recycling of all metal components prior to replacement and/or recoating by others. All metal components incorporated within, attached to, or immediately adjacent to the components/structures designated to be removed shall be carefully dismantled with minimal disturbance to the existing substrate. Said metal components removed shall be transported to a recycling facility for disposal.

During a previous study, the existing interior ceramic tile materials and exterior paint applied to door frames/components which are likely to be disturbed have been sampled and analyzed by X-Ray Fluorescence (XRF). **XRF testing indicates lead contents ranging from 2.3 mg/cm^2 to 3.3 mg/cm^2 are present on exterior door frames, stairwell handrails, and porch railing components.** The interior ceramic tile materials will be removed as part of a planned asbestos

abatement project and are not part of this specification.

Additional coatings considered Lead-Containing Paint by OSHA Guidelines may be present elsewhere on the site and additional precautions should be taken when disturbing any paint coatings in the course of the project. Results of the lead-based paint survey are provided in Section 1.07 of this Section.

Upon successful completion of all paint removal activities, removal of metal components, and segregation of any metal components, and prior to disposal of any debris generated at the site which cannot be recycled, the Owner's Representative shall conduct sampling of any waste for the purpose of characterizing the demolition debris. The materials likely to not be appropriate for recycling include wood components adjacent to the door frame/handrail/railings, any polyethylene drop sheets installed below work, paint stripper and paint chip emulsion, PPE, packaging, etc.

The non-recyclable waste shall be segregated into two categories by the Contractor as the materials are generated:

1. Paint chips, the slurry resulting from chemical removal activities, and drop cloths, rags and other materials which cannot be HEPA vacuumed or wiped clean should be drummed and assumed hazardous;
2. Polyethylene sheeting which can be wiped clean, PPE, disposable work suits, packaging, etc.

Representative samples of the materials comprising the two (2) waste streams above shall be collected per ASTM standards and submitted for analysis by Toxicity Characteristic Leachate Procedures (TCLP) for Lead which will confirm the lack of or level of hazardous materials present in the debris that will be disposed of depending on the TCLP results. The Contractor shall be responsible for waste minimization and segregation in order to allow for the disposal of the majority of the project debris as a general construction debris.

The Contractor shall carefully remove designated components by manual methods, conduct chemical/manual paint removal on the surfaces/components to remain, and segregate and containerize all waste materials as necessary. During these activities, the Contractor shall install poyethylene sheeting below any areas where components with lead-based coatings are being removed/manipulated/dismantled and personnel shall continuously mist the area with water to adequately inhibit any visible emission of dust into the air. Do not allow water to pool on site. Mist only enough to maintain dust mitigation. Precautions shall be taken such that, within the confines of the work area/physical barrier, no water shall leave the area and no free water shall be generated by the work activities. At the conclusion of work activities, the polyethylene drop sheets and any chips, dust, debris, moisture, etc. which is generated shall be collected (HEPA vacuum or wet wiped) and placed in drums for characterization prior to disposal. All metal doors, door frames, stairwell handrails, stairwell and grounds railings, fasteners, etc. that are removed in the project shall be segregated and placed in a container/trailer for transport to a recycling facility.

The following lead (Pb) hazard removal methods are prohibited:

1) Open flame burning;
2) Chemical stripping with methylene chloride based paint strippers;
3) Uncontained abrasive blasting;
4) Uncontained power washing;
5) Dry sanding or scraping;
6) Power sanding without HEPA attachement;
7) Sanding of wood after chemcial stripping.

If the Owner's Representative notices any debris on the ground as a result of the paint removal/dismantling activities, the Contractor shall clean up debris and install additional poly sheeting on the ground in a manner sufficient to catch **all** debris that is generated during the work activities. All debris generated during the paint removal/dismantling activities shall be kept wet, promptly placed in poly lined drums/closed containers, evaluated by TCLP, then removed from the site and recycled or disposed of properly. The Contractor shall avoid the use of excessive quantities of water. Measurable quantities of water shall be controlled and collected for filtration in order to avoid creating an additional liquid waste stream.

All equipment used on this project shall be free of any visible debris and operational. The Owner's Representative along with the Contractor's designated supervisor shall inspect all equipment prior to it being brought into the work area. If any debris found on the equipment is suspected to be lead (Pb) paint related, the equipment shall be wet wiped and decontaminated. **The decontamination of the equipment shall not take place on the project site.**

E. **The Work** will be conducted under a single prime contract.

1.03 PLAN OF ACTION

Submit a written detailed job-specific plan of the procedures proposed for use in complying with the requirements of this specification. Include in the plan the location, size, layout and details of the work areas and worker decontamination facilities. Include the sequencing of work processes, the interface of trades involved in the performance of work, methods to be used to assure the safety of site occupants and visitors to the site, disposal/recycling plan including location of approved disposal/recycling site, and a detailed description of the methods to be employed to control fugitive dust and debris. In addition, include the method to be employed for the segregation and recycling of metal components, and packaging of polyethylene drop sheets, lead (Pb) paint chips, non-metal components removed, dust and debris.

Describe the methods that will be used to comply with OSHA requirements including submission of exposure monitoring to demonstrate adequacy of any respiratory and worker protection equipment selected. **Note: The guideline presented in Section 01932 – Respiratory Protection shall dictate the minimum respiratory protection.**

Prior to commencement of Work, the Owner or Owner's Representative must approve the submitted plan of action.

In summary, a **Written** Plan of Action shall contain, at a minimum, the following:

1. Facilities layout and work area details that illustrate placement of equipment and decontamination facilities

2. Work process sequencing

3. Interface of trades

4. Discussion of control methods that will be implemented to:
   a. Assure site safety to adjacent occupants; and
   b. Assure that fugitive dust and debris are controlled

5. Method of dismantling of painted components and/or substrates

6. Method of packaging of Lead-Based Paint components, substrates, dust, and debris

7. A description of the worker safety program that will be used to ensure compliance with OSHA requirements (29 CFR 1926, Part II)

1.04 EXAMINATION

Prior to commencement of work, examine areas in which work will be performed with the Owner's Representative. If required elsewhere in the Project Documents, prepare a listing of damage to structure, surfaces, and equipment or of surrounding properties, which could be misconstrued as damage resulting from the work. Photograph or videotape existing conditions as necessary to document conditions. Submit to Owner's Representative prior to starting work.

1.05 POTENTIAL LEAD (PB) HAZARD

The disturbance or dislocation of lead-based painted materials may cause lead (Pb) dust to be released into the atmosphere, thereby, creating a potential health hazard to workers. Apprise all workers, supervisory personnel, subcontractors and consultants who will be at the job site of the seriousness of the hazard and of proper work procedures which must be followed.

Where in the performance of the work, workers, supervisory personnel, subcontractors, or consultants may encounter, disturb, or otherwise function in the immediate vicinity of any identified lead-based paint, take appropriate continuous measures as necessary to protect all individuals from the potential hazard of exposure to lead (Pb) dust. Such measures shall include the procedures and methods described herein, and compliance with regulations and guidelines of applicable federal, state and local agencies.

1.06 STOP WORK

If the Owner or Owner's Representative presents a written or verbal stop work order, or if stop work levels as set forth in the Contract Documents are exceeded, immediately and automatically stop all work. Do not recommence work until authorized in writing by the Owner or Owner's Representative.

1.07 LEAD-BASED/LEAD-CONTAINING PAINTED SURFACES

A. The majority of the painted surfaces may contain some quantity of lead (Pb) in the paint. It is the Contractor's responsibility to provide adequate protection for his personnel and conform to all OSHA requirements.

B. Lead-based painted surfaces are known to be present at the work-site

C. It is the Contractor's responsibility to estimate the quantities of lead-based paint surfaces to be remediated for this project. The Contractor shall field verify all quantities.

D. **Lead-Based Paint (potential OSHA Hazard) has been determined to be present in the following locations:**

- Interior ceramic wall/floor tile utilized in the 1st Floor Office Areas, Laundry Rooms, Elevator Landings. These materials shall be removed as part of the asbestos abatement activities and are not discussed further in this document.

- The black coatings applied to exterior railings, porch support posts, and stairwell handrails. It is estimated approximately 8,000 square feet of these materials are present and will be removed from or with the components comprising the stairwell handrails; porch support poles; and railings on the grounds in stairwells, on porches, and on the loading dock of the Basement through 9th Floor of the building.

- The white paint applied to the exterior door frames of all exterior openings throughout the building. It is estimated there are approximately 250 exterior door openings with painted frames from which the paint/coating materials will be removed from or with the door frame components on the Basement through 9th Floor of the building.

1.08 WORK UNDER OTHER CONTRACTS

A. **Separate Contract:** The Owner has awarded a separate contract for performance of certain construction operations and asbestos abatement at the site. There will be only one contract awarded by the Owner for all lead-related paint removal/dismantling work of this project.

1.09 WORK SEQUENCE

A. **The Paint Removal and Dismantling Work** will be conducted in one phase as project schedule dictates.

1.10 CONTRACTOR USE OF PREMISES

A. **Use of the Site:** Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the

site beyond the areas in which the Work is indicated.

1. **Owner Occupancy:** The building will be unoccupied during work in this contract. Other trades may be conducting work in the general vicinity of all work.

2. **Driveways, Entrances and Surrounding Roadways:** Keep driveways, entrances, and surrounding roadways serving the premises clear and available to the Owner, the Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials unless prior arrangements have been made with the Owner. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

3. Lock automotive type vehicles, such as passenger cars and trucks and other mechanized or motorized construction equipment, when parked and unattended, so as to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running or the ignition key in place or accessible to unauthorized persons.

4. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage trailers/containers to the areas indicated. If additional storage is necessary obtain and pay for such storage off site.

B. Use of the Existing Building:

1. Keep public areas free from accumulation of waste, rubbish or construction debris.

2. No smoking or open fires will be permitted within the building enclosure or on the premises.

3. **Use of Toilets:** Use of existing toilets within the building or surrounding buildings by the Contractor and his personnel, ***will not be*** permitted. The Contractor shall provide toilet facilities for its personnel use.

1.12 OCCUPANCY REQUIREMENTS

A. Full Owner Occupancy: The Owner **will occupy** the existing building following completion of the construction.

1.13 SUBMITTALS

Before the Start of Work: Submit the following to the Owner and Owner's Representative for review. Do not begin work until these Submittals are returned with Owner's Representative's action stamp indicating that the submittal is returned for unrestricted use or final-but-restricted use. ***Allow 3 days' time for review of submittals.***

A. Plan of Action: Submit as a written report.

B. **Inspection:** Submit written report on inspection carried out as required by this section. Include copies of all photographs, videotapes, etc.

C. **Alternative Methods:** Submit, in writing, any alternative methods proposed to accomplish the work of this contract.

D. **Submit copies of valid and current Lead Training Certificates for all worker and supervisory personnel at the work site. In addition, copies of the appropriate DOT certifications required for the manifesting and transporting of hazardous materials must be submitted.**

END OF SECTION 01920

SECTION 01921 - COORDINATION – LEAD BASED MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to the following:

1. General project coordination procedures

2. Conservation

3. Coordination Drawings

4. Administrative and supervisory personnel

5. Cleaning and protection

B. **Related Sections:** The following Sections contain requirements that relate to this Section:

1. Section 01924 - "Submittals" for preparing and submitting the Contractor's Construction Schedule

2. Section 01933 - "Materials and Equipment" for coordinating general installation

3. Section 01934 - "Contract Closeout" for coordinating contract closeout

1.3 COORDINATION

A. Coordinate lead-related operations included in various sections of these specifications to assure efficient and orderly completion of each part of the Work. Coordinate lead-related operations included under different sections that depend on each other for proper execution of the Work.

1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.

3. Make provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner, Owner's Representative and other contractors where coordination of their work is required.

C. **Administrative Procedures:** Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules

2. Installation and removal of temporary facilities

3. Delivery and processing of submittals

4. Progress meetings

5. Project Close-out activities

D. **Conservation:** Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.4 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

It is intended that the Contractor, as a minimum, shall use personnel who are propertly trained as Lead Workers (8-hour training) and/or Lead Supervisors (40-hour training) and are able to recognize lead hazards, however State of Texas Certification as Lead Supervisors and/or Lead Workers shall not be required for this project (See Section 1931 - Worker Protection - Lead (Pb) Based Materials). All Contractor worker and supervisory personnel at the work site shall be properly trained, equipped and possess valid and current training certificates.

A. **Supervisor:** Provide a full-time Supervisor who shall meet all the requirements as a Competent Person as required by OSHA 29 CFR 1926.62. The Supervisor must have completed training in Lead Paint Abatement Health and Safety. The course shall meet the requirements of the HUD Guidelines and the EPA Model Accreditation Program for supervisors (40 CFR 745). They must have experience with projects of similar type and size, including work practices, protective measures for building and personnel, disposal procedures, etc. This person is the Contractor's representative responsible for compliance with all applicable federal, state and local regulations and guidelines; particularly those relating to lead-based paint and hazardous waste.

B. **Workers:** Provide a sufficient number of workers who have received as a minimum 8-hour Lead (Pb) Worker training who are experienced in lead-based

paint removal, stabilization, dismantling projects including work practices and protective measures for building and personnel.

C. ***All workers and supervisory personnel must hold current and valid training certificates.***

1.5 PRE-CONSTRUCTION CONFERENCE

A. An initial progress meeting, recognized as "Pre-Construction Conference", will be convened by the Owner prior to start of any work. Meet at project site, or as otherwise directed, with General Superintendent, Owner, Owner's Representative, Project Administrator, and other entities concerned with lead-based paint removal work.

1. **Attendees:** Authorized representatives of the Owner, Owner's Representative, and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

2. 72 hour advance notice will be provided to all participants prior to convening Pre-construction Conference.

3. This is an organizational meeting, to review responsibilities and personnel assignments, to locate regulated areas and temporary facilities including power, light, water etc.

4. **Agenda:** Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule
b. Critical work sequencing
c. Designation of responsible personnel
d. Procedures for processing field decisions and Change Orders
e. Procedures for processing Applications for Payment
f. Distribution of Contract Documents
g. Submittal of Product Data
h. Preparation of record documents
i. Use of the premises
j. Parking availability
k. Office, work, and storage areas
l. Equipment deliveries and priorities
m. Safety procedures
n. First aid
o. Security
p. Housekeeping
q. Working hours

1.6 PROGRESS MEETINGS

A. **General:** In addition to specific coordination and pre-installation meetings for each element of work, and other regular project meetings held for other purposes, the Owner will hold general progress meetings as required. These meeting will be scheduled, where possible, at time of preparation of payment request.

B. **Attendees:** In addition to representatives of the Owner and Owner's Representative, the Contractor, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the work. Require each entity then involved in planning, coordination or performance of work to be properly represented at each meeting.

C. **Agenda:** Be prepared to discuss the following items at the progress meetings. Review other items of significance that could affect progress.

1. Contractor's Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Schedule, whether on time or ahead or behind schedule. Determine how tasks behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.

2. Review the present and future needs of each entity present, including the following:

a. Interface requirements
b. Time
c. Sequences
d. Status of submittals
e. Deliveries
f. Access
g. Site utilization
h. Temporary facilities and services
i. Hours of work
j. Hazards and risks
k. Housekeeping
l. Quality and work standards
m. Change Orders
n. Documentation of information for payment requests

D. **Reporting:** Revise the Contractor's Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule no later than one (1) day after each meeting. Include a brief summary, in narrative form, of progress since the previous meeting and report.

1.7 DAILY LOG

A. **Daily Log:** Maintain a daily log documenting the dates and time of but not limited to, the following items:

1. Meetings, purpose, attendees, brief discussion and significant decisions
2. Visitations, authorized and unauthorized
3. Log of personnel, by name, those entering and leaving Work Area
4. Accidents
5. Special or unusual events; i.e. barrier breaching or equipment failures
6. Documentation of Contractor's completion of the following:

a. Inspection of work area preparation prior to start of removal and daily thereafter
b. Removal of any sheet plastic barriers
c. Contractor's inspections prior to painting, enclosure or any other operation that will conceal the condition of lead-based painted components or the substrate from which such materials have been removed
d. Removal of waste materials from work area
e. Decontamination of equipment (list items)

7. List of subcontractors at the site
8. Approximate count of personnel at the site
9. High and low temperatures, general weather conditions
10. Stoppages, delays, shortages, losses
11. Meter readings and similar recordings
12. Emergency procedures
13. Orders and requests of governing authorities
14. Change Orders received and/or implemented
15. Services connected, disconnected
16. Equipment or system tests and start-ups
17. Partial Completions, occupancies
18. Substantial Completions authorized
19. Contractor's final inspection/final wipe test analysis

B. Submit copies of this log at final closeout of project as a project close out submittal.

1.8 SPECIAL REPORTS

A. **General:** Except as otherwise indicated, submit special reports directly to Owner within one day of occurrence requiring special report, with copy to Owner's Representative and others affected by occurrence.

B. **Reporting Unusual Events:** When an event of unusual and significant nature occurs at site, within 24 hours prepare and submit a written special report to the Owner and Owner's Representative listing chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. When such events are known or predictable in advance,

advise Owner and Owner's Representative in advance at earliest possible date.

C. **Reporting Accidents:** Prepare and submit written reports of significant accidents, at site and anywhere else work is in progress. Reports must be submitted to the Owner and Owner's Representative within 24 hours after the accident occurs. Record and document data and actions; comply with industry standards. For this purpose, a significant accident is defined to include events where personal injury is sustained, or property loss of substance is sustained, where the event posed a significant threat of loss or personal injury, or where an OSHA 200 Log is required. A copy of an OSHA 200 Log may be submitted for this purpose.

D. **Report Discovered Conditions:** When an unusual condition of the building is discovered during the work (e.g. leaks, corrosion), prepare and submit a written special report to the Owner and Owner's Representative within 24 hours of discovery indicating condition discovered.

1.9 CONTINGENCY PLAN

A. **Contingency Plan:** Prepare a contingency plan for emergencies including fire, accident, power failure, or any other event that may require modification or abridgement of decontamination or work area isolation procedures. Include in plan specific procedures for decontamination or work area isolation. Note that nothing in this specification should impede safe exiting or providing of adequate medical attention in the event of an emergency.

B. **Post:** At entrance of work area. Telephone numbers and locations of emergency services including but not limited to fire, ambulance, doctor, hospital, police, power company, telephone company.

1.10 NOTIFICATIONS

A. Notify other entities at the job site of the nature of the lead-based paint removal activities, location of lead-based painted components, requirements relative to lead- based paint set forth in these specifications and applicable regulations.

B. Notify emergency service agencies including fire, ambulance, police or other agency that may service the abatement work site in case of an emergency. Notification is to include methods of entering work area, emergency entry and exit locations, modifications to fire notification or firefighting equipment, and other information needed by agencies providing emergency services.

C. **Notifications of Emergency:** Any individual at the job site may notify emergency service agencies if necessary without effect on this contract or the Contract Sum.

1.11 SUBMITTALS

A. **Before the Start of Work:** Submit the following to the Owner's Representative. No work shall begin until these submittals are returned with Owner's Representative's stamp indicating that the submittal has been received.

1. Contingency Plans: for emergency actions.

2. Telephone Numbers: and location of emergency services.

3. Notifications: sent to other entities at the work site.

4. Notifications: sent to emergency service agencies.

5. Accreditation: Submit evidence in form of training course certificate for the supervisor, foreman and workers as being trained in lead-based paint health and safety in accordance with HUD.

6. Name and address of recycling facility that will be accepting the recyclable waste.

7. Certification/Training: Submit evidence, in form of copies, of current and valid Lead training certificates for the supervisor, foreman and all workers.

8. Staff Names: Submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.

B. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 01921

SECTION 01922 - REFERENCE STANDARDS AND DEFINITIONS – LEAD BASED MATERIALS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. **General:** Basic Contract definitions are included in the Conditions of the Contract.

B. **Indicated:** The term indicated refers to graphic representations, notes, or schedules on the Drawings, or other paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used to help the reader locate the reference. Location is not limited.

C. **Directed:** Terms such as directed, requested, authorized, selected, approved, required, and permitted mean directed by the Owner, requested by the Owner, and similar phrases.

D. **Approved:** The term approved, when used in conjunction with the Owner's action on the Remediation Contractor's submittals, applications, and requests, is limited to the Owner's duties and responsibilities as stated in the Conditions of the Contract.

E. **Regulations:** The term regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. **Furnish:** The term furnish means supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. **Install:** The term install describes operations at the Project Site including the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. **Provide:** The term provide means to furnish and install, complete and ready for the intended use.

I. **Installer:** An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. **The term experienced,** when used with the term Installer, means having a minimum of 5 previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.

J. **Trades:** Using terms such as carpentry does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to trades persons of the corresponding generic name.

K. **Assigning Specialists:** Specialists are recognized experts in operations where required by the specifications. Certain Sections of the Specifications require that specialists who are recognized experts in those operations shall perform specific construction activities. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.

L. **Project Site:** is the space available to the Contractor for performing construction activities, either exclusively or in conjunction, with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

M. **Testing Agencies:** A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

N. **Owner's Representative:** This is the entity described as the "Architect" in AIA Document A201 "General Conditions of the Contract for Construction," or is the entity described as "Engineer" in Engineers Joint Contract Document Committee (EJCDC) Document 1910-8 "Standard General Conditions of the Construction Contract." All references to Architect or Engineer in the Contract Documents in all cases refer to the Owner's Representative. The Owner's Representative will represent the Owner during remediation project. The Owner's Representative will advise and consult with the Owner. The Owner's instructions to the Contractor will be forwarded through the Owner's Representative.

O. **Owner's Representative:** This is the entity described as the "Project Representative" in AIA Document A201 "General Conditions of the Contract for Construction," or is the entity described as "Engineer" in Engineers Joint Contract Document Committee (EJCDC) Document 1910-8 "Standard General Conditions of the Construction Contract." The Owner's Representative is a full time representative of the Owner at the job site.

1. The Owner's Representative has the authority to stop the work upon verbal order if requirements of the Contract Documents are not met, or if in the sole judgement of the Owner's Representative, the Owner, the interests of the Owner, safety of any person or the Owner's property are jeopardized by

the work.

P. **Project Manual:** A bound manual consisting of the General Conditions, the Supplementary Conditions, any Special Conditions and the specification sections.

Q. **Substantial Completion:** The work of this contract is substantially complete when clearance criteria set forth in the Contract Documents are met and the work area may be occupied by the Owner.

1.3 DEFINITIONS RELATIVE TO LEAD BASED PAINT REMEDIATION

A. **Accreditation:** A formal recognition that an organization (e.g. laboratory) is competent to carry out specific tasks or type of tests.

B. **Accredited laboratory:** A laboratory that has been evaluated and given approval to perform a specified measurement or task (such as the National Lead Laboratory Accreditation Program), usually for a specific property or analyze for a specified period of time.

C. **Accredited Training Provider:** means a training provider that meets the standards established by EPA to train risk assessors, inspectors, supervisors, and workers.

D. **Adhesion:** the ability of dry paint or other coating to attach to or remain fixed on a surface without blistering, flaking, cracking, or being removed by tape.

E. **Blank:** A non-exposed sample of the medium used for testing, such as a wipe or filter, which is analyzed like other samples to determine whether: (1) samples are contaminated with lead (Pb) before samples are collected (e.g., at the factory, or at the testing site); and (2) the samples are contaminated after sample collection (e.g., during transportation to the laboratory or in the laboratory).

F. **Breathing Zone:** A hemisphere forward of the shoulders with a radius of approximately 6 to 9 inches around the nose and mouth of the face.

G. **Ceiling Concentration:** The concentration of an airborne substance that shall not be exceeded.

H. **Certified Industrial Hygienist (C.I.H.):** An industrial hygienist certified by the American Board of Industrial Hygiene.

I. **CFR - The Code of Federal Regulations:** The basic component of the Federal Register publication system. The CFR is a codification of the regulations of the various Federal Agencies.

J. **Common Area:** A room or area that is accessible to all tenants in a project (e.g., hallway, boiler room). Generally, any area that is not kept locked.

K. **Competent Person:** An agent of the Remediation Contractor who is a Competent Person as defined by OSHA in 29 CFR 1926.62. This person must be capable of identifying existing and predictable lead (Pb) hazards in the surroundings or

working conditions and who has authorization by the Remediation Contractor to take prompt corrective measures to eliminate them.

L. **Detection Limit:** The minimum of a component that a method can reliably measure.

M. **Exposure Monitoring:** The personal air monitoring of an employee's breathing zone to determine the amount of contaminant (e.g. lead (Pb)) to which he/she is exposed.

N. **Federal Register:** A document published daily by the Federal government that contains either proposed or final regulations.

O. **Hazardous Waste:** As defined in RCRA the term "hazardous waste" means a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

1. Cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or

2. Pose a substantial present or potential hazard to human health or the environment when improperly treated stored, transported, or disposed of, or otherwise managed.

3. As defined in the regulations, a solid waste is hazardous if it meets one of four (4) conditions:

a. Exhibits a characteristic of a hazardous waste (40 CFR Sections 261.20 through 262.24).

b. Has been listed as hazardous (40 CFR Section 261.31 through 261.33).

c. Is a mixture containing a listed hazardous waste and a non-hazardous solid waste (unless the mixture is specifically excluded or no longer exhibits any of the characteristics of hazardous waste).

d. Is not excluded from regulation as a hazardous waste.

P. **HEPA - High Efficiency Particulate Air:** A filter capable of filtering out particles of 0.3 microns or greater from a body of air at 99.97% efficiency or greater.

Q. **High Phosphate Detergent:** Detergent which contains at least 5% tri-sodium phosphate (TSP).

R. **Landfill:** A disposal facility or part of a facility where hazardous waste is placed in or on land and which is not a land treatment facility, a surface impoundment, or an injection well.

S. **µg - Micrograms:** The prefix "micro-" means "1/1,000,000 of" (one millionth of). A microgram is 1/1,000,000 of a gram and 1/1,000 of a milligram. A microgram is

equal to about 35/1,000,000,000 (thirty-five billionths) of an ounce. 28,400,000 µg are equal to 1 ounce.

T. **Negative Pressure Respirator:** A respirator in which the air pressure inside the respiratory-inlet covering is positive during exhalation in relation to the air pressure of the outside atmosphere and negative during inhalation in relation to the air pressure of the outside atmosphere.

U. **Personal Monitoring:** Sampling of the lead (Pb) dust concentrations within the breathing zone of an employee.

V. **Personal Samples (for sampling lead (Pb) dust):** Air samples collected from within the breathing zone of a worker, but outside the respirator. The samples are collected with a personal sampling pump, pulling 1 to 4 liters/minute of air.

W. **Protection Factor:** The ratio of the ambient concentration of an airborne substance to the concentration of the substance inside the respirator at the breathing zone of the wearer. The protection factor is a measure of the degree of protection provided by a respirator to the wearer.

X. **Respirator:** A device designed to protect the wearer from the inhalation of harmful atmospheres.

Y. **Solid Waste:** As defined in RCRA the term "solid waste" means any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under the Clean Water Act, or special nuclear or byproduct material as defined by the Atomic Energy Act of 1954.

Z. **TCLP (Toxicity Characteristic Leaching Procedure):** A test, called the extraction procedure, that is designed to identify wastes likely to leach hazardous concentrations of particular toxic constituents into the ground water as a result of improper management. It is a characteristic of hazardous waste.

AA. **Time Weighted Average (TWA):** The average concentration of a contaminant in air during a specific time period.

BB. **TSP:** Acronym for tri-sodium phosphate.

CC. **ULPA** - Ultra Low Particulate Air: Means a filter capable of filtering out particles of 0.13 microns or greater from a body of air at 99.9995% efficiency or greater.

DD. **Wet Cleaning (Wet Detergent Wash):** The process of eliminating lead (Pb) dust contamination from building surfaces and objects by using cloths, mops, or other cleaning utensils which have been dampened with a solution of water and trisodium phosphate (TSP) or appropriate substitute and afterwards thoroughly decontaminated or disposed of as lead (Pb) contaminated waste.

EE. **Work Area:** The area where lead-based paint abatement or related work is performed which is defined and/or isolated to prevent the spread of lead (Pb) dust, or debris, and entry by unauthorized personnel.

FF. **Work Practice:** A procedure followed by workers that is intended to minimize exposure to the worker and the environment.

1.4 INDUSTRY STANDARDS

A. **Applicability of Standards:** Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. **Publication Dates:** Comply with the standards in effect as of the date of the Contract Documents.

C. **Conflicting Requirements:** Where compliance with two (2) or more standards is specified and where the standards may establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different but apparently equal and uncertainties to the Owner or Owner's Representative for a decision before proceeding.

1. **Minimum Quantity or Quality Levels**: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Owner or Owner's Representative for a decision before proceeding.

D. **Copies of Standards:** Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.

E. **Abbreviations and Names:** Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

F. **Abbreviations and Names:** Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as

referenced in Contract Documents, are defined to mean the associated names. Names and addresses are subject to change and are believed, but not assured, to be accurate and up-to-date as of date of the Contract Documents.

A2LA	American Association for Laboratory Accreditation 656 Quince Orchard Road #300 Gaithersburg, MD 20878	(301) 670-1377
AIA	The American Institute of Architects 1735 New York Ave., NW Washington, DC 20006	(202) 626-7300
AIHA	American Industrial Hygiene Assoc. 2700 Prosperity Avenue, Suite 250 Fairfax, VA 22031-4307	(703) 849-8888
ANSI	American National Standards Institute 11 West 42nd St., 13th Floor New York, NY 10036	(212) 642-4900
ASTM	American Society for Testing and Materials 1916 Race St. Philadelphia, PA 19103-1187	(215) 299-5400
GA	Gypsum Association 810 First St., NE, Suite 510 Washington, DC 20002	(202) 289-5440
IESNA	Illuminating Engineering Society of North America 345 E. 47th St. New York, NY 10017	(212) 705-7926
ML/SFA	Metal Lath/Steel Framing Assoc. (A Division of the National Association of Architectural Metal Manufacturers) 600 S. Federal St., Suite 400 Chicago, IL 60605	(312) 922-6222
NEC	National Electrical Code (from NFPA)	
NEMA	National Electrical Manufacturers Assoc. 2101 L St., NW, Suite 300 Washington, DC 20037	(202) 457-8400
NFPA	National Fire Protection Assoc. One Batterymarch Park P.O. Box 9101 Quincy, MA 02269-9101	(800) 344-3555 (617) 770-3000
NSF	National Sanitation Foundation 3475 Plymouth Rd. P.O. Box 130140	(800) 223-2301

Ann Arbor, MI 48113-0140 (313) 769-8010

PDCA Painting and Decorating Contractors of America
3913 Old Lee Highway Suite 33-B
Fairfax, VA 22030 (703) 359-0826

UL Underwriters Laboratories
333 Pfingsten Rd.
Northbrook, IL 60062 (708) 272-8800

G. Federal Government Agencies: Names and titles of federal government standard or Specification-producing agencies are often abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard- or Specification-producing agencies of the federal government. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

CFR Code of Federal Regulations
(Available from the Government Printing Office)
N. Capitol St. between G and H St. NW
Washington, DC 20402 (202) 783-3238
(Material is usually first published in the
"Federal Register")

CPSC Consumer Product Safety Commission
5401 Westbard Ave.
Bethesda, MD 20207 (800) 638-2772

EPA Environmental Protection Agency
401 M St., SW
Washington, DC 20460 (202) 382-2090

HUD Department of Housing and Urban Development
Office of Lead-Based Paint Abatement and Poisoning Prevention
Room B-133
451 7th St. SW, Washington, DC 20410 (202) 755-1805

MSHA Mine Safety and Health Administration
(U.S. Department of Commerce)
4015 Wilson Blvd
Arlington, VA 22203 (703) 235-1565

NIOSH National Institute of Occupational Safety and Health
U.S. Dept. of Labor, Room N-3718
200 Constitution Ave, N.W.
Washington, D.C. 20210 (800) 35-NIOSH

NIST National Institute of Standards and Technology
(U.S. Department of Commerce)
Gaithersburg, MD 20899 (301) 975-2000

OSHA Occupational Safety and Health Administration
(U.S. Department of Labor)
200 Constitution Ave., NW
Washington, DC 20210 (202) 219-6091

1.6 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, valid accreditation and training certificates for all supervisory and worker personnel, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established in conjunction with compliance with standards bearing upon performance of the Work.

END OF SECTION 01922

SECTION 01923 - CODES, REGULATIONS AND STANDARDS – LEAD BASED MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

This section sets forth governmental regulations and industry standards which are included and incorporated herein by reference and made a part of the specification. This section also sets forth those notices and permits which are known to the Owner and which either must be applied for and received, or which must be given to governmental agencies before start of work.

A. Requirements include adherence to work practices and procedures set forth in applicable codes, regulations, guidelines and standards.

B. Requirements include obtaining permits, licenses, inspections, releases and similar documentation, as well as payments, statements and similar requirements associated with codes, regulations, and standards.

1.3 CODES AND REGULATIONS

A. **General Applicability of Codes and Regulations, Guidelines and Standards:** Except to the extent that more explicit or more stringent requirements are written directly into the contract documents, all applicable codes, regulations, guidelines and standards have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith.

B. **Remediation Contractor Responsibility:** The Remediation Contractor shall assume full responsibility and liability for the compliance with all applicable Federal, State, and local regulations pertaining to work practices, hauling, disposal, and protection of workers, visitors to the site, and persons occupying areas adjacent to the site. The Remediation Contractor is responsible for providing medical examinations and maintaining medical records of personnel as required by the applicable Federal, State, and local regulations. The Remediation Contractor shall hold the Owner and Designer harmless for failure to comply with any applicable work, hauling, disposal, safety, health or other regulation on the part of himself, his employees, or his subcontractors.

C. **Federal Requirements:** those requirements, as amended, which govern lead-based paint abatement work or hauling and disposal of hazardous waste materials include but are not limited to the following:

1. **OSHA:** U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA), including but not limited to:

29 CFR 1910.134 - Respiratory Protection;

29 CFR 1926.20 - General safety and health provisions;

29 CFR 1926.21 - Safety training and education;

29 CFR 1926.23 - First Aid;

29 CFR 1926.24 - Fire Protection;

29 CFR 1926.25 - Housekeeping;

29 CFR 1926.28 - Personal protective equipment;

29 CFR 1926.51(f) - Washing facilities;

29 CFR 1926.55 - Gases, vapors, fumes, dusts, and mists;

29 CFR 1926.56 - Illumination;

29 CFR 1926.57 - Ventilation;

29 CFR 1926.59 - Hazard Communication Standard;

29 CFR 1926.62 - Lead Construction Standard;

29 CFR 1926.103 - Respiratory protection;

29 CFR 1926.353 - Ventilation: Welding, cutting or heating of metals of toxic significance;

29 CFR 1926.300, 301, 302 - Hand and power tools;

29 CFR 1926.451 - Scaffolding;

29 CFR 1926.500, 502, 503 - Fall Protection;

2. **DOT:** U. S. Department of Transportation, including but not limited to:

49 CFR 171 and 172 - Hazardous Substances

3. **EPA:** U. S. Environmental Protection Agency (EPA), including but not limited to:

40 CFR 260, 261, 262, 263 and 264	Resource Conservation and Recovery Act (RCRA)
40 CFR 745 (Proposed)	Lead-Based Paint Activities: Training, Certification and Work Practice Requirements

4. **HUD:** Department of Housing and Urban Development

24 CFR 35, 905, 941, 965 and 968	Lead-Based Paint Hazard Elimination; Interim Rule

D. **State Requirements:** those requirements, as amended, which govern lead-based paint abatement work or hauling and disposal of hazardous waste materials include but are not limited to the following:

1. Texas Environmental Lead Reduction, February 19, 19996 amended May 10, 1998

2. Rules TNRCC 30 TAC 335, Industrial Solid and Municipal Hazardous Waste

E. **Local Requirements:** Abide by all local requirements which govern lead (Pb) remediation work or hauling and disposal of hazardous waste materials.

F. **Building Codes:** Comply with applicable provision of state and/or local building codes that govern any part of the work.

G. **Model Codes:** In the absence of an applicable adopted state or local building code which governs work involved in the lead (Pb) abatement project, comply with the applicable provisions of the BOCA National Codes/1993 published by International Conference for Building Officials or the SBCCI Standard Codes published by Southern Building Code Congress International.

1.4 PERMITS

A. **Permit:** All hazardous waste is to be transported by an entity maintaining a current "Industrial waste hauler permit" as required for transporting of waste materials to a disposal site.

B. **Building Permit:** Secure all necessary building permits as required by state and/or local building codes.

1.5 POSTING AND FILING OF REGULATIONS

A. **Posting and Filing of Regulations:** Post all notices required by applicable federal, state and local regulations. Maintain two (2) copies of applicable federal, state and local regulations and standards. Maintain one copy of each at job site. Keep on file in Remediation Contractor's office one copy of each.

1.6 SUBMITTALS:

A. **Before Start of Work:** Submit each item in this article to the Owner's Representative. No work shall begin until these submittals are returned with Owner's Representative's stamp indicating that the submittal has been received.

1. **Permits, Licenses, and Certificates:** For the Owner's records, submit copies of permits, valid accreditation and training certificates for all supervisory and worker personnel, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established in conjunction with compliance with standards bearing upon performance of the Work including:

a. **State and Local Regulations:** Submit copies of codes and regulations applicable to the work.

b. **Permits:** Submit copies of current valid permits required by state and local regulations.

c. **Certifications/Licenses:** Submit copies of all State and Local licenses and permits necessary to carry out the work of this contract.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION - 01923

SECTION 01924 - SUBMITTALS – LEAD BASED MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for submittals from the Remediation Contractor to the Owner and Owner's Representative as required for performance of the Work, including;

1. Remediation Contractor's construction schedule

2. Submittal schedule

3. Daily reports

4. Shop Drawings

5. Product Data

6. Samples

B. **Administrative Submittals:** Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

1. Permits

2. Applications for payment

3. Performance and payment bonds

4. Insurance certificates

5. List of Subcontractors

1.3 SUBMITTAL PROCEDURES

A. **Coordination:** Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery,

other submittals and related activities that requires sequential activity.

2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.

a. The Owner's Representative reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

3. **Processing:** Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.

a. **Allow three (3) days** for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Owner's Representative will promptly advise the Remediation Contractor when a submittal being processed must be delayed for coordination.

b. If an intermediate submittal is necessary, process the same as the initial submittal.

c. Allow one (1) day for reprocessing each submittal.

d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Owner's Representative sufficiently in advance of the Work to permit processing.

B. **Submittal Preparation:** Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

a. Project name
b. Date
c. Name and address of Owner
d. Name and address of Owner's Representative
e. Name and address of Remediation Contractor
f. Name and address of subcontractor
g. Name and address of supplier
h. Name of manufacturer
i. Number and title of appropriate Specification Section
j. Drawing number and detail references, as appropriate

C. **Submittal Transmittal:** Package each submittal appropriately for transmittal and handling. Transmit each submittal from Remediation Contractor to Owner's Representative using a transmittal form. Submittals received from sources other than the Remediation Contractor will be returned without action.

1. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document

requirements, including minor variations and limitations. Include Remediation Contractor's certification that information complies with Contract Document requirements.

1.4 CONTRACTOR'S REMEDIATION SCHEDULE

A. Provide proposed detailed schedule including work dates, work shift time, number of employees, dates of start and completion including dates of preparation work, removals and final inspection dates.

1.5 SUBMITTAL SCHEDULE

A. After development and acceptance of the Contractor's remediation schedule, prepare a complete schedule of submittals.

1. Coordinate submittal schedule with the list of subcontracts, schedule of values and the list of products as well as the Contractor's remediation schedule.

2. Prepare the schedule in chronological order and provide the following information:

a. Scheduled date for the first submittal
b. Related Section number
c. Submittal category
d. Name of subcontractor
e. Description of the part of the Work covered
f. Scheduled date for resubmittal
g. Scheduled date the Owner’s Representative’s final release or approval

B. **Distribution:** Following response to initial submittal, print and distribute copies to the Owner’s Representative, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in remediation activities.

C. **Schedule Updating:** Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.6 DAILY REPORTS

A. Prepare a daily report, recording the following information concerning events at the site; and submit duplicate copies to the Owner's Representative at daily intervals:

1. Log of those entering and leaving Work Area
2. List of subcontractors at the site
3. Approximate count of personnel at the site
4. High and low temperatures, general weather conditions
5. Accidents and unusual events
6. Meetings and significant decisions
7. Stoppages, delays, shortages, losses
8. Meter readings and similar recordings
9. Emergency procedures
10. Orders and requests of governing authorities
11. Change Orders received, implemented
12. Services connected, disconnected
13. Equipment or system tests and start-ups
14. Partial Completions, occupancies
15. Substantial Completions authorized

1.7 SHOP DRAWINGS

A. Shop Drawings are not required under this contract.

1.8 MISCELLANEOUS SUBMITTALS

A. **Material Safety Data Sheets:** Acknowledge receipt of material safety data sheets for all materials used during remediation activities.

B. **Records of Actual Work:** Furnish two (2) copies of records of actual work, one of which will be returned for inclusion in the record documents as specified in Section 01934 – Project Closeout – Lead Based Material.

C. **Standards:** Where submittal of a copy of standards is indicated, and except where copies of standards are specified as an integral part of a "Product Data" submittal, submit a single copy of standards for the Owner's Representative use. Where workmanship, whether at the project site or elsewhere is governed by a standard, furnish additional copies of the standard to fabricators, installers, and others involved in the performance of the work.

D. **Request for Information:** Where questions arise before or during the work activities, submit a written request to the Owner's Representative. Allow for at least four (4) hours for review and a response.

E. **Closeout Submittals:** Refer the Section 01934 – Project Closeout – Lead Based Materials and to individual sections of these specifications for specific submittal requirements of project closeout information.

1.9 OWNER'S REPRESENTATIVE'S ACTION

A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Owner's Representative will review each submittal, mark to indicate action taken, and return promptly.

1. Compliance with specified characteristics is the Remediation Contractor's responsibility.

B. **Action Stamp:** The Owner's Representative will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

1. **Final Unrestricted Release:** Where submittals are marked "Approved," that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.

2. **Final-But-Restricted Release:** When submittals are marked "Approved as Noted," that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.

3. **Returned for Resubmittal:** When submittal is marked "Not Approved, Revise and Resubmit," do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.

a. Do not permit submittals marked "Not Approved, Revise and Resubmit" to be used at the Project site, or elsewhere where Work is in progress.

4. **Other Action:** Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Action Not Required".

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

SUBMITTAL CHECKLIST

BEFORE START OF WORK

Supplementary Conditions

__ Bodily Injury and Property Damage Liability: Certificate of Coverage
__ Worker's Compensation Insurance: Certificate of Coverage
__ Automobile Liability: Certificate of Coverage
__ Performance Bond: Certificate of Coverage
__ Labor and Material Bond: Certificate of Coverage

01920 Summary of Work – Lead Based Materials

__ Plan of Action
__ Pre-construction Inspection
__ Alternate Methods

01921 Coordination – Lead Based Materials

__ Contingency Plans
__ Telephone Numbers
__ Notification sent to entities at the work site
__ Notifications sent to emergency service agencies
__ Valid Accreditation: of general superintendent, foreman and workers
__ Valid Texas Department of Health Certification/Licensing: of firm, general superintendent, foreman and workers
__ Texas Department of Health Notification
__ Staff Names
__ Name and Address of recycling facility that will be accepting the recyclable waste

01922 Reference Standards and Definitions - Lead Based Materials

__ Refer to Section

01923 Codes, Regulations, and Standards - Lead Based Materials

__ Copy of State Regulations
__ Copy of Local Regulations
__ Valid Accreditation: of general superintendent, foreman and workers
__ Valid Texas Department of Health Certification/Licensing: of firm, general superintendent, foreman and workers
__ Permits

01924 Submittals - Lead Based Materials

__ Submittal Schedule
__ Contractor's Remediation Schedule

01927 Remediation Facilities and Temporary Controls - Lead Based Materials

__ Scaffolding (including Shop Drawing)
__ Hot Water Heaters: Product data
__ Decontamination Unit Sub-panel: Product data and Shop drawing
__ Ground Fault Circuit Interrupters (GFCI): Product data
__ Lamps and Light Fixtures: Product data
__ Temporary Heating Units: Product data
__ Temporary Cooling Units: Product data and installation instructions
__ Self-contained Toilet Units: Product data and name of sub-contractor
__ First Aid Supplies: Provide list of contents
__ Fire Extinguisher: Product data, location schedule

01929 Work Area Containment - Lead Based Materials

__ Schedule of locked doors
__ Polyethylene: Product data (including fire ratings)
__ Construction plan
__ Lumber (including fire ratings)
__ Spray Cement: Product data

01931 Worker Protection - Lead Based Materials

__ Valid Accreditation: of general superintendent, foreman and workers
__ Training Program course outline
__ Results of Pre-Work Biological monitoring for blood lead (Pb) level and zinc protoporphyrin level
__ Certificate of Worker Acknowledgement for each worker and supervisor
__ Report of Medical Examination of each worker and supervisor
__ Compliance Program in compliance with 1926.62
__ Exposure Assessment in compliance with 1926.62
__ Notarized Certifications

01932 Respiratory Protection - Lead Based Materials

__ Respiratory Protection Program written manual
__ Respirator Product Data
__ Historic Sample Data
__ Fit Test Documentation

01933 Materials and Equipment - Lead Based Materials

__ Product List Schedule

01936 Removal of Lead Based Material Substrates

__ HEPA Vacuums: Product data
__ Wet Detergent Wash
__ Material Safety Data Sheet

01938 Disposal of Waste Materials - Lead Based Materials

__ Valid Waste Hauler State License
__ Valid Waste Hauler Local License, if applicable
__ U.S. EPA Identification Number of Waste Hauler
__ Name, address, permit and State License of landfill
__ Landfill contact person and telephone number
__ EPA Uniform Hazardous Waste Manifest
__ EPA Notification of hazardous waste activity
__ Forms required by State or Local agencies

PERIODICALLY DURING WORK

01921 Coordination - Lead Based Materials

__ Daily Logs
__ Event Reports
__ Accident Reports
__ Discovered Condition Reports

01924 Submittals - Lead Based Materials

__ Record Documents

01929 Work Area Containment - Lead Based Materials

__ Photograph of existing damage prior to applying coatings.

01931 Worker Protection - Lead Based Materials

__ Updated information on workers

01932 Respiratory Protection - Lead Based Materials

__ Update information on new equipment

01934 Project Closeout - Lead Based Materials

__ Refer to section

01938 Disposal of Waste Material - Lead Based Materials

__ Copies of manifests and disposal site receipts.

PROJECT CLOSEOUT

01921 Coordination - Lead Based Materials

__ Daily Log

01931 Worker Protection - Lead Based Materials

__ Results of Post-Work Biological monitoring for blood lead (Pb) level and zinc protoporphyrin level

01934 Project Closeout - Lead Based Materials

__ Record Documents
__ Record Product Data

01935 Project Decontamination - Lead Based Materials

__ Certificate of Visual Inspection

END OF SECTION 01924

SECTION 01925 - TEST LABORATORY SERVICES – LEAD BASED MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division - 1 Specification Sections, apply to work of this section.

B. Surface lead (Pb) dust wipe sampling and soil sampling during work area clearance are described in Section 01926 - Project Clearance.

1.2 DESCRIPTION OF THE WORK

A. Not in Contract Sum: This section describes work being performed by the Owner or Owner's Representative. This work is not in the Contract Sum.

B. This section describes air monitoring, soil sampling and surface lead (Pb) dust wipe sampling carried out by the Owner's Representative to verify that the work area and outside environment remains uncontaminated. This section also sets forth baseline levels that the Remediation Contractor must comply with and describes the action required if the levels are exceeded.

C. Corrective Work triggered by this section is part of the contract sum and is to be performed by the Remediation Contractor at no additional cost to the Owner.

D. Additional air monitoring required by OSHA and Section 01932 is work of the Remediation Contractor and is not covered in this section.

1.3 ANALYTICAL METHODS:

A. Atomic Absorption Spectroscopy or Inductively Coupled Plasma Emission Spectroscopy will be used for analysis of:

1. **Air Samples** that will be collected by the Owner's Representative before and during the course of the project to establish area airborne lead (Pb) dust levels.

2. **Soil Samples** shall be collected by the Owner's Representative to establish a baseline lead (Pb) content to assess the existing condition of the area soil before work efforts under this contract are started. The Owner's Representative shall collect soil samples to assess the existing condition of the area soil **after** all work efforts under this contract are completed.

3. **Wipe Samples** The Owner's Representative shall collect lead wipe samples from representative portions of the building floor areas prior to and following completion of component removal/dismantling operations.

1.4 ESTABLISH BASELINE LEAD (PB) CONCENTRATION:

A. Before start of work the Owner's Representative will secure the following air, dust and soil samples to establish a baseline level.

1. **Soil Samples:** Composite exterior samples; one (1) composite sample consisting of three (3) sub-samples from each exterior elevation below the work areas.

2. **Dust Wipe Samples:** One (1) wipe sample shall be collected from any interior floor location (one sample per 2,500 square feet or portion thereof) to remain.

1.5 AIR AND SURFACE LEAD (PB) DUST MONITORING

The purpose of the Owner's air and surface lead (Pb) dust monitoring will be to detect faults in the work area isolation which may cause contamination of the building or exterior with lead (Pb) dust.

A. Should any of the above occur, cease Hazard Reduction activities. Correct fault in work area isolation or work procedures at no cost to the Owner.

1.6 AIRBORNE LEAD (PB) CONCENTRATIONS DURING REMEDIATION WORK

The Owner may monitor airborne lead (Pb) concentrations inside and outside the work area.

A. **Inside Work Area:** Maintain lead (Pb) concentrations at lowest possible levels, not to exceed 50-micrograms/cubic meter. If concentrations rise above this, figure revise work procedures to lower lead (Pb) levels.

B. **Outside Work Area:** Maintain lead (Pb) concentrations at lowest possible levels, not to exceed baseline levels. If concentrations rise above baseline levels, stop hazard reduction work and institute corrective actions, Owner's Representative will determine source of the high reading.

1.7 SOIL LEAD (PB) CONCENTRATIONS

A. **Outside Work Area:** Maintain lead (Pb) concentrations at lowest possible levels, not to exceed baseline levels. If concentrations rise above baseline levels, institute corrective actions. Owner's Representative will determine source of the high reading.

1.8 CORRECTIVE ACTIONS

A. If the high reading above is outside work area and was result of failure of work area isolation measures, initiate the following action:

1. Decontaminate affected area in accordance with Section 01935 - Project Decontamination – Lead Based Materials at no cost to the Owner.

B. If the high reading above is soil outside building and was result of failure of work area isolation measures, initiate the following action:

1. Remediate soil in accordance with Section 01937 – Remediation of Lead Contaminated Soil at no cost to the Owner.

1.10 SCHEDULE OF SAMPLES

From start of work of Section 01929 Work Area Containment – Lead Based Materials through the work of Section 01935 Project Decontamination – Lead Based Materials, the Owner shall take the following samples on a daily basis.

Location Sampled	Number of Samples	Type Of Sample	Remarks
Each Exterior Work Area	2	Air	*Upwind and Downwind*
Each Interior Work Area	2	Air	*One sample in the Work Area and One Sample Adjacent to Work Area*

1.11 PERSONAL MONITORING

A. Owner's Representative will not perform air monitoring to meet Remediation Contractor's OSHA requirements for personnel sampling.

1.12 EFFECT ON CONTRACT SUM

A. Complete corrective work with no change in contract sum if high concentrations were caused by Remediation Contractor's activities. The contract sum will be adjusted for additional work caused by high concentrations beyond the Remediation Contractor's control.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION - 01925

SECTION 01926 PROJECT CLEARANCE – LEAD BASED MATERIALS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division -1 Specification Sections, apply to work of this section.

1. Visual Inspection: Required as a prerequisite of sampling is set forth in Section 01935 Project Decontamination – Lead Based Materials.

1.2 DESCRIPTION OF THE WORK

A. Not in Contract Sum: This section describes work being performed by the Owner's Representative. This work is not in the Contract Sum.

B. This section sets forth required surface lead (Pb) dust concentration in the work area and describes testing procedures the Owner will use to measure these levels.

C. Soil Testing: This section sets forth required soil lead (Pb) content measurements conducted on exterior abatement projects which will be used to:

1. Support pre-and post-abatement comparisons; and

2. Determine if statistically significant changes in soil lead (Pb) content exist following the completion of abatement.

1.3 ANALYTICAL METHODS

A. **Atomic Absorption Spectroscopy** or Inductively Coupled Plasma Emission Spectroscopy will be used for analysis of:

1. **Air Samples**
2. **Floor Wipe Samples**
3. **Soil Samples**

1.4 VISUAL INSPECTION

A. Work of this section will not begin until the visual inspection described in Section 01935 Project Decontamination – Lead Based Materials has been completed and certified by the Owner's Representative.

1.5 CLEARANCE CRITERIA

A. **Wipe Sampling Clearance:** Remediation is complete when every wipe sample collected is at or below the following levels. If clearance levels are not satisfactory, the remediation is incomplete and additional remediation per the Scope of Work Documents is required at no additional cost to the Owner.

1. **Floors:** 40 parts per million (ppm)

1.6. **SCHEDULE OF SAMPLES:** At the completion of the hazard reduction, the following samples will be collected.

BUILDING	*LOCATION*	*SURFACE*	*NUMBER OF SAMPLES*
Interior Work Area	*Interior*	*Floors*	*One (1) sample per work area from each 2,500 square feet of area with a minimum of two (2) samples*
Areas on the porches	*Exterior*	*Floors*	*One (1) sample per work area from each 2,500 square feet of area with a minimum of two (2) samples*
Area below drip line of each exterior elevation (4-compass points)	*Exterior*	*Soil*	*One (1) composite sample consisting of at least three (3) subsamples per elevation of the structure*

END OF SECTION 01926

SECTION 01927 - REMEDIATION FACILITIES AND TEMPORARY CONTROLS – LEAD BASED MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF REQUIREMENTS

A. **General:** Provide temporary connection to existing building utilities or provide temporary facilities as required herein or as necessary to carry out the work.

1.3 SUBMITTALS

A. **Before the Start of Work:** Submit the following to the Owner's Representative for review. Begin no work until these submittals are returned with Owner's Representative's action stamp indicating that the submittal is returned for unrestricted use or final-but-restricted use.

B. **Scaffolding:** Submit list of rolling and fixed scaffolding intended for use on the project. Submit sufficient detail to indicate compliance with applicable worker safety regulations or other requirements.

C. **Hot water heater (if applicable):** Submit manufacturer's name, model number, size in gallons, heating capacity, power requirements.

D. **Decontamination Unit Sub-panel (if applicable):** Submit product data.

E. **Ground Fault Circuit Interrupters (GFCI):** Submit product data.

F. **Temporary Heating Units (if applicable):** Provide product data.

G. **Temporary Cooling Units (if applicable):** Provide product data and installation instructions.

H. **Self-contained Toilet Units**: Provide product data and name of sub-contractor used for servicing self contained toilets. Submit method to be used for servicing.

I. **First Aid Supplies:** Provide list of contents of first aid kit. Submit in form of checklist.

J. **Fire Extinguishers:** Provide product data. Submit schedule indicating location at job site.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. **General:** Provide new or used materials and equipment that are undamaged and in serviceable condition. Provide only materials and equipment that are recognized as being suitable for the intended use, by compliance with appropriate standards.

2.2 SCAFFOLDING

A. Provide all scaffolding, ladders and/or staging, etc. as necessary to accomplish the work of this contract. Scaffolding may be of suspension type; or standing type such as metal tube and coupler, tubular welded frame, pole or outrigger type or cantilever type. The type, erection and use of all scaffolding shall comply with all applicable OSHA provisions.

B. Equip rungs of all metal ladders, etc. with an abrasive non-slip surface.

C. Provide a nonskid surface on all scaffold surfaces subject to foot traffic.

2.3 WATER SERVICE

A. **Temporary Water Service Connection:** All connections to the Owner's water system shall include backflow protection. Valves shall be temperature and pressure rated for operation of the temperatures and pressures encountered. After completion of use, connections and fittings shall be removed without damage or alteration to existing water piping and equipment. Leaking or dripping valves shall be piped to the nearest drain or located over an existing sink or grade where water will not damage existing finishes or equipment.

B. **Water Hoses:** Employ heavy-duty abrasion-resistant hoses with a pressure rating greater than the maximum pressure of the water distribution system to provide water into each work area and to each Decontamination Unit. Provide fittings as required to allow for connection to existing wall hydrants or spouts, as well as temporary water heating equipment, branch piping, showers, shut-off nozzles and equipment.

C. **Water Heater:** Provide UL rated 40-gallon electric water heater to supply hot water for the Decontamination Unit shower. Activate from 30-amp circuit breaker located within the Decontamination Unit sub-panel. Provide with relief valve compatible with water heater operation; pipe relief valve down to drip pan on floor with type L copper. Drip pans shall consist of a 12" X 12" X 6" (30 cm x 30 cm x 15 cm) deep pan, made of 19 gauge galvanized steel, with handles. A 3-quart (3 L) kitchen saucepan may be substituted for this purpose. Drip pan shall be securely fastened to the water heater with bailing wire or similar material. Wiring of the water heater shall be in compliance with NEMA, NECA, and UL standards.

D. **Hot Water:** ***may not be secured*** from the building hot water system.

2.4 ELECTRICAL SERVICE

A. General: Comply with applicable NEMA, NECA and UL standards and governing regulations for materials and layout of temporary electric service. Provide equipment that is compatible with existing electrical characteristics and available power. If existing power is either incompatible or inadequate for performance of the Work, provide auxiliary generators(s) located outside of the building.

B. Temporary Power: Provide service to Decontamination Unit subpanel with minimum 60 amp, 2-pole circuit breaker or fused disconnect connected to the buildings main distribution panel. Subpanel and disconnect shall be sized and equipped to accommodate all electrical equipment required for completion of the work.

C. Voltage Differences: Provide identification warning signs at power outlets that are other than 110-120 volt power. Provide polarized outlets for plug-in type outlets, to prevent insertion of 110-120 volt plugs into higher voltage outlets. Dry type transformers shall be provided where required to provide voltages necessary for work operations.

D. Ground Fault Protection: Equip all circuits for any purpose entering Work Area with ground fault circuit interrupters (GFCI). Locate GFCI's exterior to Work Area so that all circuits are protected prior to entry to Work Area. Provide circuit breaker type ground fault circuit interrupters (GFCI) equipped with test button and reset switch for all circuits to be used for any purpose in work area, decontamination units, exterior, or as otherwise required by national electrical code, OSHA or other authority. Locate in panel exterior to Work Area.

2.5 ELECTRICAL EQUIPMENT

A. Electrical Power Cords: Use only grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Use single lengths or use waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas of work.

2.6 TEMPORARY HEAT

A. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the fuel being consumed. Use steam or hot water radiant heat where available, and where not available use electric resistant fin radiation supplied from a branch circuit with ground fault circuit interrupter.

2.7 TEMPORARY COOLING

A. Cooling Units: Provide temporary cooling units consisting of a fan coil unit inside the work area with a compressor and heat rejection coil outside sufficient to keep the work area temperature below 100 degrees Fahrenheit.

2.8 SELF-CONTAINED TOILETS

A. **Self-contained Toilet Units:** Provide single-occupant self-contained toilet units of the chemical type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar non-absorbent material.

2.9 FIRST AID

A. **First Aid Supplies:** Comply with governing regulations and recognized recommendations within the construction industry.

2.10 FIRE EXTINGUISHERS

A. **Fire Extinguishers:** Provide Type "A" fire extinguishers for temporary offices and similar spaces where there is minimal danger of electrical or grease-oil-flammable liquid fires. In other locations provide type "ABC" dry chemical extinguishers, or a combination of several extinguishers of NFPA recommended types for the exposures in each case.

PART 3 - EXECUTION

3.1 SCAFFOLDING

A. Require that a Competent Person supervise the erection, movement, and dismantling of scaffolding in accordance with OSHA 29 CFR 1926.451.

B. During the erection and/or moving of scaffolding, care must be exercised so that the polyethylene floor covering is not damaged.

C. Clean as necessary debris from non-slip surfaces.

D. At the completion of remediation work clean all construction aids within the work area, wrap in one layer of 6-mil polyethylene sheet and seal before removal from the work area.

3.2 GENERAL INSTALLATION

A. **General:** Use qualified tradesmen for installation of temporary services and facilities. Locate temporary services and facilities where they will serve the entire project adequately and result in minimum interference with the performance of the Work.

1. Require that tradesmen accomplishing this work be licensed as required by local authority for the work performed.

B. Relocate, modify and extend services and facilities as required during the course of work so as to accommodate the entire work of the project.

3.3 WATER SERVICE

A. **General:** Water connection (without charge) to Owner's existing potable water system is limited to one 3/4" pipe-size connection, and a maximum flow of 10 gpm cold water supply. Install using vacuum breakers or other backflow preventer as required by local authority.

B. Maintain hose connections and outlet valves in leak-proof condition. Where spillage or leakage might damage finish work below an outlet, provide a drip pan of suitable size to minimize the possibility of water damage. Drain water promptly from pans as it accumulates.

3.4 TEMPORARY POWER - REGULATED AREAS

A. **General:** Use existing power available in Work Area.

B. **Circuit Protection:** Protect each tool or extension cord with a ground fault circuit interrupter (GFCI) of proper size. GFCI can be type that plugs into existing duplex outlets. Insure that outlet is properly grounded before installation of GFCI.

3.5 ELECTRICAL SERVICE

A. **General:** Provide a weatherproof, grounded temporary electric power service and distribution system of sufficient size, capacity, and power characteristics to accommodate performance of work during the construction period. Install temporary lighting adequate to provide sufficient illumination for safe work and traffic conditions in every area of work.

B. **Lockout:** Lockout all existing power to or through the work area as described below. Unless specifically noted otherwise existing power and lighting circuits to the work area are not to be used. All power and lighting to the Work Area is to be provided from temporary electrical panel described below.

1. Lockout power to work area by switching off all breakers serving power or lighting circuits in work area. Label breakers with tape over breaker with notation "DANGER circuit being worked on". Lock panel and have all keys under control of Remediation Contractor's superintendent or owner's designated representative.

2. Lockout power to circuits running through work area wherever possible by switching off all breakers serving these circuits. Label breakers with tape over breaker with notation "DANGER circuit being worked on". Sign and date danger tag. Lock panel and supply keys to Remediation Contractor, Owner and Designer. If circuits cannot be shut down for any reason, label at 4'-0" on center with tags reading, "DANGER live electric circuit. Electrocution hazard."

C. **Temporary Electrical Panel:** Provide temporary electrical panel sized and equipped to accommodate all electrical equipment and lighting required by the work. Connect temporary panel to existing building electrical. Protect with circuit breaker or fused disconnect. Locate temporary panel as directed by Owner or

Owner's Representative. Power may be obtained from adjacent apartments if authorized in writing by the Owner.

D. **Power Distribution System:** Provide circuits of adequate size and proper characteristics for each use. In general run wiring overhead and rise vertically where wiring will be least exposed to damage from construction operations.

E. **Circuit Protection:** Protect each circuit with a ground fault circuit interrupter (GFCI) of proper size located in the temporary panel. Do not use outlet type GFCI devices.

F. **Temporary Wiring:** in the work area shall be type UF non-metallic sheathed cable located overhead and exposed for surveillance. Do not wire temporary lighting with plain, exposed (insulated) electrical conductors. Provide liquid tight enclosures or boxes for wiring devices.

G. **Number of Branch Circuits:** Provide sufficient branch circuits as required by the work. All branch circuits are to originate at temporary electrical panel. At minimum provide the following:

1. For power tools and task lighting, provide one temporary 4-gang outlet in the following locations. Provide a separate 110-120 Volt, 20 Amp circuit for each 4-gang outlet (4 outlets per circuit).

a. One outlet in the work area for each 2500 square feet of work area.

b. One outlet at each decontamination unit, located in equipment room.

2. 110-120 volt 20 amp branch circuits with 4-gang outlet for Owner's exclusive use while conducting air sampling during the work as follows:

a. One in each work area.

b. One at clean side of each Decontamination Unit.

3.6 TEMPORARY HEAT

A. **General:** Provide temporary heat where indicated or needed for performance of the Work.

B. **Temperature:** Maintain a minimum temperature of 70 degrees F. where finished work has been installed.

C. **Temperature in shower:** Maintain a minimum temperature of 75 degrees F.

D. **Temperature:** Maintain a minimum temperature of 70 degrees F. in the Work Area at all times that work is going on. At all other times and at completion of removal work, but before start of reconstruction work, maintain a minimum temperature of 50 degrees F.

E. **Temperature:** Maintain a minimum temperature of 50 degrees F. in the Work Area at all times during and after removal work.

3.7 TEMPORARY COOLING

A. **Required Cooling:** Provide units sufficient to supply a temperature of less than 100 degrees F in the work area.

3.8 SANITARY FACILITIES

A. **Toilets:** *Use of the Owner's existing toilet facilities will be not permitted*. Provide one self-contained chemical toilet unit in the Work Area for each 30 workers. Facilities shall be maintained throughout the Work. At the end of the job, facilities shall be decontaminated in accordance with these specifications.

3.9 FIRE EXTINGUISHERS

A. **Fire Extinguishers:** Comply with the applicable recommendations of NFPA Standard 10 "Standard for Portable Fire Extinguishers". Locate the appropriate class of fire extinguishers where they are most convenient and effective for their intended purpose.

3.10 STORAGE FACILITIES

A. **Storage:** The Remediation Contractor shall provide a temporary construction trailer as a storage area for tools, equipment and supplies. Waste generated during abatement shall be stored in a construction trailer in addition to above.

END OF SECTION - 01927

SECTION 01928 REGULATED AREAS – LEAD BASED MATERIALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Remediation Facilities & Temporary Controls: Is specified in Section 01927.

B. Worker Protection: is specified in Section 01931.

C. Respiratory Protection: is specified in Section 01932.

1.03 DESCRIPTION OF WORK

A. Work of this section consists of preparing a Regulated Area for work delineated of the following specification sections:

1.	**Section 01947**	Removal - Lead Based Materials
2.	**Section 01948**	Chemical Stripping of Lead Based Materials

PART 2 - PRODUCTS

2.01 HEPA Filtered Vacuum Cleaners

2.02Duct Tape: Provide 2" (51mm) width tape with an adhesive that is formulated to aggressively stick to sheet polyethylene.

2.03 Wet Detergent Wash: Provide detergent or cleaning agent formulated to be effective in removing lead dust. Follow dilution ratio recommended by the manufacturer's instructions.

2.04 Plastic Sheet: A single polyethylene film in the largest sheet size possible to minimize seams 6 mils thick.

2.05 Barricade Fence: Plywood barricade fence, eight (8) feet high constructed such that there is no visibility by the public.

PART 3 - EXECUTION

3.01 SECURING WORK AREA

A. Secure work area from access by occupants, staff or users of the building and general public. However, the Contractor shall provide access to the Owner and Owner's Representative.

3.02 DEMARCATION OF REGULATED AREA

A. Demarcate each exterior Regulated Area with a sheet plastic drop sheet as described below.

B. Provide barricade fence with support posts. Provide barrier warning tape at perimeter with the following legend "Caution Lead Hazard - Do not enter work area unless authorized." Barricade fence shall be securely fastened and no closer than twelve feet (12') from the work.

3.03 EXTERIOR ABATEMENT GENERAL PROCEDURES

A. The following precautions and procedures have application to the work of this section. Workers must exercise caution to avoid the release of lead (Pb) dust into the air and to contain lead (Pb) dust and debris on drop sheet.

B. Before start of work, comply with requirement for Worker Protection in Section 01931 and Respiratory Protection in Section 01932.

C. Do not allow eating, drinking, smoking, chewing tobacco or gum, or applying cosmetics in the regulated area.

D. Provide barricade fencing and signage. Maintain egress from exits.

E. On a daily basis, collect dust and debris by HEPA vacuuming the surface or by wet wiping. Remaining debris and building components shall be collected and containerized prior to leaving the work site daily.

F. On a daily basis and during final cleanup, visually examine the immediate area to ensure that no debris has escaped drop sheets/work area. Wet wipe or HEPA vacuum any debris found and place in 6-mil disposal bags or in poly-lined drums. Securely store with other waste.

G. Suspend any exterior work activities during inclement weather; including but not limited to high wind, rain, snow ice, and hail.

3.04 INTERIOR ABATEMENT GENERAL PROCEDURES

A. The following precautions and procedures have application to the work of this section. Workers must exercise caution to avoid the release of lead (Pb) dust into the air and to contain lead (Pb) dust and debris on drop sheet.

B. Before start of work, comply with requirement for Worker Protection in Section 01931 and Respiratory Protection in Section 01932.

C. Do not allow eating, drinking, smoking, chewing tobacco or gum, or applying cosmetics in the regulated area.

D. Segregate the work area from other portions of the facility with 6-mil polyethylene drop sheets and barrier tape. Provide proper hazard communication signage. Maintain egress from exits.

E. On a daily basis, collect dust and debris by wet wiping or HEPA vacuuming

surfaces.

F. On a daily basis and during final cleanup, visually examine the immediate area to ensure that no debris has escaped the drop sheet(s) or work area. Wet wipe or HEPA vacuum up any debris found and place in 6-mil disposal bags or in poly-lined drums. Securely store with other waste.

G. Ensure that any HVAC equipment in the building is deactivated and that HVAC return and supply registers are covered in the vicinity of any work prior to the start of any lead-related work.

END OF SECTION - 01928

SECTION 01931 WORKER PROTECTION – LEAD BASED MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

This section describes the equipment and procedures required for protecting workers against lead (Pb) contamination and other workplace hazards except for respiratory protection. For the purpose of this project, and unless the Remediation Contractor can show an exposure assessment that can show otherwise, the assumed exposure for this project shall be at least 50 µg/m³ - 500 µg/m³. This work corresponds to an OSHA Class I Task and requires specific actions on the part of the Remediation Contractor. The minimum respiratory protection during dismantling and demolition activities will be half face negative pressure respirators equipped with HEPA/organic filters indicated in Section 01932 Respiratory Protection – Lead Based Materials during all remediation activities. The contractor shall provide information to assure that the above respiratory protection is sufficient in accordance with 29 CFR 1926.1101 negative exposure assessment requirements. In addition, the contractor's personnel shall wear eye protection during all encapsulation and demolition activities.

1.3 STANDARDS

A. Except to the extent that more stringent requirements are written directly into the Contract Documents, the following regulations and standards have the same force and effect (and are made a part of the Contract Documents by reference) as if copied directly into the Contract Documents, or as if published copies were bound herewith. Where there is a conflict in requirements set forth in these regulations and standards, meet the more stringent requirement.

B. **OSHA** - U.S. Department of Labor, Occupational Safety and Health Administration, Safety and Health Standards including but not limited to:

The following sections are brought to the Remediation Contractor's attention for convenience. All appropriate OSHA Standards apply to this project.

1. **29 CFR 1910.134** Respiratory Protection;

2. **29 CFR 1926.20** General safety and health provisions;

3. **29 CFR 1926.21** Safety training and education;

4. **29 CFR 1926.23** First Aid;

5.	**29 CFR 1926.24**	Medical Surveillance and Medical Removal Protection Programs;
6.	**29 CFR 1926.25**	Housekeeping;
7.	**29 CFR 1926.28**	Personal protective equipment;
8.	**29 CFR 1926.51(f)**	Washing facilities;
9.	**29 CFR 1926.55**-	Gases, vapors, fumes, dusts, and mists;
10.	**29 CFR 1926.56**	Illumination;
11.	**29 CFR 1926.57**	Ventilation;
12.	**29 CFR 1926.59**	Hazard Communication Standard;
13.	**29 CFR 1926.62**	Lead Construction Standard;
14.	**29 CFR 1926.103**	Respiratory protection;
15.	**29 CFR 1926.353(c)**	Ventilation: Welding, cutting or heating of metals of toxic significance;
16.	**29 CFR 1926.300, 301, 302**	Hand and power tools;
17.	**29 CFR 1926.451 500, 501, 502, 503**	Scaffolding & Fall Protection.

1.4 RELATED WORK SPECIFIED ELSEWHERE

A. **Respiratory Protection**: is specified in Section 01932 – Respiratory Protection – Lead Based Materials.

1.5 COMPETENT PERSON

A. **Definition:** A "Competent Person" is one who is capable of identifying existing and predictable hazards at the worksite and who has the authority to ensure prompt corrective measures are taken to eliminate them. The competent person has authority to shut down the project in accordance with OSHA 1926.62.

B. Provide on-site, full time competent person (or persons) to ensure that the worker protection program is effective.

1.6 WORKER TRAINING

A. **Certification:** Workers and supervisors are not required to hold Texas Department of State Health Services Lead Certificates.

B. **OSHA-Required Training:** All workers are to be trained in the dangers inherent in handling lead (Pb) and breathing or ingesting lead (Pb) dust and in the proper work procedures and personal and area protective measures prior to the time of initial job assignment and at least annually thereafter. Include but do not limit the

topics covered in the 8-hour course to the following:

1. Content of OSHA lead standard
2. Possible routes of exposure to lead (Pb)
3. Health effects associated with lead (Pb) exposure
4. Medical removal protection program
5. The importance of good personal hygiene
6. Nature of operations that could result in exposure to lead (Pb)
7. The proper use and maintenance of protective clothing and equipment, including respiratory protection
8. The correct use of engineering controls and implementation of good work practices
9. Importance of and instruction in the use of necessary protective controls, practices and procedures to minimize exposure including:
    a. Engineering controls
    b. Work Practices
    c. Respirators
    d. Housekeeping procedures
    e. Hygiene facilities
    f. Protective clothing
    g. Decontamination procedures
    h. Emergency procedures
    i. Waste disposal procedures
10. Purpose, proper use, fitting, instructions, and limitations of respirators as required by 29 CFR 1926.103
11. The specific methods of hazard reduction to be used for the project
12. Requirements of medical monitoring/surveillance program
13. Signs and labels
14. Work practices including hands on or on-the-job training
15. Personal decontamination procedures

16. Health and safety considerations

17. Review of OSHA written compliance program as required by 29 CFR 1926.62

18. Information on the use of chelating agents and the fact that they should not be routinely used to remove lead (Pb) from their bodies except under the direction of a licensed physician

19. The employees' right of access to medical records per 29 CFR 1910.20

C. **Acceptable Training Requirements:** Acceptable training by a Texas Department of State Health Services Certified training provider for all persons conducting "Lead-related activities" on this project shall include:

1. **For workers:**

a. A minimum of 8 hours of EPA training, with a minimum of 4 hours devoted to hands-on training

b. Instruction in regulatory background; Federal, state and local

2. **For supervisors:**

a. A minimum of 32 hours of EPA training, with a minimum of 8 hours devoted to hands-on training

b. Instruction in legal insurance issues

c. Development of pre-abatement work plans

d. Employee information and training

e. Project management

f. Contract specifications

g. Supervisory techniques

h. Soil, dust and air testing

i. Clearance standards and testing

j. Community relations process

k. Cost estimations

l. Recordkeeping

MEDICAL SURVEILLANCE

A. Provide full medical examinations for all workers performing lead-related activities prior to the start of work and for each worker exposed to lead (Pb) for more than thirty (30) days a year and/or who have blood lead (Pb) levels over 25 micrograms/deciliter. Provide initial medical examinations for each worker exposed to lead (Pb) for more than one (1) day per year. Provide medical examination for any employee who has signs and symptoms of lead (Pb) poisoning or when a worker becomes pregnant.

B. Medical evaluation to include:

1. A detailed work and medical history

2. A thorough physical examination

3. Evaluation of pulmonary status

4. A blood pressure measurement

5. A blood sample and analysis that determines blood lead (Pb) levels, hemoglobin and hematocrit, red cell indices, peripheral smear morphology, blood urea nitrogen, serum creatinine and zinc protoporphyrin

6. A routine urinalysis

7. Any other laboratory or other test which is recommended by the examining physician

C. The medical evaluation must be provided prior to the start of the lead (Pb) hazard reduction project or assignment requiring the use of air purifying respirators.

D. Blood testing (blood lead (Pb) and zinc protoporphyrin) shall be performed prior to Start of Work and at least every two (2) months during the first six (6) months of the project and every two (2) months thereafter. ***An additional blood test shall be performed at the completion of the project*** or upon termination of employment.

The employer must make available the following:

1. Biological monitoring for blood lead (Pb) level and zinc protoporphyrin level at least every two (2) months during the first six months and every two (2) months thereafter.

2. When an employee's blood lead (Pb) level is at or above 40 µg/dl, biological monitoring at least every two (2) months until two (2) consecutive blood lead (Pb) level results are below 40 µg/dl.

3. Monthly blood lead (Pb) level testing during removal period or any employee medically removed due to an elevated blood lead (Pb) level.

4. When an employee's blood lead (Pb) level meet the criterion for medical removal (at or above 50 µg/dl), follow-up blood testing within two (2) weeks.

1.7 MEDICAL REMOVAL

A. Employers must remove employees with lead (Pb) exposure at or above 30-micrograms/cubic meter of air each time:

1. A periodic and follow-up blood sampling test indicates a blood lead (Pb) level at or above 50 µg/dl; and

2. A final medical determination indicates a detectable medical condition that increases health risks from lead (Pb) exposure.

1.9 COMPLIANCE PROGRAM

A. The OSHA Lead in Construction Standard requires the employer to establish and implement a written compliance program prior to the commencement of a job. All employees covered under this standard must implement engineering and work practice controls to reduce and maintain employee exposures to lead (Pb) at or below the Permissible Exposure Limit (PEL). This program must include:

1. Description of activities that produce lead (Pb) exposures.

2. Description of the specific means that will be employed to reduce exposure, and where engineering controls are used, the plans and studies used to determine the methods selected.

3. A detailed schedule for implementing the compliance program.

4. A report of the technology considered in meeting the PEL.

5. Air monitoring data that documents the source of the lead (Pb) exposure.

6. Specific work practice procedures which will be employed on the project.

7. A schedule of administrative controls if these are to be utilized.

8. A description of all arrangements made on multi-employer work sites to inform affected employers about the lead (Pb) project.

1.10 EXPOSURE ASSESSMENT

A. The OSHA Lead in Construction Standard requires employers to implement protective measures before exposure assessment has been completed if they are conducting any one of a number of "lead (Pb) related tasks". These tasks are divided into three different classes. The employer must assume that the worker is exposed to airborne concentrations at least to a certain level of lead (Pb) (depending on the class) until exposure assessment shows otherwise. When the employer has objective data demonstrating that the process, operation or activity does not result in employee exposure to lead (Pb) at or above the action level, the employer may rely upon such data for the initial exposure assessment.

B. **Class 1 Tasks** - Employer must assume exposure of at least 50 µg/m³ - 500 µg/m³ until exposure assessment proves otherwise. Examples include:

1. Manual dismantling of components and/or demolition of structures;

2. Manual scraping;

3. Manual sanding;

4. Using a heat gun;

5. Power tool paint removal with dust collection systems;

6. Spray painting with lead-based paint.

C. **Class 2 Tasks** - Employers must assume exposure of at least 500 µg/m³ - 2500 µg/m³ until exposure assessment proves otherwise. Examples include:

1. Using lead (Pb) containing mortar

2. Burning lead (Pb)

3. Rivet busting on lead (Pb) paint

4. Power tool paint removal without dust collection systems

5. Clean up activities where dry expendable abrasives are used

6. Abrasive blasting enclosures movement and removal

D. **Class 3 Tasks** - Employer must assume exposure of at least 2,500 µg/m³ until exposure assessment proves otherwise. Examples include:

1. Abrasive blasting

2. Cutting

3. Welding

4. Torch burning

E. Prior to the completion of an exposure assessment of the tasks being conducted, the employer should follow the regulations as if the employee was exposed above the PEL. The employee(s) must be notified in writing within 5 days of receipt of the results representing their exposure. Where exposure is above the PEL, employees must be informed of this fact and advised of corrective action to be taken. Monitoring and analysis must have an accuracy (to a confidence level of 95%) of not less than plus or minus 25% for airborne lead (Pb) levels equal to or greater than 30 µg/m³.

F. Personal protective equipment for each of the tasks above is to include protective work clothing and equipment, change areas, washing facilities, and training. The only difference in protective equipment for the different classes of tasks is respiratory protection which is to be provided in accordance with Section 01932 Respiratory Protection – Lead Based Materials.

1.11 SUBMITTALS

A. **Before Start of Work:** Submit the following to the Owner's Representative for review. Do not start work until these submittals are returned with Owner's Representative action stamp indicating that the submittal is returned for unrestricted use.

B. **Training Certificates:** Submit evidence that all workers and supervisors have been trained and accredited to work with lead.

C. **Certificate of Worker's Acknowledgement:** Submit an original signed copy of the Certificate of Worker's Acknowledgement found at the end of this section, for each worker who is to be at the job site or enter the Work Area.

D. **Training Program:** Submit a course outline of the worker and supervisor training courses. Include date and time course was given, name and title of teacher.

E. **Report from Medical Examination:** Conducted within last 12 months as part of compliance with medical surveillance requirements for each worker who is to enter the Work Area. Submit, at a minimum, for each worker the following:

1. Name and Social Security Number;

2. Physician's Written Opinion from examining physician including at a minimum the following:

a. Whether worker has any detected medical conditions that would place the worker at an increased risk of material health impairment from lead (Pb) exposure.

b. Any recommended limitations on the worker or on the use of personal protective equipment such as respirators.

c. Results of blood lead (Pb) determinations and any actions taken as a result of recommendations.

d. Statement that the worker has been informed by the physician of the results of the medical examination and of any medical conditions that necessitates further medical exam or treatment.

3. Copy of information that was provided to physician prior to the examination.

4. Statement that worker is able to wear and use the type of respiratory protection specified for the project, and is able to work safely in an environment capable of producing heat stress in the worker.

5. Compliance Program: Submit program in compliance with 1926.62.

6. Exposure Assessment: Submit assessment in compliance with 1926.62.

7. Notarized Certifications: Submit certification signed by an officer of the contracting firm and notarized that exposure measurements, medical surveillance, and worker training records are being kept as required in this specification.

PART 2 - EQUIPMENT

2.1 PROTECTIVE CLOTHING:

A. **Coveralls:** Provide disposable full-body coveralls and disposable head covers, and require that all workers in the Work Area wear them. Provide a sufficient number for all required changes, for all workers in the Work Area. Dispose of coveralls as clothing waste at the end of each day.

B. **Shoe Covers**: Provide disposable shoe covers and require that all workers in the Work Area wear them. Shoe covers must be replaced each time a worker leaves the work area. Shoe covers are disposed as clothing waste in the equipment section of the Change Room.

C. **Boots**: Provide work boots with non-skid soles, and where required by OSHA, foot protectives, for all workers. Provide boots at no cost to workers. Do not allow boots to be removed from the Work Area for any reason, after being contaminated with lead (Pb) dust. Dispose of boots with clothing waste at the end of the work, or bag and take to next project. Boots that are non-porous may be decontaminated and removed from work area.

D. **Hard Hats:** Provide head protectives (hard hats) as required by OSHA for all workers, and provide 4 spares for use by Owner and Owner's Representative. Require hard hats to be worn at all times that work is in progress that may potentially cause head injury. Provide hard hats of type with plastic strap type suspension. Require hats to remain in the Work Area throughout the work. Thoroughly clean and decontaminate hats before removing them from Work Area at the end of the project.

E. **Goggles and Face Shields:** Provide eye and face protection (goggles or face shields) as required by OSHA for all workers involved in scraping, spraying, stripping or any other activity which may potentially cause eye or face injury. Thoroughly clean and decontaminate goggles or face shields before removing them from Work Area at the end of the project.

F. **Gloves:** Provide work gloves to all workers and require that they be worn at all times in the Work Area. Chemical resistant gloves must be provided when using chemical strippers to remove lead (Pb) based paint. Gloves must be secured to the coveralls using duct tape to protect arms and hands from the chemical strippers. Do not remove gloves from Work Area. Dispose of as clothing waste at the end of the work.

2.2 ADDITIONAL PROTECTIVE EQUIPMENT:

A. Respirators, disposable coveralls, head covers, and footwear covers shall be provided by the Remediation Contractor for the Owner, Owner's Representative, and other authorized representatives who may inspect the job site.

2.3 DECONTAMINATION FACILITIES

A. Provide decontamination facilities to be used by all workers.

1. Provide as a minimum, a demarcated area or chamber at the designated exit from the work area where workers can HEPA vacuum their respirators and disposable coveralls prior to removal. Facilities which include soap and water shall be provided in this location for the workers to wash their faces and hands prior to leaving the work area. Filter all water or dispose of in accordance with Section 01938 Disposal of Waste Materials – Lead Based Materials.

2. If pre-fabricated or site-built shower facilities are provided, supply hot and cold water to shower head which can be controlled from inside shower. Filter all shower water or dispose of in accordance with Section 01938 Disposal of Waste Materials – Lead Based Materials.

3. Supply a sufficient quantity of soap and towels for the workers and authorized visitors.

2.4 EYEWASH STATION

A. Where the eyes of employees may be exposed to injurious corrosive materials, suitable facilities for flushing of the eyes shall be provided within the work area for immediate emergency use.

PART 3 - EXECUTION

3.1 GENERAL:

A. Provide worker protection as required by the most stringent OSHA and/or EPA standards applicable to the work. The following procedures are minimums to be adhered to regardless of lead (Pb) concentration in the Work Area.

B. Each time Work Area is entered remove street clothes and put on new disposable coverall or (re-use previous coverall if not overly contaminated or torn), new head cover, and a clean respirator with cartridges appropriate for the abatement work to be performed. Reinforce coverall seams and secure gloves to coveralls with duct tape. Proceed to the Work Area.

3.2 DECONTAMINATION PROCEDURES:

A. Require all workers to adhere to the following personal decontamination procedures whenever they leave the Work Area:

1. **Air Purifying Respirators:** Require that all workers use the following decontamination procedure as a minimum requirement whenever leaving

the Work Area with a respirator:

a. Still wearing respirators, comply with the following procedure. Care must be taken to follow reasonable procedures in removing the respirator and filters to avoid disturbing lead (Pb) dust. The following procedure is required as a minimum:

i. HEPA vacuum heavily contaminated protective work clothing.

ii. When exiting Work Area, remove foot covers in work area. Remove disposable coveralls and disposable head - covers in the Change Room. Remove protective coveralls by carefully rolling down the garment to minimize exposure to lead (Pb) dust.

b. Remove respirator; cap filter cartridges; and set aside.

c. Thoroughly wash hands and face with soap and water. If shower facilities are available, proceed to shower and shower completely with soap and water.

d. Carefully wash face piece of respirator inside and out. Do not remove respiratory cartridges unless wet. If wet, remove respirator cartridges from blower unit and discard.

e. Thoroughly wash hands with soap and water.

B. Within Work Area:

1. Require that workers NOT eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the Work Area. To eat, chew, drink or smoke, workers shall follow the procedure described above before entering the Non-Work Areas of the building or exterior.

3.3 CERTIFICATE OF WORKER'S ACKNOWLEDGEMENT:

A. Following this section is a Certificate of Worker Training. After each worker has been included in the Remediation Contractor's Respiratory Protection Program, completed the training program and medical examination, secure a fully executed copy of this form.

END OF SECTION - 01931

CERTIFICATE OF WORKER'S ACKNOWLEDGEMENT

PROJECT NAME_____ DATE_____

PROJECT ADDRESS_____

REMEDIATION CONTRACTOR'S NAME_____

WORKING WITH LEAD (PB) CAN BE DANGEROUS. INHALING AND INGESTING LEAD (PB) DUST CAN CAUSE AN INCREASE IN BLOOD LEAD (PB) LEVELS WHICH CAN LEAD TO ADVERSE HEALTH EFFECTS SUCH AS KIDNEY DAMAGE, ELEVATED BLOOD PRESSURE OR INFERTILITY.

Your employer's contract with the Owner for the above project requires that the following are provided at no cost to you: 1) you are supplied with the proper respirator and trained in its use; 2) you are trained in safe work practices and in the use of the equipment found on the job; and 3) you receive a medical examination.

RESPIRATORY PROTECTION: You must have been trained in the proper use of respirators, and informed of the type respirator to be used on the above referenced project. You must be given a copy of the written respiratory protection manual issued by your employer. You must be equipped at no cost with the respirator to be used on the above project.

TRAINING COURSE: You must have been trained in the dangers inherent in handling lead (Pb) and breathing and ingesting lead (Pb) dust and in proper work procedures and personal and area protective measures. The topics covered in the course must have included the following:

- Possible routes of exposure to lead (Pb)
- Health hazards associated with lead (Pb)
- Respiratory protection
- Use of protective equipment
- Work practices including hands on or on-the-job training
- Personal decontamination procedures
- Health and safety considerations

MEDICAL EXAMINATION: You must have had a medical examination within the past 12 months at no cost to you. This examination must have included: health history, physical examination, a blood pressure measurement, pulmonary function test and blood sample and analysis for lead (Pb).

By signing this document you are acknowledging only that the Owner of the building you are about to work in has advised you of your rights to training and protection relative to your employer, the Remediation Contractor.

Signature_____Social Security No_____

Printed Name_____Witness_____

CERTIFICADO DE RECONOCIMIENTO PARA LOS TRABAJADORES

NOMBRE DEL PROYECTO _____ FECHA _____

DIRECCION DEL PROYECTO _____

NOMBRE DEL CONTRATISTA _____

TRABAJAR CON PLOMO PUEDE SER PELIGROSO. INHALAR O INGERIR POLVO DE PLOMO PUEDE CAUSAR UN INCREMENTO DEL NIVEL DE PLOMO EN LA SANGRE, LO CUAL PUEDE OCACIONAR EFECTOS ADVERSOS A LA SALUD, TALES COMO DANOS A LOS RINONES, ALTA PRESION SANGUINEA, O INFERTILIDAD.

El contrato del empleador con el Propietario del proyecto arriba mencionado, requiere que: (1) Ud. debe ser proveido con la mascarilla apropiada, y le van a entrenar para usarla; (2) Ud. debe de ser entrenado en las practicas para un trabajo seguro, y en el uso del equipo existente en el trabajo; y (3) Ud. debe recibir un examen medico. Estos elementos le deben de ser proporcionados a Ud. sin ningun costo.

PROTECCION RESPIRATORIA: Ud. debe de ser entrenado para el uso apropiado de mascarillas, y tambien debe de ser informado del tipo de mascarilla a usar en el proyecto arriba mencionado. A Ud. se le debe dar una copia del manual de la mascarilla, entregado por el empleador. Ud. debe de ser proveido, sin ningun costo, de esta mascarilla a usarse en el proyecto arriba mencionado.

CURSO DE ENTRENAMIENTO: Ud. debe de ser entrenado en los riesgos inherentes de manejar, inhalar y respirar el polvo de plomo, y en los procedimientos de trabajo apropiado, asi como en las medidas de proteccion personal y del area de trabajo. Los temas a cubrir en este curso deben de incluir lo siguiente:

- Probables rutas de exposicion de plomo
- Riesgos para la salud relacionados con el plomo
- Proteccion respiratoria
- Uso del equipo de proteccion
- Practica de trabajo, incluyendo el entrenamiento para el trabajo
- Procedimentos para desinfeccion personal
- Consideraciones con respecto a salud y seguridad

EXAMEN MEDICO: Ud debe haber recibido un examen medico sin ningun costo, durante los ultimos 12 meses. Este examen debe de incluir: historia de salud, examen fisico, medicion de la presion sanguinea, examen de la funcion pulmonar, y muestra de sangre para el analisis del contenido de plomo.

Al firmar este documento, Ud. esta reconociendo que el Propietario del edificio para el cual Ud. va a trabajar, le a avisado de sus derechos de proteccion y entrenamiento relativo con su empleador, el Constratista.

Firma _____ No. de Seguro Social_____

Nombre_____ Testigo_____

SECTION 01932 RESPIRATORY PROTECTION - LEAD-BASED PAINT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

For the purpose of this project, and unless the Remediation Contractor can show an exposure assessment that can show otherwise, the assumed exposure for this project shall be at least 50 µg/m³ - 500 µg/m³. This work corresponds to an OSHA Class I Task and requires specific actions on the part of the Remediation Contractor. The minimum respiratory protection during remediation and demolition activities will be half face negative pressure respirators equipped with HEPA/organic filters indicated in Section 01932 Respiratory Protection – Lead Based Materials during all remediation activities. The contractor shall provide information to assure that the above respiratory protection is sufficient in accordance with 29 CFR 1926.1101 negative exposure assessment requirements. In addition, the contractor's personnel shall wear eye protection during all encapsulation and demolition activities.

A. Instruct and train each worker involved in lead abatement or lead based paint hazard reduction in proper respiratory use and require that each worker wear a respiratory, properly fitted on the face in the Work Area from the start of any operation which may expose the worker above the permissible exposure limit (PEL) until the Work Area is completely decontaminated. Use respiratory protection as specified for the lead levels encountered in the work place or as required for other toxic or oxygen deficient situations encountered.

1.3 STANDARDS

A. Except to the extent that more stringent requirements are written directly into the Contract Documents, the following regulations, guidelines and standards have the same force and effect (and are made a part of the Contract Documents by reference) as if copied directly into the Contract Documents, or as if published copies were bound herewith. Where there is a conflict in requirements set forth in these regulations and standards, meet the more stringent requirement.

1. OSHA U.S. Department of Labor Occupational Safety and Health Administration, Safety and Health Standards 29 CFR 1910, Section 1000 - Air Contaminants, Section 1926.103, 1910.134 - Respiratory Protection and Section 1926.62 - Lead.

2. **ANSI** American National Standards Institute, American National Standard Practices for Respiratory Protection, ANSI Z88.2-1992.

3. **HUD** U.S. Department of Housing and Urban Development, Lead Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing.

4. **NIOSH** National Institute for Occupational Safety and Health, Guide to Respiratory Protection, 1987, 87-116.

5. **MSHA** Mine Safety and Health Administration

1.4 SUBMITTALS

A. Before Start of Work, submit the following to the Owner's Representative for review. Do not begin work until these submittals are returned with the Owner's Representative's action stamp indicating that the submittal is returned for unrestricted use.

1. **Written Respiratory Protection Program:** Submit written respiratory protection program in accordance with the OSHA Respiratory Protection Standard 29 CFR 1926.103, 29 CFR 1910.134 and OSHA Lead Construction Standard 1926.62.

2. **Product Data:** Submit manufacturer's product information for each component used, including NIOSH and MSHA Certifications for each component in an assembly and/or for entire assembly.

3. **Respiratory Protection Schedule:** Submit level of respiratory protection intended for each operation required by the project. Submit this information on the "Respiratory Protection schedule" on the form included at the end of this Section.

4. **Historic Sampling Data:** Submit air sampling data from previous projects to substantiate selection of respiratory protection proposed. Data submitted shall include at least the following for each procedure required by the work

   a. Date of measurements

   b. Operation monitored

   c. Sampling and analytical methods used and evidence of their accuracy

   d. Number, duration, and results of samples taken

   e. Workers name, social security number and job classification

   f. Type of respirator worn by workers

   g. Type of material

   h. Control Methods

   i. Work Practices

j. Training and experience level of workers and supervisors

5. **Fit Test Documentation:** Submit fit test documentation for all worker and supervisory personnel.

PART 2 - PRODUCTS

2.1 AIR PURIFYING RESPIRATORS

A. **Respirator Bodies:** Provide half face or full face type respirators. Equip full face respirators with a nose cup or other anti-fogging device as would be appropriate for use in air temperatures less than 32 degrees Fahrenheit.

B. **Filter Cartridges:** Provide, at a minimum, HEPA type filters labeled with NIOSH and MSHA Certification for "Radionuclides, Radon Daughters, Dust, Fumes, Mists including Asbestos-Based Dusts and Mists" and color coded in accordance with ANSI Z88.2 (1992). In addition, a chemical cartridge section (organic vapor/acid gas) may be added, if required, for solvents, strippers, etc., in use. In this case, provide cartridges that have each section of the combination canister labeled with the appropriate color code and NIOSH/MSHA Certification.

C. **Non-permitted respirators:** Do not use single use, disposable or quarter face respirators.

PART 3 - EXECUTION

3.1 GENERAL

A. **Respiratory Protection Program:** Comply with ANSI Z88.2 - 1992 "Practices for Respiratory Protection" and OSHA 29 CFR 1910 and 1926.

B. Require that respiratory protection be used at all times that there is any possibility of airborne lead levels exceeding the permissible exposure level required in OSHA 1926.62.

C. Require that a respirator be worn by anyone in a Work Area at all times, regardless of activity, during a period that starts with any operation which could cause disturbance of lead based paint or dust, until the area has met the requirements of Section 01935 Project Decontamination – Lead Based Materials or Section 01926 Project Clearance – Lead Based Materials.

D. Regardless of Airborne Lead Levels or Surface Dust Contamination: Require that the minimum level of respiratory protection used be negative pressure air purifying respirators with high efficiency filter cartridges.

E. Do not allow the use of single use, disposable, or quarter-face respirators for any purpose.

3.2 FIT TESTING

A. **Initial Fitting:** Fit types of respirator to be worn by each individual. Require that an individual use only those respirators for which training and fit testing has been

provided. Require that fit testing be repeated semiannually, and at any time a respirator is replaced.

B. **Upon Each Wearing:** Require that each time an air purifying respirator is put on it be checked for fit with a positive and negative pressure fit check in accordance with 29 CFR 1926.62, Appendix D.

3.3 PERMISSIBLE EXPOSURE LIMIT (PEL)

A. **Permissible Exposure Limit** (PEL-TWA) - 50 micrograms/cubic meter

B. **Action Level** (TWA) - 30 micrograms/cubic meter

3.4 TYPE OF RESPIRATORY PROTECTION REQUIRED

A. Respiratory Protection Factors as indicated in paragraph below are for information purposes only. Respiratory protection shall be as described in 3.1(D) above.

3.5 RESPIRATORY PROTECTION FACTOR:

Table I. - Respiratory Protection for Lead Aerosols

A. Airborne concentration of lead or required respirator {1} condition of use

1.	Not in excess of 500 µg/M^3	1/2 mask air purifying respirator with high efficiency filters.{2}, {3} 1/2 mask supplied air respirator operated in demand (negative pressure) mode.
2.	Not in excess of 1,250 µg/M^3	Loose fitting hood or helmet powered air purifying respirator with high efficiency filters.{3} Hood or helmet supplied air respirator operated in a continuous flow mode - e.g., type CE abrasive blasting respirators operated in a continuous flow mode.
3.	Not in excess of 2,500 µg/M^3	Full face piece air purifying respirator with high efficiency filters.{3} Tight fitting powered air purifying respirator with high efficiency filters.{3} Full face piece supplied air respirator operated in demand mode. 1/2 mask or full face piece supplied air respirator operated in a continuous flow mode. Full face piece self-contained breathing apparatus (SCBA) operated in demand mode.
4.	Not in excess of 50,000 µg/M^3	1/2 mask supplied air respirator operated in pressure demand or other positive pressure mode.

5.	Not in excess of 100,000 µg/M^3	Full face piece supplied air respirator operated in pressure demand or other positive pressure mode - e.g., type CE abrasive blasting respirators operated in a positive pressure mode.
6.	Greater than 100,000 µg/M^3 or unknown concentration	Full face piece SCBA operated in pressure demand or other positive-pressure mode.

{1} Respirators specified for higher concentrations can be used at lower concentrations of lead.

{2} Full face piece is required if the lead aerosols cause eye or skin irritation at the use concentrations.

{3} A high efficiency particulate filter (HEPA) means a filter that is 99.97 percent efficient against particles of 0.3 micron size or larger.

3.6 AIR PURIFYING RESPIRATORS:

A. Powered air purifying: Half or full face mask: Supply a sufficient quantity of high efficiency respirator filters approved for lead so that workers can change filters at any time that flow through the face piece decreases to the level at which the manufacturer recommends filter replacement. Require that regardless of flow, filter cartridges be replaced after 40 hours of use. Require that HEPA elements in filter cartridges be protected from wetting during personal decontamination. Require entire exterior housing of respirator, including blower unit, filter cartridges, hoses, battery pack, face mask, belt, and cords, be washed each time a worker leaves the Work Area. Caution should be used to avoid shorting battery pack during washing. Provide an extra battery pack for each respirator so that one can be charging while one is in use.

END OF SECTION - 01932

SECTION 01934 - PROJECT CLOSEOUT – LEAD BASED MATERIALS

PART 1- GENERAL

1.01 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, and other Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF REQUIREMENTS:

Definitions: Project closeout is the term used to describe certain collective project requirements indicating completion of the work that are to be fulfilled near the end of the contract time in preparation for final acceptance and occupancy of the work by the Owner, as well as final payment to the Contractor and the normal termination of the contract.

Specific requirements for individual units of work are included in the appropriate sections in Division 1.

Time of closeout is directly related to "Substantial Completion", therefore, the time of closeout may be either single time period for the entire work or a series of time periods for individual elements of the work that have been certified as substantially complete at different dates. This time variation, if any, shall be applicable to the other provisions of this section.

1.03 SUBSTANTIAL COMPLETION:

Inspection Procedures: Upon receipt of Contractor's request for inspection, the Owner's Representative will either proceed with inspection or advise Contractor of unfulfilled prerequisites.

Following initial inspection, Owner's Representative will either prepare the certificate of substantial completion, or will advise Contractor of work which must be performed before the certificate will be issued. The Owner's Representative will repeat the inspection when requested and when assured that the work has been substantially completed.

Results of the completed inspection will form the initial "punch-list" for final acceptance.

1.04 PREREQUISITES TO FINAL ACCEPTANCE:

General: Complete the following before requesting the Owner's Representative's final inspection for clearance of final acceptance, and final payment as required by the general conditions. List known exceptions, if any, in request:

Submit the payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

Submit an updated final statement accounting for final additional changes to the contract sum.

Submit a certified copy of the Owner's Representative’s final punch-list of itemized work to be completed or corrected stating that each item has been completed or otherwise resolved for acceptance and has been endorsed and dated by the Owner's Representative and Owner.

Submit evidence of final continuing insurance coverage complying with insurance requirements.

Reinspection Procedure: The Owner's Representative will reinspect the work upon receipt of the Contractor's notice that the work, including punch-list items resulting from earlier inspections, has been completed except for these items whose completion has been delayed because of circumstances that are acceptable to the Owner's Representative.

Upon completion of reinspection, the Owner's Representative will either prepare a certificate of final acceptance or will advise the Contractor of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

If necessary, the reinspection procedure will be repeated.

1.05 RECORD DOCUMENT SUBMITTALS:

General: Specific requirements for record documents are indicated in the individual sections of these specifications. Other requirements are indicated in the general conditions. General submittal requirements are indicated in "submittals" sections.

Do not use record documents for construction purposes. Protect from deterioration and loss in a secure fire-resistive location. Provide access to record documents for the Architect/Engineer's reference during normal working hours.

Note related change-order number where applicable.

Record Specifications: Maintain one complete copy of the project manual, including specifications and addenda, and one copy of other written construction documents such as change orders and similar modifications issued in printed form during construction. Mark these documents to show substantial variations in the actual work performed in comparison with the text of the specifications and modifications as issued. Give particular attention to substitutions, selection of options and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data where applicable.

Upon completion of the work, submit record specifications to the Owner's Representative for the Owner's records.

Record Sample Submittal: Immediately prior to date or dates of substantial completion, the Contractor will meet at the site with the Owner's Representative and the Owner's Personnel, if desired, to determine which, if any, of the submitted samples that have been maintained by the Contractor during progress of the work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's sample storage space.

Miscellaneous Record Submittals: Refer to other sections of these specifications for requirements of miscellaneous record-keeping and submittals in connection with the actual performance of the work. **Evidence of post-project biological medical monitoring of supervisory and worker personnel must be submitted prior to final application for payment.** Immediately prior to the date or dates of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Owner's Representative for the Owner's records.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 FINAL CLEANING:

General: Special cleaning requirements for specific units of work are included in the appropriate sections of Division 1. General cleaning during the regular progress of the work is required by the General Conditions and is included under section "Temporary Facilities".

Removal of Protection: Except as otherwise indicated or requested by the Owner's Representative remove temporary protection devices and facilities which were installed during the course of the work to protect previously completed work during the remainder of the construction period.

Compliance's: Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at the site. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile or other harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

Where extra materials of value remaining after completion of associated work have become the Owner's property, dispose of these to the Owner's best advantage as directed.

END OF SECTION 01934

SECTION 01935 - PROJECT DECONTAMINATION – LEAD BASED MATERIALS

PART 1-GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of Contract, and other Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF REQUIREMENTS

General: This section applies to areas where any Lead Based Materials are to be disturbed. Since the renovation activities may cause dust to be generated, the bulk of the work will involve prevention of contamination of the work area.

1.03 RELATED WORK SPECIFIED ELSEWHERE

Work area clearance: Air testing and other requirements that must be met before release of Contractor are specified in Section 01926 - Project Clearance.

PART 2-PRODUCTS (Not Applicable)

PART 3-EXECUTION

3.01 GENERAL

Work of this section: Includes the decontamination of the work area which has been, or may have been contaminated by the elevated lead (Pb) dust levels generated during renovation/dismantling activities.

Work of this section: Includes the cleaning, and decontamination of all surfaces of the work area and all equipment in the work area.

3.02 CLEANING

Cleaning: Carry out cleaning of all surfaces of the work area including items of remaining sheeting, tools, scaffolding and/or staging by use of damp-cleaning and mopping, and/or a High Efficiency Particulate Absolute (HEPA) filtered vacuum. (Note: A HEPA vacuum will fail if used with wet material). Do not perform dry dusting or dry sweeping. Use each surface of a cleaning cloth one time only and then dispose of as contaminated waste. Continue this cleaning until there is no visible debris from removed materials or residue on plastic sheeting or other surfaces.

3.03 VISUAL INSPECTION

After Final Cleaning, the Owner's Representative, a Texas State licensed Lead (Pb) Inspector or his designated representative, along with the Owner, shall perform a complete visual inspection of the entire work area to look for debris from any sources, residue on surfaces, dust or other matter. If any such debris, residue, dust or other matter is found repeat final cleaning and continue decontamination procedure from that point. When the area is visually clean, complete the certification at the end of this section.

Visual inspection is not complete until confirmed in writing, on the verification, by the Owner's Representative.

The visual inspection shall be conducted in accordance with ASTM E1368 as a minimum.

3.04 COMPLETION OF THE WORK

The work is substantially complete upon meeting the work area clearance criteria and fulfilling the following:

Remove all equipment, materials, and debris from the work site.

Dispose of all generated debris and waste material which includes all soil and poly sheeting used as specified in Section 01938 – Disposal of Waste.

The work is finally complete upon meeting the requirements of this section and Section 01926 – Project Clearance, including submission of:

Certificate of Visual Inspection.

Receipts documenting proper disposal/recycling as required by Section 01938 – Disposal of Waste Materials.

3.05 VERIFICATION OF VISUAL INSPECTION

Following this section is a "Verification of Visual Inspection" form, as well as, a "Verification of Final Visual Inspection" form. This document is to be completed by the Contractor and verified by the Owner's Representative. Submit completed document with application for final payment. Final payment will not be made until this verification is executed.

END OF SECTION 01935

VERIFICATION OF VISUAL INSPECTION

In accordance with Section 01935 "Project Decontamination" the Contractor hereby certifies that he has visually inspected the work area (all surfaces including pipes, beams, ledges, walls, ceiling and floor, decontamination unit, sheet plastic, etc.) and has found no dust, debris or residue.

BY: (Signature) _____ (Date)_____

(Print Name) _____

(Print Title) _____

(Print Project Name) _____

(Print Name of Contractor) _____

OWNER'S REPRESENTATIVE VERIFICATION

The Owner's Representative, a Texas State licensed Lead (Pb) Inspector**,** hereby verifies that he has accompanied the Contractor on his visual inspection and that this inspection has been thorough and to the best of his knowledge and belief, the Contractor's verification above is a true and honest one.

BY: (Signature) _____ (Date)_____

(Print Name) _____

(Print Title) _____

(Print Project Name) _____

(Print Company Affiliation) _____

SECTION 01938 DISPOSAL OF WASTE MATERIALS – LEAD BASED MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

B. Section 01923 Codes, Regulations and Standards – Lead Based Materials describes applicable federal, state and local regulations.

1.2 DESCRIPTION OF THE WORK

A. This section describes the disposal of lead (Pb) Based or lead (Pb) contaminated waste materials. Disposal includes packaging of all waste materials. Disposal of all non-metal debris shall be accomplished by landfilling if determined appropriate by TCLP RCRA-8 sample analysis. All metal debris, if any, shall be transported to a recycling facility by the Remediation Contractor. Approval by Owner is required prior to all disposal activities.

The Owner requires the amount of hazardous waste generated and disposed of during this project to be minimized.

All metal components, railings, handrails, door frames, fasteners, and other metal parts/components generated shall be recycled rather than disposed of by landfilling.

Disposal of all non-metal debris, polyethylene sheeting, packaging, etc. generated shall be accomplished by landfilling. All lead (Pb) contaminated debris generated shall be kept adequately wet and promptly placed into polyethylene lined drums or other Department of Transportation (DOT) approved containers. As appropriate and in accordance with the waste classification, the waste containers shall be labeled and placarded with any appropriate Universal Waste labels. The containers shall be securely stored on site until the Owner approves the waste disposal site then to an approved landfill.

1.3 SUBMITTALS

A. Before Start of Work: Submit the following to the Owner's Representative for review. Do not start work until these submittals are returned with Owner's Representative action stamp indicating that the submittal is returned for unrestricted use.

4. Copy of EPA "uniform hazardous waste manifest" form.

2. Copy of forms required by state or local agencies.

3. Sample of disposal bag and labels to be used.

B. Submit copies of all manifests and disposal site receipts to Owner's Representative.

PART 2 - PRODUCTS

2.1 Disposal: Provide 6-mil thick leak tight polyethylene bags or wrap components in 6-mil polyethylene sheeting and seal with duct tape. Label with text as follows:

A. "Label with specific Hazardous Waste Label"

B. For wrapped materials, provide stick-on labels.

PART 3 - EXECUTION

3.1 GENERAL

A. Contact DOT, EPA, state and local authorities to determine lead (Pb) based material disposal requirements.

B. Testing of waste will be performed to determine disposal requirements. The Owner's Representative shall verify that all waste has been properly segregated, containerized, and classified into the following categories.

B. Place all waste generated during the project in 6-mil disposal bags or wrap in 6-mil polyethylene sheeting, store in the designated storage area in enclosed drums. Separate waste materials into the following categories and label all disposal bags and wrapped packages.

1. Non-Hazardous Solid Waste:

a. After thorough cleaning, plastic sheeting and duct tape used during abatement, PPE, disposable work suits, packaging, etc.

2. Potentially Hazardous Solid Waste: (as determined by testing)

a. Paint chips

b. Rags, sponges, mops, HEPA Vacuum filters and contents, respirator cartridges, protective clothing, shower water filter(s) and other materials used during abatement

c. Painted Wood Components

3. Painted Metal Components to be Recycled: (RCRA Exempt Scrap Metal)

a. Metal piping, hand rails, door frames, railings, other metal components and fasteners, if any.

4. Hazardous Liquid Waste: (as determined by testing)

a. Waste Water
b. Chemical Stripper Waste

D. Properly store and secure waste at all times. Do not leave debris in the work area or in uncovered or unlocked trailers or dumpsters. Do not incinerate debris or use an unauthorized dumpster. Do not introduce lead (Pb)-contaminated water into storm or sanitary sewers.

E. All waste shall be handled and disposed of according to local, city, state, and federal regulations. All waste shall be transported by the Remediation Contractor or by a Hazardous Waste Transporter as appropriate.

F. Do not permit resale or re-use of any building components, piping, railings, door frames, etc. which are removed as part of this contract.

3.2 DISPOSAL OF NON-HAZARDOUS SOLID WASTE (As Categorized by Owner's Representative)

A. Materials are to remain in 6-mil disposal bags or wrapped in polyethylene sheeting. Label all packages. Substrates removed with paint in good condition which is adhered to the substrate may be placed directly in dumpsters then covered.

B. Transport wastes in covered or enclosed trucks, trailers or dumpsters.

3.3 DISPOSAL OF NON-HAZARDOUS LIQUID WASTE (As Categorized by Owner's Representative)

A. Dispose of liquid waste by pouring into sanitary sewage system if permission is received from publicly owned treatment works facility (POTW). Do not dispose of liquid waste by pouring onto ground or into storm drain. If the liquid waste contains phosphates or other chemicals advise treatment facility of quantity of liquid and that it likely will contain phosphates.

B. *Properly filtered water shall be disposed of as non-hazardous liquid waste. All filters shall be disposed of in accordance with all applicable regulations.*

3.4 DISPOSAL OF HAZARDOUS LIQUID OR SOLID WASTES (As Categorized by Owner's Representative)

A. Comply with RCRA, DOT, state and local regulations.

B. Comply with DOT and state regulations for containers. The most stringent regulation shall apply.

C. All waste is to be hauled by a licensed waste hauler with all required licenses form all state and local authorities with jurisdiction.

D. Load all waste material into properly labeled disposal bags, polyethylene sheeting, or leak-tight drums. All materials are to be contained in one of the following:

1. One (1) 6-mil layer of sheet polyethylene, duct tape all seams or
One (1) 6-mil disposal bag; or

2. Two (2) 4-mil disposal bags; or

3. Sealed steel drum with no bag

E. Protect interior of truck, dumpster or dumpster with two (2) layers of 6-mil polyethylene sheeting with all seams sealed with duct tape.

F. Carefully load containerized waste in fully enclosed dumpsters, trucks or other appropriate vehicles for transport. Exercise care before and during transport, to insure that no unauthorized persons have access to the material.

G. Do not store containerized materials outside of the Work Area. Take containers from the Work Area directly to the designated storage area, sealed truck or dumpster.

H. At disposal site, unload containerized waste:

1. At a disposal site, sealed plastic bags may be carefully unloaded from the truck. If bags are broken or damaged, return to work site for rebagging. Clean entire truck and contents using procedures set forth in Section 01935 Project Decontamination – Lead Based Materials.

I. Retain all documents from the disposal site.

J. At completion of hauling and disposal of each load submit copy of Uniform Hazardous Waste Manifest to Owner's Representative.

3.5 BACKCHARGES

A. Where Remediation Contractor fails to fulfill packaging, handling, or disposal requirements as outlined herein, Owner will charge back to Remediation Contractor all costs associated with insuring that hazardous wastes are packaged and segregated in accordance with EPA and DOT regulations.

B. Environmental pollution of Owner's property resulting from Remediation Contractor's hazardous waste management activities shall be promptly remediated under Owner direction, to the Owner's sole satisfaction, and at the Remediation Contractor's sole expense.

C. Remediation Contractor agrees to either reimburse the Owner, or reduce the Contract amount by change order to cover all costs associated with waste repackaging, waste re-segregation, or pollution remediation efforts.

END OF SECTION 01938

CERTIFICATION OF TRANSPORTING RCRA EXEMPT SCRAP METAL MATERIALS TO A RECYCLING FACILITY.

CONTRACTOR CERTIFICATION

In accordance with Section 01938 – Disposal of Waste Materials – Lead-Based Materials, the Contractor hereby certifies that the scrap metal building components have been prepared for transportation to the following recycling facility:

Recycling Facility Name: _____

Address: _____

Phone: _____

Facility Contact:_____

by: (Signature)_____ Date_____

(Print Name)_____

OWNER'S REPRESENTATIVE CERTIFICATION

The Owner's Representative hereby certifies that the Contractor has prepared the scrap metal components for transportation to the above referenced recycling facility. The Owner's Representative has witnessed the loading of the components for transport from the job site by the Contractor and to the best of his knowledge and belief, the Contractor's certification above is a true and honest one.

by: (Signature)_____ Date_____

(Print Name)_____

(Print Title)_____

RECYCLING FACILITY

The Recycling Facility Representative hereby certifies receipt (Attach Scale Receipts) of the following scrap metal from the Project Job Site via the Contractor mentioned above.

by: (Signature)_____ Date_____

(Print Name)_____

(Print Title)_____

PROJECT JOB SITE:

_____

Quantity	RCRA Exempt Scrap Metal Material(s):

SECTION 01947 - REMOVAL – LEAD BASED MATERIALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

B. HUD has issued guidelines titled *Guidelines For the Evaluation and Control of Lead-Based Paint Hazard in Housing* (Chapter 7 – Lead-Based Paint Inspection) pursuant to Title X of the Housing and Community Development Act of 1992. The US Environmental Protection Agency (EPA)/HUD action level for lead-based painted surfaces is 1 mg/cm^2 by XRF sampling or 5,000 parts per million (ppm) or 0.5% dry weight using the atomic absorption analytical method.

C. The Occupational Safety and Health Administration (OSHA) considers paint containing any level of lead above the analytical method detection limit a potential hazard which should be communicated to any employees or contractors who may disturb the materials in the course of their assigned work.

1.02 SUMMARY OF WORK:

A. Work under this section includes the furnishing of all labor, materials, and equipment required to conduct component removal and/or manual/chemical paint removal on select exterior components to remain, exterior door frames, exterior railings and handrails, stairwell handrails, porch railings, and all other exterior components which are coated with lead-based paint. The majority of the work will involve chemical removal of LBP coatings (down to clean metal) with some dismantling and removal of metal components. The means and methods included should be appropriate to facilitate operations by others on the components which are to remain in service.

The Owner has contracted with Terracon in an effort to determine whether the coatings which will be disturbed during the project contain detectable levels of Lead.

B. Lead-Based Paint (potential OSHA Hazard) has been determined to be present in the following locations:

- Interior ceramic wall/floor tile utilized in the 1st Floor Office Areas, Laundry Rooms, Elevator Landings. These materials shall be removed as part of the asbestos abatement activities and are not discussed further in this document.

- The black coatings applied to exterior railings, porch support posts, and stairwell handrails. It is estimated approximately 8,000 square feet of these materials are present and will be removed from or with the components comprising the stairwell handrails; porch support poles; and railings on the grounds in stairwells, on porches, and on the loading dock of the Basement through 9th Floor of the building.

- The white paint applied to the exterior door frames of all exterior openings throughout the building. It is estimated there are approximately 250 exterior door openings with painted frames from which the paint/coating materials will be removed from or with the door frame components on the Basement through 9th Floor of the building.

1.03 SUBMITTALS:

A. **Before Start of Work:** Submit the following to the Owner's Representative for review. Do not start work until these submittals are returned with Owner's Representative action stamp indicating that the submittal is returned for unrestricted use.

OSHA Safety Data Sheet (SDS) for solvents, strippers, encapsulants, cleaning solutions, and other chemicals utilized or stored at the jobsite.

Description of removal method(s) and list of removal equipment with manufacturer's instructions.

B. **Product Data:** Submit product data, use instructions, and recommendations from manufacturer's intended for use. Include data substantiating that material complies with requirements of this section. Submit manufacturer's warranties on the durability of the product. Provide material safety data sheets.

1.04 DELIVERY AND STORAGE

A. Deliver materials to the job site in original, new and unopened packages and containers bearing manufacturer's name and label and following information:

Name and Title of Material
Manufacturer's Name
Manufacturer's Stock Number and Date of Manufacture
Applications Instructions

1.05 JOB CONDITIONS

A. Conduct removal operations only when environmental conditions in the work area are such that any lead dust produced can be maintained within the work area. Do not conduct exterior Lead Removal operations during periods of high wind or steady rain which might allow lead dust/debris to migrate from the work areas.

1.06 QUALITY ASSURANCE

A. **Testing**: Test methods, visual inspection protocols and analytical methods to be employed by the Owner's Representative are included in Section 01925 of this Specification.

PART 2 – PRODUCTS

2.01 GENERAL

A. **Removal Methods and Equipment**: Unless indicated otherwise in this Specification, removal method(s) and equipment specific removal techniques employed for various

components (pipes, valves, equipment, etc.) shall be determined by the CONTRACTOR, except for the following prohibited methods:

Dry blasting or dry scraping equipment, without a HEPA vacuum attachment.
Compressed air or other non-airless type equipment.
Chemical strippers that contain methylene chloride.
Hydro-blasting.
Wet Abrasive Blasting
Chemicals with a flash point below 140EF
Heat gun or open flame device.

B. Disposal Bags: Provide as a minimum, individual, 6 mil thick, leak-tight, manufactured polyethylene bags.

C. Polyethylene Wrap: Provide minimum 6 mil polyethylene sheeting as a wrapping for large sections of rigid waste material.

D. Disposal Drums: Provide U.S. Department of Transportation (DOT) approved disposal drums, as applicable for the type of waste generated.

E. Disposal Labels: Provide labels that meet regulatory requirements and include the following information, lettered with indelible ink:

OWNER's name; CONTRACTOR's name; Project site address; Description of contents; Date that waste was first put into container; and the following warning:

DANGER
CONTAINS LEAD
AVOID CREATING DUST

F. Liquid Spreadable Encapsulants

Provide demolition encapsulation system consisting of FESI-BOND Paint and CCA Wood Surfaces Stabilizer which is a durable coating that is compatible with the lead-based painted surface.

Available Manufacturer's include but are not limited to:
Forrester Environmental Services, Inc.
78 Racy Way
Meredith, NH 03253
www.fesi.net/bond/paint.htm

PART 3 - EXECUTION

3.01 BEFORE STARTING WORK OF THIS SECTION, COMPLETE THE FOLLOWING:

A. Section 01910 - Worker Protection – Asbestos/Lead Based Materials

B. Section 01911 - Respiratory Protection - Asbestos/Lead Based Materials

C. Section 01928 - Exterior Regulated Areas – Asbestos/Lead Based Materials

3.02 REMOVAL METHODS

Use abatement procedures and equipment that are the most appropriate and will minimize occupational and environmental exposure to lead during and after removal operations.

Use procedures and work methods that will minimize Lead-contaminated waste.

Lead-related activities shall be performed in accordance with the accepted CONTRACTOR'S Remediation Plan as modified and approved following the Pilot Abatement Project.

A. Chemical Stripper Removal: The paint remover shall be applied in accordance with manufacturer's recommendations, the time the remover must stay on the surface will depend on the number of layers of paint, the type of paint, the temperature and humidity. The remover shall not be allowed to dry out.

Remove the Lead-Based or Lead-Containing paint down to the bare substrate shall be employed in the locations denoted in the attached drawings. Neutralization shall be performed in accordance with manufacturer's recommendations. A flash-point of greater than 140 Degrees Fahrenheit is required for any chemical stripper. Follow protective clothing requirements of manufacturer (gloves, eyewear, etc.).

B. Component Removal: Manual dismantling of select sections of exterior railings, stairwell handrails, and exterior door frames which are not ADA compliant and have Lead-Based Paint (LBP) applied shall be employed in the locations denoted in the attached drawings. All work shall be conducted by appropriately trained individuals and employ appropriate levels of PPE. At a minimum, work shall be conducted within a work area which consists of controlled access with proper hazard signage, and 6-mil polyethylene sheeting placed below the work and in any areas where workers conducting component removal will walk, store tools/equipment, and collect removed components prior to transport to the waste storage dumpster/trailer.

Removal of fasteners shall be accomplished by with the appropriate tools, breaker bars, and/or power/pneumatic tools as necessary. Use of gas torches, saws and/or chisels are not considered acceptable methods for fastener removal without chemical removal of any LCP present where cuts are to be made. These methods are discussed in Section 01948 of this Specification.

Mist work area continuously with water whenever necessary to reduce airborne dust levels. Accumulations of free water, paint chips and/or dust on the polyethylene drop sheets shall be minimized by periodically collecting the debris with a HEPA vacuum or wet rags. The drop sheets shall be cleaned or replaced prior to any crew breaks and at the end of each work shift.

Components and/or substrates that are removed shall be placed on polyethylene sheeting and wrapped in two layers of 6-mil polyethylene sheeting or in lined dumpsters/trailer and maintained on-site until transferred to an off-site recycling or disposal facility. Care shall be taken to avoid damage to adjacent areas during the removal of the components.

C. Preparation for Repainting: Peeling and deteriorated exterior surfaces may be wet scraped or prepared using HEPA equipped tools prior to application but must result in a bare metal surface suitable for application of new paint/coatings.

Debris shall be packaged and stored on-site for testing and disposal. Surfaces shall be prepared according to the manufacturer's specifications.

D. **HEPA Vacuum Shrouded Blasting Removal:** Blasting shall be done on flat and shaped surfaces that are compatible with the available blast heads as provided by the equipment manufacturer. Blast heads shall come into contact with the surfaces being blasted as to provide maximum containment of dust and debris created by the blasting operation.

   All Lead-Containing or Lead-Based paint shall be removed down to the bare substrate. In some cases pigment may remain embedded in porous materials, care shall be taken not to damage the substrate with the blasting operation. If pigments cannot be removed without damaging the substrates, the CONTRACTOR shall immediately notify the LEAD PROJECT DESIGNER for further instructions.

   Mist work area continuously with water whenever necessary to reduce airborne dust levels.

E. **HEPA Roto Peen Removal:** Roto Peen removal shall be done on flat and shaped surfaces that are compatible with the available heads as provided by the equipment manufacturer. Equipment heads shall come into contact with the surfaces being abated as to provide maximum containment of dust and debris created by the removal operation.

   All Lead-Containing or Lead-Based paint shall be removed down to the bare substrate. In some cases pigment may remain embedded in porous materials, care shall be taken not to damage the substrate with the blasting operation. If pigments cannot be removed without damaging the substrates, the CONTRACTOR shall immediately notify the LEAD PROJECT DESIGNER for further instructions.

   Mist work area continuously with water whenever necessary to reduce airborne dust levels.

F. **HEPA Needle Gun Removal:** Needle Gun removal shall be done on appropriate surfaces that are compatible with the available shrouds provided by the equipment manufacturer. Shrouds shall come into contact with the surfaces being abated as to provide maximum containment of dust and debris created by the metal needle operation.

   All Lead-Containing or Lead-Based paint shall be removed down to the bare substrate. In some cases that pigment may remain embedded in porous materials, care shall be taken not to damage the substrate with the blasting operation. If pigments cannot be removed without damaging the substrates, the CONTRACTOR shall immediately notify the LEAD PROJECT DESIGNER for further instructions.

   Mist work area continuously with water whenever necessary to reduce airborne dust levels.

G. **HEPA Recovery Tool Removal:** HEPA equipped sanders, saws, drills and other tools may be used with specially designed shrouds or containment systems kept in direct contact with the surfaces being worked on and having adequate air

flow to permit the system to operate properly.

Mist work area continuously with water whenever necessary to reduce airborne dust levels.

H. Encapsulation Application: Apply encapsulation system in accordance with manufacturer's recommendations. Examine existing conditions to determine surface preparation required and compatibility with substrate.

Encapsulation system shall be applied to the substrate in a continuous system to seal the entire surface being coated. Number of coats and coverage rates shall be in accordance with manufacturer's recommendations.

Test the adhesion of the system by using minimum 6" X 6" (152 x 152 mm) area in accordance with HUD Guidelines. The area must pass a visual inspection before applying and performing the patch test to ensure a clean surface and before completing the encapsulation process.

At completion of encapsulation, comply with requirements of Section 01914 - Project Decontamination – Asbestos/Lead Based Materials.

At completion of work, submit manufacturer's warranty executed by both manufacturer and Contractor.

3.03 LEAD-BASED WASTE MATERIALS

The metal components to be removed and recycled as work in this project consist of metal exterior doors and door frames which are not ADA compliant, stairwell handrails, and exterior porch/loading dock and grounds railings. The metal components will be recycled as scrap metal.

All polyethylene prep/dust control materials, PPE, chemical striper emulsion and/or loose paint chips shall be disposed of as TCLP Lead sampling indicates is appropriate. In dismantling the components, however, some paint chips/debris, polyethylene sheeting, worker PPE items, and other waste shall be generated. It is the CONTRACTOR'S responsibility to reduce the waste stream as much as practical and to containerize, have transported and dispose of any waste which cannot be included in the recycling stream.

A. General: Waste materials generated during lead-related work, including but not limited to bagged or wrapped waste, waste water, contaminated clothing, polyethylene sheeting, filters, cleaning fluids and materials, etc. shall be bagged, wrapped in polyethylene or placed in disposal drums. CONTRACTOR will use secure DOT-approved containers for waste storage. The CONTRACTOR will be responsible for ensuring proper segregation of waste products.

B. Bagging: Evacuate air from disposal bags with a HEPA filtered vacuum cleaner before sealing. Twist neck of bag, bend over and seal with minimum three wraps of duct tape. Clean outside of first bag and move to wash room of material decontamination unit. In wash room, place second bag around first. Evacuate air, twist neck of bag, bend over and seal with minimum of three wraps of duct tape. Clean outside of second bag and move to holding room of material decontamination unit. Attach label to each disposal bag in accordance with regulatory requirements.

C. Wrapping: If authorized by the LEAD PROJECT DESIGNER / LEAD INSPECTOR rigid waste material that will not easily fit into disposal bags (panels, boards, pipe, etc.), may be double wrapped as follows:

Tape sharp edges that may perforate wrapping. Wrap manageable quantities of waste material in one layer of 6 mil polyethylene and seal with duct tape. Clean outside of first layer and move bundle to wash room of material decontamination unit. In wash room, wrap second 6 mil layer around first and seal with duct tape. Clean outside of second layer and move bundle to holding room of material decontamination unit. Attach label to each bundle in accordance with regulatory requirements.

D. Disposal Drums: CONTRACTOR will provide waste storage drums which meet United Nations (UN) and the U.S. Department of Transportation standards. Place only one type of waste material in each drum and seal. Clean and label outside of drum, in accordance with 40 CFR Part 262 and 29 CFR Parts 170-178, before transferring to OWNER. Current regulations require United Nations numerical designation be utilized on all labels.

3.04 DISPOSAL

Disposal of Lead-Based Paint Waste is more fully discussed in Section 01938 of this Specification.

A. General: The OWNER will be responsible for the TCLP lead testing to profile the waste as segregated by the Contractor. The Contractor shall be responsible for disposal of the lead-related waste, any hazardous components and general construction debris.

Do not store uncovered, bagged, wrapped or drummed waste material outside the Work Area in an open, exposed area.

Take labeled, contained waste from the Work Area directly to the storage area designated by the OWNER.

The CONTRACTOR shall be responsible for clearly marking the provided drums to identify the waste contained within.

END OF SECTION 01947

SECTION 01948 - CHEMICAL STRIPPING OF LEAD BASED MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY OF WORK: Work of this section includes removal and disposal of lead-based paint.

A. The majority of the exterior railings and door frames, and the interior stairwell handrails have Lead-Based Paint coatings applied to metal substrates and the goal of the project is to remove the paint in its entirety on components to remain and to dismantle and remove for recycling select railing, door and door frame components in the locations denoted in the attached drawings. There are metal components present which are to be removed/recycled and will require reciprocal saw cutting or possibly torch cutting which will require chemical cleaning of the areas where cuts are to be made.

1.3 GENERAL: prohibited lead hazard removal methods.

A. Open flame burning;

B. Chemical stripping with methylene chloride based paint strippers;

C. Uncontained abrasive blasting;

D. Uncontained power washing;

E. Dry sanding or scraping;

F. Power sanding without HEPA attachment;

G. Sanding of wood after chemical stripping.

1.4 SUBMITTALS: Before start of work: Submit the following to the Owner's Representative for review. Do not start work until these submittals are returned with Owner's Representative action stamp indicating that the submittal is returned for unrestricted use.

A. Chemical Stripping Removers And Neutralizers: Submit product data, use instructions and recommendations from manufacturer for use intended. Include data substantiating that material complies with requirements.

B. Safety Data Sheet: Submit safety data sheet, or equivalent, in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200) for each chemical stripper and neutralizer, include a separate attachment for each sheet indicating the specific worker protective equipment proposed for use with the material indicated.

PART 2 - PRODUCTS

A. **Chemical Stripping Removers:** Shall contain **no methylene chloride** products. Chemical removers shall be compatible with, and not harmful to the substrate that they are applied to. The Remediation Contractor shall comply with the manufacturer's recommendations for use of the product supplied.

B. **Chemical Stripping Agent Neutralizer:** Provide chemical agent neutralizer in accordance with manufacturer's recommendations. Neutralizers shall be compatible with and not harmful to the substrate. Neutralizers shall also be compatible with the stripping agent used.

C. **Wet Detergent Wash:** Provide detergent or cleaning agent formulated to be effective in removing lead dust. Follow dilution ratio recommended by the manufacturer's instructions.

PART 3 - EXECUTION

3.1 Before starting work of this section, complete the following:

A. **Section 01927** - Remediation Facilities and Temporary Controls

B. **Section 01928** - Exterior Regulated Areas

C. **Section 01929** - Work Area Containment

D. **Section 01931** - Worker Protection

E. **Section 01932** - Respiratory Protection

3.2 CHEMICAL LEAD-BASED PAINT REMOVAL ON-SITE:

A. **Chemical Stripping Agents** and neutralizers shall be applied in accordance with the recommendations of the manufacturer.

B. **Caustic Stripper Neutralization:** Caustic strippers shall be neutralized in accordance with manufacturer's recommendations. Provide workers with proper protective equipment, including but not limited to; protective clothing (non-paper), chemically resistant gloves, eye protection and respiratory protection with filters selected for the hazards to be encountered.

C. **Remove Stripper Sludge:** Place lead containing stripper sludge in corrosion-proof containers and place in a secure waste storage area. The surface from which lead-based paint has been removed shall be thoroughly scrubbed, while still damp from the stripper, in accordance with the manufacturer's recommendation. Monitor pH of the neutralizing solution to ensure it has not become neutralized in the process. If the pH exceeds 6.5, or the solution becomes overly soiled, change solution. Solution may be classified as hazardous waste. Place in 55 gallon drums and test in accordance with Section 01938- Disposal of Waste Materials – Lead Based Materials. The surface shall be tested with litmus paper following this process. If the litmus paper turns pink, the acid has effectively neutralized the alkali. If litmus turns blue continue scrubbing until satisfactory results are achieved.

D. **Final Cleaning Of Surfaces:** Prepare wet detergent wash. Workers must wear eye shields and chemically resistant gloves when working with this solution. Thoroughly scrub stripped surface to remove as much remaining lead residue as possible. The wash solution may also be hazardous waste, treat in accordance with Section 01938- Disposal of Waste Materials – Lead Based Materials. Following wet detergent wash, perform a final wash with clear water to remove any traces of detergent. Sponges used in the clean-up process may not be reused and must be placed in double 4 mil or single 6 mil plastic bags, which will be sealed, labeled, and placed in the secure waste storage area. Surfaces must be allowed to dry thoroughly before repainting. A grayish film indicates that significant lead residues remain and the cleaning process must be repeated. If a white powder appears, the surface is Alkaline and requires further neutralization.

E. **Complete Project Decontamination** Requirements of Section 01935 - Project Decontamination – Lead Based Materials.

3.3 JOB CONDITIONS

A. Apply Encapsulating Materials only when environmental conditions in the work area are as required by the manufacturer's instructions.

END OF SECTION 01948

SECTION 019113 GENERAL COMMISSIONING REQUIREMENTS (REVISED)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Group 14 Report, VICTORIA PLAZA MODERNIZATION ASSESSMENT (See below)
B. Attachment 1 - COMMISSIONING PLAN (See Section 019113 - Attachment 1)

1.2 SUMMARY

A. Why Owner Commissions

Commissioning is part of the Quality Assurance process that ensures a building or project's complex range of systems is designed, installed, tested, and performs to the intent and operational needs.

B. What Owner Expects From Commissioning.

Depending on size and complexity of the project, expectations for Commissioning range from completing the manufacturer's installation and startup checklists followed by a functional performance test to a fully integrated commission process that begins early in the design phase and ends when the warranty period is over.

C. The Roles and Responsibilities of the Owner, Commissioning Agent, Design Team, and Contractor.

1.3 RELATED WORK

013300 Submittals	Covers content and format of all submittals.
017700 Closeout	Defines Substantial Completion and Functional Completion 017823
O&M Manuals	Defines O&M documentation

1.4 DEFINITIONS AND DELIVERABLES
See Attachment 1, Commissioning Plan

PART 2 – PRODUCTS (N/A)

PART 3 – EXECUTION (N/A)

VICTORIA PLAZA MODERNIZATION ASSESSMENT
Group 14 Report
02/09/2015
Chapter 5

1. INSTALL SETPOINT ENABLE AND OA RESET CONTROLS ON SPACE HEATING PLAN

2. DEMOLISH CHILLED WATER PLANT
Demolish 3 Air Handling Units and replace new modular air-handling with VFD's on supply Fans. Re-establish OA with code level ventilation to the first floor. Provide DX Cooling via remote condensors with minimum 12 SEER.

3. PLACE EXHAUST FANS ON THERMOSTATIC CONTROLS

4. COMPACT FLUORESCENT LIGHTING FOR HARD WIRED LAMPS

5. COMMON AREA LIGHTING RETROFIT

6. EXTERIOR LIGHTING RETROFIT

7. ALL WINDOW REPLACED WITH LOW-E, DOUBLE PANED

8. KITCHEN AIREATOR REPLACEMENTS
Bathroom Aerator replacement, faucet replacement, Shower head replacements, toilet flush valve

SECTION 019113 ATTACHMENT 1 - COMMISSIONING PLAN

PROJECT: Victoria Plaza Modernization
411 Barrera, San Antonio, Texas

Building Type: Type II-B
Square Footage: 117,360 square feet
Building Description: 9-story Residential Tower
Owner Agency: San Antonio Housing Authority
Scheduled Completion Date: TBD

OVERVIEW

The Commissioning Process is the means to identify, verify, and document that the facility systems installed operate in accordance with their design intent. This process also assures that the operations staff fully understands the systems operational procedures and is prepared to continue operating the system per the design intent.

Several definitions must be identified to clarify the Commissioning Process:

Commissioning Plan will identify:

- The Systems to be Commissioned
- Commissioning activities and documentation
- Scheduling parameters
- Acceptance criteria
- Roles of the Commissioning team

Commissioning Report is the instrument to document the Commissioning Plan throughout the Project. The report is updated at each level of project completion by the Commissioning Agent to document the progress throughout the Project.

Owner's Project Requirements are the detailed Goals for the Project that will indicate the success of the Project when successfully completed.

Basis-of-Design is the detailed description of the Design Team's concepts, assumptions, calculations, decisions, product selections and operating conditions to meet the Owner's project requirements and to satisfy applicable codes, standards, and guidelines.

Several members of the construction team have responsibilities in the commissioning process:

1. The Owner
    - Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to the following:
        - Coordinate Meetings
        - Making Personnel available for training in operation and maintenance of systems, subsystems, and equipment
        - Testing meetings
        - Inspection and review of mock-ups and installations
        - Demonstration of operations of systems, sub-systems, and equipment

2. Commissioning Agent will:
    - Provide PRELIMINARY COMMISSIONING REPORT to City of San Antonio
    - Coordinate Commissioning Meetings
    - Perform all Commissioning Planning
    - Perform all Commissioning Scheduling
    - Record all Commissioning Documentation
    - Coordination and Completion of Commissioning related corrective activities
    - Provide a contact list of all parties participating in the Commissioning Process indicating Phone Numbers, Email Addresses and titles (See Page 6).
        - This Contact list is to be updated at the start of each phase of Project Completion.
3. Contractor:
    - Evaluate performance deficiencies identified in test reports and recommend corrective action
    - Cooperate with the Commissioning Agent for resolution of issues recorded in the issues and benefits log
    - Attend commissioning team meetings held on an as needed basis
    - Integrate and coordinate commissioning process activities with construction schedule
    - Review and accept pre-functional checklists provided by the Commissioning Agent.
    - Complete paper or electronic pre-functional checklists as work is completed and provide to the Commissioning Agent prior to Functional Performance Testing.
    - Review and accept commissioning functional performance test procedures provided by the Commissioning Agent.
    - Complete commissioning functional performance test procedures
    - Provide to the Commissioning Agent copies of all submittals, shop drawings, manufacturers literature, maintenance information or other information as may be needed for systems to be commissioned.
    - Provide the Commissioning Agent with any requested documentation prior to, or in addition to the O&M Manual submittals requirements outlined in other specifications sections.
    - Assist in clarifying the operation and control of commissioned equipment in areas where the specification, control drawings, or equipment documentation is not sufficient for writing functional performance testing procedures.
    - Develop a full start-up and initial check-out plan using the manufacturer’s start-up procedures and related specification sections.
    - Provide updates to all project documentation to reflect all supplemental instructions. These must be posted to the master set of contract documents for

review and reference by all contractors, sub contractors, and system component suppliers, and for the Commissioning Agent's use.

- Provide qualified and trained personnel to participate in the commissioning process.
- Review the Commissioning Plan, Commissioning Issues, benefits log, and project correspondence. In a timely manner, respond to the Commissioning Agent and address the identified issues.
- Issue a written Notice of Readiness for each system to the Commissioning Agent upon completion of all systems work, start-up and Pre-functional Test Checklists requirements by trade contractors.
- Test all equipment and systems using the Functional Performance Test procedures PRIOR TO DEMONSTRATING PROPER PERFORMANCE TO THE COMMISSIONING AGENT
  - Contractor is responsible for completing Functional Performance Testing.
  - Commissioning Agent is responsible for verifying Functional Performance Testing.
- Operate equipment and systems as required for Functional Performance verification by Commissioning Agent. This includes manipulating the temperature controls to execute the Functional Performance Testing.
- Participate in the fine-tuning or troubleshooting of system performance, if either of these measures becomes necessary.
- Readiness
  - It is the obligation of all parties to be prepared for commissioning activities. Prior to commencement of Functional Performance Testing, the Contractor shall ensure completion of the following items as they relate to the equipment and/or system being commissioned:
    - Permanent utility and central plant connection to the equipment/system
    - Completed equipment/system start-up documentation has been delivered to the Commissioning Agent.
    - Written notification from the responsible contractor to the Commissioning Agent stating completion of the equipment/system start-up documentation.
  - It is the sole discretion of the Commissioning Agent to begin Functional Performance Testing without one or more of the aforementioned items completed. If the aforementioned items will not be completed prior to mutually agreed upon start date for Functional Performance Testing the Contractor may provide 48 hours notice.

4. The Design Team; the Architect, Electrical Engineer, and Mechanical Engineer are responsible for the implementation of the Energy Conservation Measures as indicated in the **Group 14 Report,** a report prepared for the San Antonio Housing Authority on February 9, 2015 which identifies Energy and Water Conservation Measures.

REPORT

The Commissioning Report is the compilation of the information collected throughout the Project on the items to be commissioned. This information will be kept in two (2) three-ring binders, one for the Commissioning Agent, and one for the Owner. The binders will be updated at each phase of completion by the Commissioning Agent.

The following systems have been identified to be commissioned on this project:

- Central Plant Retrofits
- Cooling Plant Demolition
- Replacement Windows (Reference Specification Section 085313)

Quality Based Sampling is to be performed for the following:

- Thermostats and Heating Controls:
  - Place exhaust fans on thermostatic control
- In-Unit Lighting Retrofit:
  - CFL's provided for hard wired lamps
- Dial Timers:
  - Installed on Bath Heat Lamps/coils
- Common Area Lighting Retrofit:
  - Replace T-12 magnetic ballast fixtures with T-8 electronic fixtures
  - Replace incandescent lamps with screw-in CFL
  - Replace Incandescent exit signs with LED exit signs
- Energy Star Refrigerators:
- Low Flow Aerator Installations:
  - Kitchen: 1.5 gpm
  - Bath Lavatory: 1.0 gpm
- Low Flow Showerhead Installations:
  - Bath Shower: 1.5 gpm
- Low Flow Toilet Flush Valve Installations:
  - Toilet Flush Valve: 1.6 gpm

SYSTEM COMMISSIONING ACTIVITIES:

Design Development

During the Design Development phase, the Commissioning Agent will assemble documentation for each of the commissioned components and the quality based sampling components. This information includes the following:

- Installation Sequences
- Manufacturers Factory Testing Certificates
- Commissioning Status Check Sheets
- Pre installation Check Sheets
- Pre Start Checklists
- Manufacturer’s Check, Test and Start Forms/Field Reports

The Quality based Sampling components require design parameters that are established by the **Group 14 Report,** a report prepared for the San Antonio Housing Authority on February 9, 2015. At the conclusion of the Design Development Phase, a Commissioning

Meeting will be held to review the information collected with the Owner and update the Commissioning Plan.

Construction Documentation

The Design Team is to provide documentation to assist with the Commissioning Process. As the components are selected and sized, manufacturer's information will be collected and compiled in the Commissioning Report. These items are assembled into the Commissioning Report for use during the Construction Phase:

- Functional Test Forms
- Performance Test Data/Report
- Commissioning Order and Timing integrated into the project schedule
- Duct Leakage Testing

Specifications will be amended to include the following General Contractor requirements:

- Training Plan/ Attendance Sheets/Reports
- Pipe Flushing and Cleaning Plan
- Water/Water Treatment Reports
- AHJ Approved Documentation
- Lube/Filter/Maintenance Reports
- Various Projects Specific Certifications/Field Reports

Documentation of all Commissioning Activities is to be kept in the Commissioning Report. This Documentation can include:

- Commissioning Meeting Notes
- Commissioning Reports
- Transmittal Records

At the conclusion of the Construction Documentation Phase, a Commissioning Meeting will be held to review the information collected with the Owner, verify the compliance with the Basis-of-Design, and update the Commissioning Report.

Construction Period

- The General Contractor will submit specific information regarding the components of the Project. These submittals are reviewed by the Design Team for completeness and compliance with the Basis-of-Design of the Contract Documents.
- The Architect will forward a copy to the Commissioning Agent indicating compliance with the Basic Design.
- The Commissioning Agent will contact the manufacturer and collect the data which will be used to verify the components have been installed correctly and are functioning as designed.
- The General Contractor will provide a schedule of Commissioning Component installations and forward to the Commissioning Agent for review.
- The Commissioning Agent will coordinate the times of installation with the General Contractor and witness the installation of the components, verify the completion of the Pre-start-up checklist, and verify the completion of the start-up checklist.

- Once the component is started, the General Contractor will measure the Basic Design quantities.

Commissioning Team Information

FUNCTION	NAME	ADDRESS	PHONE	EMAIL
OWNER				
OWNER'S PROJECT MANAGER				
COMMISSIONING AGENT				
ARCHITECT				
MECHANICAL ENGINEER				
ELECTRICAL ENGINEER				
GENERAL CONTRACTOR				
MECHANICAL CONTRACTOR				
ELECTRICAL CONTRACTOR				
CONTROLS CONTRACTOR				
MAINTENANCE MANAGER				

Notes by: James Ed Carleton AIA

SECTION 024119 - SELECTIVE DEMOLITION (REVISED)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

1.2 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Contractor shall remove and salvage original copper gutter material for auction by Owner.

1.3 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Engineering Survey: Submit engineering survey of condition of building.

B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property**,** for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

C. Schedule of selective demolition activities with starting and ending dates for each activity.

D. Predemolition photographs or video.

E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician.

1.5 CLOSEOUT SUBMITTALS

A. Inventory of items that have been removed and reinstalled.

1.6 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.7 FIELD CONDITIONS

A. The building has been fully vacated and will remain unoccupied until Certificate of Occupancy has been delivered.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: Refer to Document 003126 - EXISTING HAZARDOUS MATERIAL INFORMATION.

E. Contractor's storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

G. Arrange selective demolition schedule so as not to interfere with Owner's operations.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

C. Inventory and record the condition of items to be removed and reused.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
4. Maintain fire watch during and for at least six (6) hours after flame-cutting operations.
5. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
6. Dispose of demolished items and materials promptly

B. Existing Unit Appliances: Contractor shall be responsible for temporary displacement of all appliances and shall reset appliances back in place and functioning at apartment unit completion.

C. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

D. Remove and Salvage for Owner: Contractor shall remove original copper gutter material and store on site for Owner to auction off.

E. Removed and Reinstalled Items: Contractor shall remove unique architectural finishes, such as ceramic and glass tile or as indicated on drawings for reuse.

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

F. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 CLEANING

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 030130 - MAINTENANCE OF CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Removal of deteriorated concrete at sidewalks, curbs, walls, pavement, ramps, footings and approach entrances and subsequent replacement and patching.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type of portland cement and aggregate supplied for mixing or adding to products at Project site.

B. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Concrete Repair and Maintenance System: Of importance is the use of consistent, systematic approach to concrete repair by the following basic seven steps.
1. Determine the cause(s) of damage
2. Evaluate the extent of damage
3. Evaluate the need to repair
4. Select the repair method and material
5. Prepare the existing concrete for repair
6. Apply the repair method
7. Cure the repair properly

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's written instructions for minimum and maximum temperature requirements and other conditions for storage.

B. Store cementitious materials off the ground, under cover, and in a dry location.

C. Store aggregates covered and in a dry location; maintain grading and other required characteristics and prevent contamination.

1.6 FIELD CONDITIONS

A. Cold-Weather Requirements for Cementitious Materials: Do not apply unless concrete-surface and air temperatures are above 40 deg F and will remain so for at least 48 hours after completion of Work.

B. Cold-Weather Requirements for Cementitious Materials: Comply with the following procedures:

1. When air temperature is below 40 deg F, heat patching-material ingredients and existing concrete to produce temperatures between 40 and 90 deg F .
2. When mean daily air temperature is between 25 and 40 deg F, cover completed Work with weather-resistant insulating blankets for 48 hours after repair or provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 48 hours after repair.
3. When mean daily air temperature is below 25 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 48 hours after repair.

C. Hot-Weather Requirements for Cementitious Materials: Protect repair work when temperature and humidity conditions produce excessive evaporation of water from patching materials. Provide artificial shade and wind breaks, and use cooled materials as required. Do not apply to substrates with temperatures of 90 deg F and above.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: For repair products, obtain each color, grade, finish, type, and variety of product from single source and from single manufacturer with resources to provide products of consistent quality in appearance and physical properties.

2.2 PATCHING MORTAR

A. Patching Mortar Requirements:

1. Only use patching mortars that are recommended by manufacturer for each applicable horizontal, vertical, or overhead use orientation.
2. Color and Aggregate Texture: Provide patching mortar and aggregates of colors and sizes necessary to produce patching mortar that matches existing, adjacent, exposed concrete. Blend several aggregates if necessary to achieve suitable matches.
3. Coarse Aggregate for Patching Mortar: ASTM C 33/C 33M, washed aggregate, Size No. 8, Class 5S. Add to patching-mortar mix only as permitted by patching-mortar manufacturer.

B. Job-Mixed Patching Mortar: 1 part portland cement and 2-1/2 parts fine aggregate complying with ASTM C 144, except 100 percent passing a No. 16 (1.18-mm) sieve.

C. Cementitious Patching Mortar: Packaged, dry mix for repair of concrete.

1. BASE Corp., MAPEI Corp., Sika Corp., Sto. Corp., WR Meadows, Inc.
2. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109/C 109M.

D. Rapid-Strengthening, Cementitious Patching Mortar: Packaged, dry mix, ASTM C 928/C 928M for repair of concrete.
1. BASF Corp., MAPEI Corp., Sika Corp., Sto Corp., WR Meadows, Inc.
2. Compressive Strength: Not less than 4000 psi within three hours when tested according to ASTM C 109/C 109M.

2.3 PREPLACED CONCRETE MATERIALS

A. Preplaced Aggregate: Washed aggregate, ASTM C 33/C 33M, Class 5S, with 95 to 100 percent passing a 1-1/2-inch sieve, 40 to 80 percent passing a 1-inch sieve, 20 to 45 percent passing a 3/4-inch sieve, zero to 10 percent passing a 1/2-inch sieve, and zero to 2 percent passing a 3/8-inch sieve.

B. Fine Aggregate for Grout: Fine aggregate according to ASTM C 33/C 33M, but with 100 percent passing a No. 8 sieve, 95 to 100 percent passing a No. 16 sieve, 55 to 80 percent passing a No. 30 sieve, 30 to 55 percent passing a No. 50 sieve, 10 to 30 percent passing a No. 100 sieve, zero to 10 percent passing a No. 200 sieve, and having a fineness modulus of 1.30 to 2.10.

C. Grout Fluidifier for Grout: ASTM C 937.

D. Pozzolans for Grout: ASTM C 618.

2.4 JOINT FILLER

A. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A Shore durometer hardness of at least 80 according to ASTM D 2240.
1. BASF Corp., MAPEI Corp., Sika Corp.

B. Color: Matching existing joint filler.

2.5 EPOXY CRACK-INJECTION MATERIALS

A. Epoxy Crack-Injection Adhesive: ASTM C 881/C 881M, bonding system Type I, free of VOCs.
1. BASF Corp., MAPEI corp., Sika Corp.
2. Capping Adhesive: Product manufactured for use with crack-injection adhesive by same manufacturer.
3. Color: Provide epoxy crack-injection adhesive and capping adhesive that blend with existing, adjacent concrete and do not stain concrete surface.

2.6 CORROSION-INHIBITING MATERIALS

A. Corrosion-Inhibiting Treatment: Waterborne solution of alkaline corrosion-inhibiting chemicals for concrete-surface application that penetrates concrete by diffusion and forms a protective film on steel reinforcement.
   1. BASF Corp., Cortec Corp., Sika Corp.

2.7 POLYMER-OVERLAY MATERIALS

A. Polymer Overlay: Epoxy adhesive complying with ASTM C 881/C 881M, bonding system Type III, with surface-applied aggregate for skid resistance; free of VOCs.
   1. BASF Corp., Sika Corp., Sto. Corp.
   2. Aggregate: ACI 503.3, oven-dried, washed silica sand.
   3. Color and Texture: Matching existing.

2.8 POLYMER-SEALER MATERIALS

A. Epoxy Polymer Sealer: Low-viscosity epoxy, penetrating sealer and crack filler recommended by manufacturer for penetrating and sealing cracks in exterior concrete traffic surfaces; free of VOCs.
   1. BASF Corp., ChemCo Sys., Sika Corp.
   2. Color: As indicated by manufacturer's designations.

2.9 MISCELLANEOUS MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I, II, or III unless otherwise indicated.

B. Water: Potable.

2.10 MIXES

A. General: Mix products, in clean containers, according to manufacturer's written instructions.

   1. Do not add water, thinners, or additives unless recommended by manufacturer.
   2. When practical, use manufacturer's premeasured packages to ensure that materials are mixed in proper proportions. When premeasured packages are not used, measure ingredients using graduated measuring containers; do not estimate quantities or use shovel or trowel as unit of measure.
   3. Do not mix more materials than can be used within time limits recommended by manufacturer. Discard materials that have begun to set.

B. Mortar Scrub Coat: Mix dry ingredients with enough water to provide consistency of thick cream.

C. Dry-Pack Mortar: Mix required type(s) of patching-mortar dry ingredients with just enough liquid to form damp cohesive mixture that can be squeezed by hand into a ball but is not plastic.

D. Concrete: Comply as noted in this section.

E. Grout for Use with Preplaced Aggregate: Proportion according to ASTM C 938. Add grout fluidifier to mixing water followed by portland cement, pozzolan, and fine aggregate.

PART 3 - EXECUTION

3.1 CONCRETE MAINTENANCE

A. Have concrete-maintenance work performed only by qualified concrete-maintenance specialist.

B. Comply with manufacturers' written instructions for surface preparation and product application.

3.2 EXAMINATION

A. Notify Architect or Owner seven days in advance of dates when areas of deteriorated or delaminated concrete and deteriorated reinforcing bars will be located.

B. Locate areas of deteriorated or delaminated concrete using hammer or chain-drag sounding and mark boundaries. Mark areas for removal by simplifying and squaring off boundaries. At columns and walls make boundaries level and plumb unless otherwise indicated.

C. Perform surveys as the Work progresses to detect hazards resulting from concrete-maintenance work.

3.3 PREPARATION

A. Ensure that supervisory personnel are on-site and on duty when concrete maintenance work begins and during its progress.

B. Protect persons, motor vehicles, surrounding surfaces of building being repaired, building site, plants, and surrounding buildings from harm resulting from concrete maintenance work.

1. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
2. Use only proven protection methods appropriate to each area and surface being protected.
3. Provide temporary barricades, barriers, and directional signage to exclude public from areas where concrete maintenance work is being performed.
4. Contain dust and debris generated by concrete maintenance work and prevent it from reaching the public or adjacent surfaces.
5. Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment that ensure that such water will not create a hazard or adversely affect other building areas or materials.
6. Protect floors and other surfaces along haul routes from damage, wear, and staining.
7. Provide supplemental sound-control treatment to isolate removal and dismantling work from other areas of the building.

8. Protect adjacent surfaces and equipment by covering them with heavy polyethylene film and waterproof masking tape. If practical, remove items, store, and reinstall after potentially damaging operations are complete.
9. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
10. Dispose of debris and runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

C. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect or Owner immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is in working order.

1. Prevent solids such as aggregate or mortar residue from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from concrete maintenance work.
2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

D. Preparation for Concrete Removal: Examine construction to be repaired to determine best methods to safely and effectively perform concrete maintenance work. Examine adjacent work to determine what protective measures will be necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed in the course of repair.

1. Verify that affected utilities have been disconnected and capped.
2. Inventory and record the condition of items to be removed for reinstallation or salvage.
3. Provide and maintain shoring, bracing, and temporary structural supports as required to preserve stability and prevent unexpected or uncontrolled movement, settlement, or collapse of construction being demolished and construction and finishes to remain. Strengthen or add new supports when required during progress of removal work.

E. Reinforcing-Bar Preparation: Remove loose and flaking rust from exposed reinforcing bars by high-pressure water cleaning, abrasive blast cleaning or until only tightly adhered light rust remains.

1. Where section loss of reinforcing bar is more than 25 percent, or 20 percent in two or more adjacent bars, cut bars and remove and replace as indicated on Drawings.
2. Remove additional concrete as necessary to provide at least 3/4-inch clearance at existing and replacement bars.
3. Splice replacement bars to existing bars according to ACI 318 (ACI 318M) by lapping, welding, or using mechanical couplings.

F. Surface Preparation for Corrosion-Inhibiting Treatment: Clean concrete to remove dirt, oils, films, and other materials detrimental to treatment application.

1. Use low-pressure water cleaning, detergent scrubbing or sand blasting.
2. Allow surface to dry before applying corrosion-inhibiting treatment.

G. Surface Preparation for Overlays:

1. Remove delaminated material and deteriorated concrete surface material.

2. Roughen surface of concrete to produce a surface profile matching CSP 3 according to ICRI 310.2.
3. Use sand blasting, high-pressure water jetting or milling.
4. Sweep and vacuum roughened surface to remove debris followed by low-pressure water cleaning.

H. Acidic Surface Preparation for Sealers: Acid etch surface of concrete to produce a surface profile matching CSP 1 according to ICRI 310.2. Prepare surface for acid etching by detergent scrubbing to remove oils and films that may prevent acid penetration.

1. Remove excess acid solution, reaction products, and debris by squeegeeing or vacuuming.
2. Scrub surface with an alkaline detergent, rinse, and squeegee or vacuum.
3. Check acidity of surface with pH test paper and continue rinsing until pH is acceptable according to sealer manufacturer's written instructions.
4. When pH is acceptable according to sealer manufacturer's written instructions and surface is clean, vacuum dry.

I. Nonacidic Surface Preparation for Sealers: Clean concrete to remove dirt, oils, films, and other materials detrimental to sealer application.

1. Use low-pressure water cleaning or detergent scrubbing.

J. Surface Preparation for Composite Structural Reinforcement: Clean concrete where reinforcement and epoxy patching mortar is to be placed by low-pressure water cleaning or detergent scrubbing to remove dirt, oils, films, and other materials detrimental to epoxy patching mortar.

1. Roughen surface of concrete by sand blasting.
2. Remove delaminated material and deteriorated concrete surface material.
3. Sweep and vacuum roughened surface to remove debris followed by low-pressure water cleaning.

3.4 CONCRETE REMOVAL

A. Do not overload structural elements with debris.

B. Saw-cut perimeter of areas indicated for removal to a depth of at least 1/2 inch. Make cuts perpendicular to concrete surfaces and no deeper than cover on reinforcement.

C. Remove deteriorated and delaminated concrete by breaking up and dislodging from reinforcement.

D. Remove additional concrete if necessary to provide a depth of removal of at least 1/2 inch over entire removal area.

E. Where half or more of the perimeter of reinforcing bar is exposed, bond between reinforcing bar and surrounding concrete is broken, or reinforcing bar is corroded, remove concrete from entire perimeter of bar and to provide at least 3/4-inch clearance around bar.

F. Test areas where concrete has been removed by tapping with hammer, and remove additional concrete until unsound and disbonded concrete is completely removed.

G. Provide surfaces with a fractured profile of at least 1/8 inch that are approximately perpendicular or parallel to original concrete surfaces. At columns and walls, make top and bottom surfaces level unless otherwise directed.

H. Thoroughly clean removal areas of loose concrete, dust, and debris.

3.5 BONDING AGENT APPLICATION

A. Epoxy-Modified, Cementitious Bonding and Anticorrosion Agent: Apply to reinforcing bars and concrete by stiff brush or hopper spray according to manufacturer's written instructions. Apply to reinforcing bars in two coats, allowing first coat to dry two to three hours before applying second coat. Allow to dry before placing patching mortar or concrete.

B. Epoxy Bonding Agent: Apply to reinforcing bars and concrete by brush, roller, or spray according to manufacturer's written instructions, leaving no pinholes or other uncoated areas. Apply to reinforcing bars in at least two coats, allowing first coat to dry before applying second coat. Place patching mortar or concrete while epoxy is still tacky. If epoxy dries, recoat before placing patching mortar or concrete.

C. Latex Bonding Agent, Type I: Apply to concrete by brush roller or spray. Allow to dry before placing patching mortar or concrete.

D. Latex Bonding Agent, Type II: Mix with portland cement and scrub into concrete surface according to manufacturer's written instructions. Place patching mortar or concrete while bonding agent is still wet. If bonding agent dries, recoat before placing patching mortar or concrete.

E. Mortar Scrub Coat for Job-Mixed Patching Mortar and Concrete: Dampen repair area and surrounding concrete 6 inches beyond repair area. Remove standing water and apply scrub coat with a brush, scrubbing it into surface and thoroughly coating repair area. If scrub coat dries, recoat before placing patching mortar or concrete.

F. Slurry Coat for Cementitious Patching Mortar: Wet substrate thoroughly and then remove standing water. Scrub a slurry of neat patching mortar[mixed with latex bonding agent] into substrate, filling pores and voids.

3.6 PATCHING MORTAR APPLICATION

A. Place patching mortar as specified in this section unless otherwise recommended in writing by manufacturer.

1. Provide forms where necessary to confine patch to required shape.
2. Wet substrate and forms thoroughly and then remove standing water.

B. Pretreatment: Apply specified bonding agent.

C. General Placement: Place patching mortar by troweling toward edges of patch to force intimate contact with edge surfaces. For large patches, fill edges first and then work toward center, always troweling toward edges of patch. At fully exposed reinforcing bars, force patching mortar to fill space behind bars by compacting with trowel from sides of bars.

D. Vertical Patching: Place material in lifts of not more than 1 inch or less than 1/8 inch. Do not feather edge.

E. Consolidation: After each lift is placed, consolidate material and screed surface.

F. Multiple Lifts: Where multiple lifts are used, score surface of lifts to provide a rough surface for placing subsequent lifts. Allow each lift to reach final set before placing subsequent lifts.

G. Finishing: Allow surfaces of lifts that are to remain exposed to become firm and then finish to a surface matching adjacent concrete.

H. Curing: Wet-cure cementitious patching materials, including polymer-modified cementitious patching materials, for not less than seven days by water-fog spray or water-saturated absorptive cover.

3.7 DRY-PACK-MORTAR APPLICATION

A. Use dry-pack mortar for deep cavities. Place as specified in this section unless otherwise recommended in writing by manufacturer.

1. Provide forms where necessary to confine patch to required shape.
2. Wet substrate and forms thoroughly and then remove standing water.

B. Pretreatment: Apply specified bonding agent.

C. Place dry-pack mortar into cavity by hand, and compact tightly into place. Do not place more material at a time than can be properly compacted. Continue placing and compacting until patch is approximately level with surrounding surface.

D. After cavity is filled and patch is compacted, trowel surface to match profile and finish of surrounding concrete. A thin coat of patching mortar may be troweled into the surface of patch to help obtain required finish.

E. Wet-cure patch for not less than seven days by water-fog spray or water-saturated absorptive cover.

3.8 CONCRETE PLACEMENT

A. Place concrete according to as specified in this section.

B. Pretreatment: Apply epoxy-modified, cementitious bonding and anticorrosion agent, epoxy bonding agent to reinforcement and concrete substrate.

C. Pretreatment: Apply latex bonding agent, Type I latex bonding agent, mortar scrub coat to concrete substrate.

D. Standard Placement: Place concrete by form-and-pump method unless otherwise indicated.

1. Use vibrators to consolidate concrete as it is placed.
2. At unformed surfaces, screed concrete to produce a surface that when finished with patching mortar will match required profile and surrounding concrete.

E. Form-and-Pump Placement: Place concrete by form-and-pump method where indicated.

1. Design and construct forms to resist pumping pressure in addition to weight of wet concrete. Seal joints and seams in forms and where forms abut existing concrete.
2. Pump concrete into place from bottom to top, releasing air from forms as concrete is introduced. When formed space is full, close air vents and pressurize to 14 psi.

F. Wet-cure concrete for not less than seven days by leaving forms in place or keeping surfaces continuously wet by water-fog spray or water-saturated absorptive cover.

G. Fill placement cavities with dry-pack mortar and repair voids with patching mortar. Finish to match surrounding concrete.

3.9 GROUTING PREPLACED AGGREGATE CONCRETE

A. Use grouted preplaced aggregate concrete for column and wall repairs. Place as specified in this article.

B. Design and construct forms to resist pumping pressure in addition to weight of wet grout. Seal joints and seams in forms and where forms abut existing concrete.

C. Apply epoxy-modified cementitious bonding and anticorrosion agent or epoxy bonding agent to reinforcement and concrete substrate.

D. Place aggregate in forms, consolidating aggregate in lifts as it is placed. Pack aggregate into upper areas of forms to achieve intimate contact with concrete surfaces.

E. Fill forms with water to thoroughly dampen aggregate and substrates. Drain water from forms before placing grout.

F. Pump grout into place at bottom of preplaced aggregate, forcing grout upward. Release air from forms at top as grout is introduced. When formed space is full and grout flows from air vents, close vents and pressurize to 14 psi.

G. Wet-cure concrete for not less than seven days by leaving forms in place or keeping surfaces continuously wet by water-fog spray or water-saturated absorptive cover.

H. Repair voids with patching mortar and finish to match surrounding concrete.

3.10 EPOXY CRACK INJECTION

A. Clean cracks with oil-free compressed air or low-pressure water to remove loose particles.

B. Clean areas to receive capping adhesive of oil, dirt, and other substances that would interfere with bond.

C. Place injection ports as recommended by epoxy manufacturer, spacing no farther apart than thickness of member being injected. Seal injection ports in place with capping adhesive.

D. Seal cracks at exposed surfaces with a ribbon of capping adhesive at least 1/4 inch thick by 1 inch wider than crack.

E. Inject cracks wider than 0.003 inch to a depth of 8 inches.

F. Inject epoxy adhesive, beginning at widest part of crack and working toward narrower parts. Inject adhesive into ports to refusal, capping adjacent ports when they extrude epoxy. Cap injected ports and inject through adjacent ports until crack is filled.

G. After epoxy adhesive has set, remove injection ports and grind surfaces smooth.

3.11 CORROSION-INHIBITING-TREATMENT APPLICATION

A. Apply corrosion-inhibiting treatment or curb-to-curb and from joint-to-joint in the perpendicular direction.

B. Apply by brush, roller, or airless spray in two coats at manufacturer's recommended application rate. Remove film of excess treatment by high-pressure washing before patching treated concrete or applying a sealer or overlay.

3.12 POLYMER OVERLAY APPLICATION

A. Apply polymer overlay according to ACI 503.3.

B. Apply to traffic-bearing surfaces, including parking areas and walks.

3.13 POLYMER SEALER APPLICATION

A. Apply polymer sealer by brush, roller, or airless spray at manufacturer's recommended application rate.

B. Apply to traffic-bearing surfaces, including parking areas and walks.

3.14 FIELD QUALITY CONTROL

A. Manufacturers Field Service: Engage manufacturers' factory-authorized service representatives for consultation and Project-site inspection and to provide on-site assistance when requested by Architect.

1. Have manufacturers' factory-authorized service representatives perform the following number of Project-site inspections to observe progress and quality of the Work,

distributed over the period of product installation, regardless of on-site assistance requested by Architect:

END OF SECTION 030130

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Miscellaneous steel framing and supports.
   2. Shelf angles.
   3. Miscellaneous steel trim.
   4. Loose bearing and leveling plates.

B. Products furnished, but not installed, under this Section include the following:
   1. Loose steel lintels.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Paint products.
   2. Grout.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting." Section 099123 Interior Painting."

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.

C. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.

E. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.6 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize shelf angles located in exterior walls.

D. Prime shelf angles located in exterior walls with zinc-rich primer.

2.7 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Galvanize loose steel lintels located in exterior walls.

C. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.8 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.9 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

2.10 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
   1. Shop prime with universal shop primer primers specified in Section 099113 "Exterior Painting."

C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." SSPC-SP 3, "Power Tool Cleaning." requirements indicated below:
   1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   3. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000

SECTION 055213 - PIPE AND TUBE RAILINGS & GATE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel pipe and tube railings and gate.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Railing brackets.
3. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Steel Pipe and Tube Railings Manufacturers:
1. Viva Railings, Wagner, R&B Inc.; or approved equal.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a q ualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
b. Infill load and other loads need not be assumed to act concurrently.

2.3 METALS, GENERAL

A. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt or predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.4 STEEL AND IRON

A. Tubing: ASTM A 500 (cold formed) or ASTM A 513.

B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.5 FASTENERS

A. General: Provide the following:
1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.

B. Post-Installed Anchors: As indicated on drawings capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as d etermined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primer: Provide primer that complies with Section 099113 "Exterior Painting." Shop primer to be Sherwin Williams Kem 400 Primer Gray or Equal.

C. Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

2.7 FABRICATION

A. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

B. Form work true to line and level with accurate angles and surfaces.

C. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

D. Form changes in direction by bending.

E. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

F. Close exposed ends of railing members with prefabricated end fittings.

G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

I. Gate: Match height and design of adjacent railings, as indicated on drawings.

2.8 STEEL AND IRON FINISHES

A. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

3.2 ANCHORING POSTS

A. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members.

3.3 ATTACHING RAILINGS

A. Attach railings to wall with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

B. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

END OF SECTION 055213

SECTION 057510 – PERFORATED METAL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Perforated metal sheet panels used to fabricate screens as indicated in Architectural drawings.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM) Publications:
   1. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   2. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
   3. ASTM A283 - Low and Intermediate Tensile Strength Carbon Steel Plates.
   4. ASTM A653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, Structural (Physical) Quality.
   5. ASTM B122 - Copper-Nickel-Tin Alloy, Copper-Nickel-Zinc Alloy (Nickel Silver) and Copper-Nickel Alloy Plate, Sheet, Strip, and Rolled Bar.
   6. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
   7. ASTM B248 - Wrought Copper and Copper Alloy Plate, Sheet, Strip, and Rolled Bar.
   8. ASTM B370 - Copper Sheet and Strip for Building Construction.

1.3 SUBMITTALS

A. Provide in accordance with Section 013300 - Submittal Procedures:
   1. Product data for perforated metal panels and finish.
   2. Sample: 8 by 10 inches minimum size sample in selected perforation pattern and finish.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis of Design: McNichols Designer Metals, www.mcnichols.com 1.877.884.4653

B. Requests to use equivalent products of other manufacturers shall be submitted in accordance with Section 01 63 00 - Product Substitution Procedures.

2.2 PERFORATED METAL PANELS

A. Material: ASTM A283 steel plates and sheets.
   1. Thickness: 16 gage.
   2. Sheet size: 36 by 96 inches.

B. Perforations:
   1. Square: 3/8inch square perforations placed in straight line pattern and on ½ inch row.

C. End pattern: Finished.

D. Margins: Provide perforated panels with minimum width margins.

E. Equip panels with perimeter welded metal frames and attachment brackets as detailed and dimensioned on Drawings and approved shop drawings.

2.3 FACTORY FINISH

A. Provide perforated metal sheets, fabricated panels with:
   1. Polyester powder coating:
      a. Electrostatically applied colored polyester powder coating heat cured to chemically bond finish to metal substrate.
      b. Color: Selected by Architect from manufacturer's standard range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Preparation: Prior to panel fabrication, field verify required dimensions.

B. Provide perforated metal panels specified in this Section for fabrication of screen wall as indicated on Architectural Drawings.

C. Install in accordance with manufacturer's installation instructions and approved shop drawings.

D. After installation, touch-up damaged finish with paint supplied by manufacturer and matching original coating.

END OF SECTION

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Wood blocking, cants, and nailers.
3. Wood furring and grounds.
4. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Engineered wood products.
4. Shear panels.
5. Power-driven fasteners.
6. Post-installed anchors.
7. Metal framing anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by a n agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less; 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat all rough carpentry unless otherwise indicated.

2.3 DIMENSION LUMBER FRAMING

A. Framing Other Than Non-Load-Bearing Partitions: Construction or No. 2 grade.

1. Application: Framing other than interior partitions not indicated as load bearing.
2. Species:
   a. Southern pine; SPIB.
   b. Douglas fir-larch; WCLIB or WWPA.

c. Southern pine or mixed southern pine; SPIB.
d. Douglas fir-south; WWPA.

B. Exposed Framing: Hand-select material for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

1. Species and Grade: As indicated above for load-bearing construction of same type.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Cants.
4. Furring.
5. Grounds.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.

C. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine or southern pine; No. [**2**] [**3**] grade; SPIB.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.6 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 as appropriate for the substrate.

2.7 METAL FRAMING ANCHORS

A. Allowable design loads, as published by manufacturer, shall meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

2.8 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a s ill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.

B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

C. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

D. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate [**furring,**]nailers, blocking, [**grounds,**]and similar supports to comply with requirements for attaching other construction.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

3.2 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Sheathing joint and penetration treatment.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

A. Emissions: Products shall meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.3 WALL SHEATHING

A. Cementitious Backer Units: ASTM C 1325, Type A.
1. Manufacturers: U.S.G. Durock Cement Board or approved equal product.
2. Thickness: 1/2 inch.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

2.5 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sheathing Tape for Cement Board Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 CEMENTITIOUS BACKER UNIT INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

END OF SECTION 061600

SECTION 071326 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modified bituminous sheet waterproofing.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, expansion joints, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.

C. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: Three (3) years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one side to a 4-mil- thick, polyethylene-film reinforcement, and with release liner on adhesive side**;** formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.

1. Manufacturers: Carlisle Coatings & Waterproofing; Henry Co.; Polyguard Products; W.R. Meadows.
2. Physical Properties:

    a. Tensile Strength, Membrane: 250 psi minimum; ASTM D 412, Die C, modified.
    b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
    c. Low-Temperature Flexibility: Pass at minus 20 deg F ; ASTM D 1970/D 1970M.
    d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836/C 836M.
    e. Puncture Resistance: 40 lbf minimum; ASTM E 154/E 154M.
    f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F ; ASTM D 570.
    g. Water Vapor Permeance: 0.05 perm maximum; ASTM E 96/E 96M, Water Method.
    h. Hydrostatic-Head Resistance: 200 feet minimum; ASTM D 5385.

3. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

2.2 AUXILIARY MATERIALS

A. Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by sheet-waterproofing material manufacturer.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.

E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.

F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch predrilled at 9-inch centers.

G. Protection Course: Extruded-polystyrene board insulation, unfaced, ASTM C 578, Type X, 1/2 inch thick.

2.3 INSULATION DRAINAGE PANELS

A. Insulation: Comply with Section 072100 "Thermal Insulation" for general building insulation**,**

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

3.2 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and per recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F , install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F

D. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.

E. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

F. Seal edges of sheet-waterproofing terminations with mastic.

G. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.

H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.

I. Immediately install protection course with butted joints over waterproofing membrane.

1. Board insulation may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately

3.3 PROTECTION, REPAIR, AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 071326

SECTION 072200 - ROOF DECK AND INSULATION (REVISED)

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the Conditions of the Contract and Division 01 Specification Sections apply to this section.

1.2 SUMMARY

A. Section includes roof insulation over the properly prepared deck substrate.

B. Related Sections:
1. Section 076200 – Sheet Metal Flashing and Trim.
2. Section 075500 – Modified Bituminous membrane Roofing

1.3 REFERENCES

A. American Society for Testing and materials (ASTM):
1. ASTM A167 Standard Specification for Stainless and Heat-Resisting Chromium Nickel Steel Plate, Sheet and Strip.
2. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.
3. ASTM B29 Standard Specification for Refined Lead.
4. ASTM B32 Standard Specification for Solder Metal.
5. ASTM C165 Standard Test Method for Measuring Compressive Properties of Thermal Insulation.
6. ASTM C208 Standard Specification for Cellulosic Fiber Insulation Board.
7. ASTM C209 Standard Test Method for Cellulosic Fiber Insulating Board.
8. ASTM C272 Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
9. ASTM C1396 Standard Specification for Gypsum Wallboard.
10. ASTM C518 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
11. ASTM C578 Standard Specification for Perlite Thermal Insulation Board.
12. ASTM C728 Standard Test Methods for Fire Test of Roof Coverings.
13. ASTM C1289 Standard Specification for Faced Rigid Polyisocyanurate Thermal Insulation.
14. ASTM D5 Standard Test Method for Penetration of Bituminous Materials.
15. ASTM D36 Standard Test Method for Softening Point of Bitumen (Ring and Ball Apparatus).
16. ASTM D312 Standard Specification for Asphalt Used in Roofing.
17. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
18. ASTM D1621 Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
19. ASTM D1622 Standard Test Method for Apparent Density of Rigid Cellular Plastics.
20. ASTM D2126 Standard Test Method for Response off Rigid Cellular Plastics to Thermal Humid Aging.

21. ASTM D4601 Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
22. ASTM D5147 Standard Sampling and Testing Modified Bituminous Sheet Material.

B. Cast Iron Soil Pipe Institute, Washington, D.C. (CISPI)

C. Factory Mutual Research (FM):
1. Roof Assembly Classifications.

D. National Roofing Contractors Association (NRCA):
1. Roofing and Waterproofing Manual.

E. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

F. Steel Deck Institute, St. Louis, Missouri (SDI)

G. Southern Pine Inspection Bureau, Pensacola, Florida (SPIB)

H. Insulation Board, Polyisocyanurate (FS HH-I-1972)

I. Insulation Board, Thermal (Fiberboard) (FS LLL-1-535B)

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's specification data sheets for each product in accordance with Division 01 Section Submittal Procedures. 01300.

B. Provide approval letters from insulation manufacturer for use of their insulation within this particular roofing system type.

C. Provide a sample of each insulation type.

D. Shop Drawings
1. Submit manufacturer's shop drawings indicating complete installation details of tapered insulation system, including identification of each insulation block, sequence of installation, layout, drain locations, roof slopes, thicknesses, crickets and saddles.
2. Shop drawing shall include: Outline of roof, location of drains, complete board layout of tapered insulation components, thickness and the average "R" value for the completed insulation system.

E. Certification
1. Submit roof manufacturer's certification that insulation fasteners furnished are acceptable to roof manufacturer.
2. Submit roof manufacturer's certification that insulation furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.

1.5 QUALITY ASSURANCE

A. Fire Classification, ASTM E-108.

B. Manufacturer's Certificate: Certify that roof system furnished is approved by Factory Mutual, Underwriters Laboratories, Warnock Hersey or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.

C. Manufacturer's Certificate: Certify that the roof system is adhered properly to meet or exceed the requirements of FM 1-90.

D. Pre-installation meeting: Refer to Division 07 roofing specifications for pre-installation meeting requirements.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.

B. Store all insulation materials in a manner to protect them from the wind, sun and moisture damage prior to and during installation. Any insulation that has been exposed to any moisture shall be removed from the project site.

C. Keep materials enclosed in a watertight, ventilated enclosure (i.e. tarpaulins).

D. Store materials off the ground. Any warped, broken or wet insulation boards shall be removed from the site.

PART 2 – PRODUCTS

2.1 PRODUCTS, GENERAL

A. Refer to Division 01 Section "Common Product Requirements."

B. Basis of Design: Materials, manufacturer's product designations, and/or manufacturer's names specified herein shall be regarded as the minimum standard of quality required for work of this Section. Comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1.

2.2 INSULATION MATERIALS

A. Thermal Insulation Properties and Approved Insulation Boards.
   1. Rigid Polyisocyanurate Roof Insulation; ASTM C1289:
      a. Qualities: Rigid, closed cell polyisocyanurate foam core bonded to heavy duty glass fiber mat facers.
      b. Thickness: Minimum 2 1/2". (See roof drawings for actual thicknesses)
      c. R-Value: 25 ci
      d. Compliances: UL, or FM listed under Roofing Systems
         Federal Specification HH-I-1972, Class 1.
      e. Acceptable Products:
         1) ENRGY-3; Johns Manville
         2) Hytherm; Dow
         3) EnergyGuard; GAF
         4) Approved Equivalent

2. Tapered Polyisocyanurate Roof Insulation; ASTM C1289:
    a. Qualities: Factory Tapered, closed cell polyisocyanurate foam core bonded to heavy duty glass fiber mat facers.
    b. Thickness: Field Minimum ¼" to 12" listed under Roofing Systems Federal Specification HH-I-1972, Class 1
    c. Thickness: Crickets Minimum 1/2" to 12" listed under Roofing Systems Federal Specification HH-I-1972, Class 1
    d. Acceptable Products:
        1) ENRGY 3; Johns Manville
        2) EnergyGuard; GAF
        3) Approved Equivalent

3. Dens-Deck Prime Roof Cover Board
    a. Qualities: Nonstructural glass mat faced, noncombustible, water-resistant treated gypsum core panel.
    b. Board Size: Four feet by four feet (4'x4').
    c. Thickness: One half (1/2) inch.
    d. R-Value: .56
    e. Compliances: UL, or FM listed under Roofing Systems.

OR

4. Securock Roof Cover Board
    a. Qualities: Nonstructural, noncombustible, homogenous composition panel.
    b. Board Size: Four by four feet (4'x4').
    c. Thickness: One half (1/2) inch.
    d. R-Value: .5
    e. Compliances: UL. or FM listed under Roofing Systems.
    f. Manufacturer: USG

2.3 RELATED MATERIALS

A. Fiber Cant and Tapered Edge Strips: Performed rigid insulation units of sizes/shapes indicated, matching insulation board or of perlite or organic fiberboard, as per the approved manufacturer.
1. Acceptable Manufacturers:
    a. The Garland Company, Inc.
    b. Celotex
    c. Johns Manville
    d. GAF
    e. Approved Equivalent

B. Protection Board: Pre-molded semi-rigid asphalt composition board one half (1/2) inch.

C. Roof Board Joint Tape: Six (6) inches wide glass fiber mat with adhesive compatible with insulation board facers.

D. Roof Deck Insulation Adhesive: OMG, Lexcore Insultak II or pre-approved equal.
1. Tensile Strength (ASTM D412)……250 psi
2. Density (ASTM D1875)……..8.5 lbs./gal.
3. Viscosity (ASTM D2556)……22,000 to 60,000 cP.
4. 2 `Peel Strength (ASTM D903)…..17 lb/in.

5. 3 `Flexibility (ASTM D816)……Pass @ -70°F

E. Fasteners: Corrosion resistant screw fastener as recommended by roof membrane manufacturer.
1. Factory Mutual Tested and Approved with three (3) inches coated disc for I-90 rating, length required to penetrate metal deck one inch.

PART 3 – EXECUTION

3.1 EXECUTION, GENERAL

A. Comply with requirements of Division 01 Section "Common Execution Requirements."

3.2 INSPECTOR OF SURFACES

A. Roofing contractor shall be responsible for preparing an adequate substrate to receive insulation.
1. Verify that work which penetrates roof deck has been completed.
2. Verify that wood nailers are properly and securely installed.
3. Examine surfaces for defects, rough spots, ridges, depressions, foreign material, moisture, and unevenness.
4. Do not proceed until defects are corrected.
5. Do not apply insulation until substrate is sufficiently dry.
6. Broom clean substrate immediately prior to application.
7. Use additional insulation to fill depressions and low spots that would otherwise cause ponding water.
8. Verify that temporary roof has been completed.

3.3 INSTALLATION

A. Attachment with Insulation Adhesive Approved by Factory Mutual (FM).
1. Ensure all surfaces are clean, dry, free of dirt, debris, oils, loose ore embedded gravel, unadhered coatings, deteriorated membrane and other contaminants that may inhibit adhesion.
2. Apply insulation adhesive directly to the substrate using a ribbon pattern with one quarter to one half (1/4-1/2) inch wide beads 12 inches o.c., using either the manual applicator or an automatic applicator, at a rate of one (1) gallon per one hundred (150) square feet per cartridge.
3. Immediately place insulation boards into wet adhesive. Do not slide boards into place. Do not allow the adhesive to skin over before installing insulation boards.
4. Briefly step each board into place to ensure contact with the adhesive. Substrates with irregular surfaces may prevent the insulation board from making positive contact with the adhesive. Relief cuts or temporary weights may be required to ensure proper contact.
5. All boards shall be cut and fitted where the roof deck intersects a vertical surface. The boards shall be cut to fit a minimum of one quarter (1/4) inch away from the vertical surface.
6. Tape joints of insulation as per manufacturer's requirements.

3.4 CLEANING

A. Remove debris and cartons from roof deck. Leave insulation clean and dry, ready to receive roofing membrane.

3.5 CONSTRUCTION WASTE MANAGEMENT

A. Remove and properly dispose of waste products generated during installation. Comply with requirements of authorities having jurisdiction.

END OF SECTION

SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS (NEW)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes standing-seam metal roof panels.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

C. Samples: For each type of metal panel indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two (2) years from date of Final Acceptance.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: Twenty (20) years from date of Final Acceptance..

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: Twenty (20) years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.

2. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft.

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft.

D. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.

E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F ambient; 180 deg F material surfaces

2.2 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637.

B. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.

1. Manufacturer: Basis of Design, Berridge Company, or approved equal.
2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

    a. Nominal Thickness: 0.022 inch
    b. Exterior Finish: Two-coat fluoropolymer
    c. Color: As selected by Architect or Owner from manufacturer's full range

3. Clips: One-piece fixed to accommodate thermal movement.

    a. Material: 0.028-inch- nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
    b. Material: 0.025-inch- thick, stainless-steel sheet.

4. Panel Coverage: 16 inches
5. Panel Height: 1.5 inches

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F ASTM D 1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F ASTM D 1970.

2.4 MISCELLANEOUS MATERIALS

A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

C. Panel Fasteners: Self-tapping screws designed to withstand design loads.

D. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch wide and 1/8 inch thick.
2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.5 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.6 FINISHES

A. Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621 ,AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.

2. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated on Drawings, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the entire roof surface.

a.
b.

2.

B. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.

C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.3 METAL PANEL INSTALLATION

A. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
5. Watertight Installation:

    a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
    b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
    c. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074113.16

SECTION 075500 - MODIFIED BITUMINOUS MEMBRANE ROOFING (REVISED)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Torch Applied 2-Ply Modified Asphalt Roofing.

B. Accessories.

1.2 RELATED SECTIONS

A. Section 06100 - Rough Carpentry

B. Section 07220 - Insulation Board: Insulation and fastening.

C. Section 07620 - Sheet Metal Flashing and Trim: Weather protection for base flashings.

1.3 REFERENCES

A. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

B. ASTM D 312 - Standard Specification for Asphalt used in Roofing.

C. ASTM D 451 - Standard Test Method for Sieve Analysis of Granular Mineral Surfacing for Asphalt Roofing Products.

D. ASTM D 1079 Standard Terminology Relating to Roofing, Waterproofing and Bituminous Materials.

E. ASTM D 1863 Standard Specification for Mineral Aggregate Used as a Protective Coating for Roofing.

F. ASTM D 2822 Standard Specification for Asphalt Roof Cement.

G. ASTM D 5147 Standard Test Method for Sampling and Testing Modified Bituminous Sheet Materials.

H. ASTM D 6162 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.

I. ASTM E 108 - Standard Test Methods for Fire Test of Roof Coverings

J. Factory Mutual Research (FM): Roof Assembly Classifications.

K. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual.

L. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.

M. ANSI-SPRI ES-1 Wind Design Standard for Edge Systems used with Low Slope Roofing

Systems.

N. ASCE 7, Minimum Design Loads for Buildings and Other Structures

O. FM Approvals - Roof Coverings and/or RoofNav assembly database.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Perform work in accordance with all federal, state and local codes.

B. Exterior Fire Test Exposure: Roof system shall achieve Class rating for roof slopes indicated on the Drawings as follows:
1. Factory Mutual Class A Rating.
2. Underwriters Laboratory Class A Rating.
3. Warnock Hersey Class A Rating.

C. Design Requirements:
1. Uniform Wind Uplift Load Capacity
    a. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria.
        1) Roof Area Design Uplift Pressure:
            a) Zone 1 - Field of roof 225psf
            b) Zone 2 – Perimeter 360 psf
            c) Zone 3 - Corners 540 psf
2. Live Load: 20 psf, or not to exceed original building design.
3. Dead Load:
    a. Installation of new roofing materials shall not exceed the dead load capacity of the existing roof structure.

D. Roof system shall have been tested in compliance with the following codes and test requirements:
1. Cool Roof Rating Council:
    a. CRRC Directory CRRC 1.
2. FM Approvals:
    a. RoofNav Website, FM Approvals 4450 or 4470 for Class 1
    b. Fire/Windstorm Classificatin: Class 1A-105
    c. Hail Rating: SH

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation instructions.

C. Shop Drawings: Submit shop drawings including installation details of roofing, flashing, fastening, insulation and vapor barrier, including notation of roof slopes and fastening patterns of insulation and base modified bitumen membrane, prior to job start.

D. Design Pressure Calculations: Submit design pressure calculations performed by the roofing system manufacturer’s engineering department for the roof area in accordance with ASCE 7

and the local Building Code requirements. Include a roof system attachment analysis report, certifying the system's compliance with applicable wind load requirements before Work begins.

E. Verification Samples: For each modified bituminous membrane ply product specified, two samples, minimum size 6 inches square, representing actual product, color, and patterns.

F. Manufacturer's Certificates: Provide to certify products meet or exceed specified requirements.

G. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147. Testing must be performed at 77 deg. F. Tests at 0 deg. F will not be considered.

H. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic inspection and maintenance of all completed roofing work. Provide product warranty executed by the manufacturer. Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified with documented ISO 9001 certification and minimum of twelve years of documented experience and must not have been in Chapter 11 bankruptcy during the last five years.

C. Installer Qualifications: Company specializing in performing Work of this section with minimum five years documented experience and be a certified Pre-Approved Contractor by Roof Manufacturer.

D. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work while roofing work is in progress.

E. Product Certification: Provide manufacturer's certification that materials conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.

F. Source Limitations: Obtain all components of roof system from a single manufacturer. Secondary products that are required shall be recommended and approved in writing by the roofing system Manufacturer. Upon request of the Architect or Owner, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.

1.7 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to commencing Work of this section.

B. Review installation procedures and coordination required with related Work.

C. Inspect and make notes of job conditions prior to installation:
   1. Record minutes of the conference and provide copies to all parties present.

2. Identify all outstanding issues in writing designating the responsible party for follow-up action and the timetable for completion.
3. Installation of roofing system shall not begin until all outstanding issues are resolved to the satisfaction of the Architect.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging with labels intact until ready for installation.

B. Store all roofing materials in a dry place, on pallets or raised platforms, out of direct exposure to the elements until time of application. Store materials at least 4 inches above ground level and covered with "breathable" tarpaulins.

C. Stored in accordance with the instructions of the manufacturer prior to their application or installation. Store roll goods on end on a clean flat surface. No wet or damaged materials will be used in the application.

D. Store at room temperature wherever possible, until immediately prior to installing the roll. During winter, store materials in a heated location with a 50 degree F (10 degree C) minimum temperature, removed only as needed for immediate use. Keep materials away from open flame or welding sparks.

E. Avoid stockpiling of materials on roofs without first obtaining acceptance from the Architect/Engineer.

F. Adhesive storage shall be between the range of above 50 degree F (10 degree C) and below 80 degree F (27 degree C). Area of storage shall be constructed for flammable storage.

1.9 COORDINATION

A. Coordinate Work with installing associated metal flashings as work of this section proceeds.

1.10 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.11 WARRANTY

A. Upon completion of the work, provide the Manufacturer's written and signed Edge-To-Edge NDL System Warranty, warranting that, if a leak develops in the roof during the term of this warranty, due either to defective material or defective workmanship by the installer, the manufacturer shall provide the Owner, at the Manufacturer's expense, with the labor and material necessary to return the defective area to a watertight condition including Garland Metal Components.
   1. Warranty Period:
      a. 20 years from date of Final Acceptance.

B. Installer is to guarantee all work against defects in materials and workmanship for a period indicated following Final Acceptance of the Work.
   1. Warranty Period:
      a. 2 years from date of acceptance.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: The Garland Co., Inc. (800-321-9336). Other manufacturer that meets or exceeds the specified requirements of the two ply modified assembly, warranty and inspections):
   1. Certain Teed Corp.
   2. Firestone Building Products
   3. Johns Manville

B. The Products specified are intended to be the Standard of Quality for the products required for this project based on their physical characteristics. Products that are proposed by the bidder must be disclosed at the request of the Owner or Architect.
   1. Bidder will not be allowed to change materials after the bid opening date.
   2. All products included in the bid must be equal to or exceed the products specified. Supporting technical data shall be submitted to the Architect/ Owner for approval prior to acceptance.
   3. In making a request for substitution, the Bidder/Roofing Contractor represents that it has:
      a. Personally investigated the proposed product or method, and determined that it is equal or superior in all respects to that specified.
      b. Will provide the same guarantee for substitution as for the product and method specified.
      c. Will coordinate installation of accepted substitution in work, making such changes as may be required for work to be completed in all respects.
      d. Will waive all claims for additional cost related to substitution, which consequently become apparent.
      e. Cost data is complete and includes all related cost under his/her contract or other contracts, which may be affected by the substitution.
      f. Will reimburse the Owner for all redesign cost by the Architect for accommodation of the substitution.
   4. Architect/ Owner reserves the right to be the final authority on the acceptance or rejection of any or all bids, proposed alternate roofing systems or materials that has met ALL specified requirement criteria.

2.2 TORCH APPLIED 2-PLY ASPHALT ROOFING

A. Base (Ply) Sheet:
   1. Torch Base Sheet: 110 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing base sheet reinforced with a fiberglass scrim. Designed for torch applications with a burn-off backer that indicates when the material is hot enough to be installed.
      a. Tensile Strength, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 210 lbf/in XD 210 lbf/in
         2) 50 mm/min. @ 23 +/- 2 deg. C MD 36.75 kN/m XD 36.75 kN/m
      b. Tear Strength, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 300 lbf XD 300 lbf
         2) 50 mm/min. @ 23 +/- 2 deg. C MD 1,334 N XD 1,334 N
      c. Elongation at Maximum Tensile, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 6% XD 6%
         2) 50 mm/min. @ 23 +/- 2 deg. C MD 6% XD 6%
      d. Low Temperature Flexibility, ASTM D5147, Passes -30 deg. F (-34.4 deg. C)

B. Modified Cap (Ply) Sheet: One ply bonded to the prepared substrate with interplay adhesive.
1. Torch Cap Sheet: 180 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing membrane reinforced with a fiberglass and polyester composite scrim. This membrane is designed for torch applications and has a burn-off backer that indicates when the material is hot enough to be installed.
   a. Tensile Strength, ASTM D 5147
      1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 310 lbf/in XD 310 lbf/in
      2) 50 mm/min. @ 23 +/- 2 deg. C MD 54.25 kN/m XD 54.25 kN/m
   b. Tear Strength, ASTM D 5147
      1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 510 lbf XD 510 lbf
      2) 50 mm/min. @ 23 +/- 2 deg. C MD 2269 N XD 2269 N
   c. Elongation at Maximum Tensile, ASTM D 5147
      1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 9% XD 8%
      2) 50 mm/min. @ 23 +/- 2 deg. C MD 9% XD 8%
   d. Low Temperature Flexibility, ASTM D 5147, Passes -40 deg. F (-40 deg. C)

C. Flashing Base Ply:
1. Torch Base Sheet: 110 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing base sheet reinforced with a fiberglass scrim. Designed for torch applications with a burn-off backer that indicates when the material is hot enough to be installed.
   a. Tensile Strength, ASTM D 5147
      1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 210 lbf/in XD 210 lbf/in
      2) 50 mm/min. @ 23 +/- 2 deg. C MD 36.75 kN/m XD 36.75 kN/m
   b. Tear Strength, ASTM D 5147
      1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 300 lbf XD 300 lbf
      2) 50 mm/min. @ 23 +/- 2 deg. C MD 1,334 N XD 1,334 N
   c. Elongation at Maximum Tensile, ASTM D 5147
      1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 6% XD 6%
      2) 50 mm/min. @ 23 +/- 2 deg. C MD 6% XD 6%
   d. Low Temperature Flexibility, ASTM D5147, Passes -30 deg. F (-34.4 deg. C)

D. Flashing Cap (Ply) Sheet
1. Torch Cap Sheet: 180 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing membrane reinforced with a fiberglass and polyester composite scrim. This membrane is designed for torch applications and has a burn-off backer that indicates when the material is hot enough to be installed.
   a. Tensile Strength, ASTM D 5147
      1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 310 lbf/in XD 310 lbf/in
      2) 50 mm/min. @ 23 +/- 2 deg. C MD 54.25 kN/m XD 54.25 kN/m
   b. Tear Strength, ASTM D 5147
      1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 510 lbf XD 510 lbf
      2) 50 mm/min. @ 23 +/- 2 deg. C MD 2269 N XD 2269 N
   c. Elongation at Maximum Tensile, ASTM D 5147
      1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 9% XD 8%
      2) 50 mm/min. @ 23 +/- 2 deg. C MD 9% XD 8%
   d. Low Temperature Flexibility, ASTM D 5147, Passes -40 deg. F (-40 deg. C)

2.3 ACCESSORIES

A. Roof Insulation Cover Board: Provide G-P Gypsum DenDeck Prime, G-P Gypsum DenDeck DuraGuard, USG Securrock for proper adhesion of the torch applied base sheet.

B. Nails and Fasteners: Non-ferrous metal or galvanized steel, except that hard copper nails shall be used with copper; aluminum or stainless steel nails shall be used with aluminum; and stainless steel nails shall be used with stainless steel, Fasteners shall be self-clinching type of penetrating type as recommended by the deck manufacturer. Fasten nails and fasteners flush-driven through flat metal discs not less than 1 inch diameter. Omit metal discs when one-piece composite nails or fasteners with heads not less than 1 inch diameter are used.

C. Walkway Pads - As recommended by the membrane manufacturer set in approved adhesive to control foot traffic on roof top surface and provide a durable compliant non-slip walkway.

D. Non-Shrink Grout: All weather fast setting chemical action concrete material to fill pitch pans.
1. Flexural Strength, ASTM C 78: (modified) 7 days 1100psi
2. High Strength, ASTM C 109: (modified) 24 days 8400lbs (3810kg)

E. Pitch Pocket Sealer - Seal-Tite: Two part, 100% solids, self-leveling, polyurethane sealant for filling pitch pans as recommended by the membrane manufacturer.
1. Durometer, ASTM D 2240: 40-50 Shore
2. Elongation, ASTM D 412: 250%
3. Tensile Strength, ASTM D 412: 200 @ 100 mil

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Inspect and approve the deck condition, slopes and fastener backing if applicable, parapet walls, expansion joints, roof drains, stack vents, vent outlets, nailers and surfaces and elements.

C. Verify that work penetrating the roof deck, or which may otherwise affect the roofing, has been properly completed.

D. If substrate preparation and other conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. General: Clean surfaces thoroughly prior to installation.
1. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
2. Fill substrate surface voids that are greater than 1/4 inch wide with an acceptable fill material.
3. Roof surface to receive roofing system shall be smooth, clean, free from loose gravel, dirt and debris, dry and structurally sound.
4. Wherever necessary, all surfaces to receive roofing materials shall be power broom and vacuumed to remove debris and loose matter prior to starting work.
5. Do not apply roofing during inclement weather. Do not apply roofing membrane to damp, frozen, dirty, or dusty surfaces.
6. Fasteners and plates for fastening components mechanically to the substrate shall provide a minimum pull-out capacity of 300 lbs. (136 k) per fastener. Base or ply sheets attached

with cap nails require a minimum pullout capacity of 40 lb. per nail.

7. Prime decks in accordance with requirements and recommendations of the primer and membrane manufacturer.

B. Poured reinforced concrete
   1. Shall be smooth, dry, clean and free of ice/frost, projections and depressions. Concrete shall be fully cured and the surface shall be broom cleaned and free of release/curing agents prior to commencement of work.
   2. Prepared concrete surfaces for roofing or insulation by priming with asphalt/concrete primer conforming to ASTM D 41. Apply at a rate of approx. 1 gallon/100 sq. ft. (.4 L/m2). All primed areas shall be fully dried before proceeding with the application of the roof system. Hold back bitumen at the joints approximately 4 inches to prevent bitumen drippage.

C. Insulation: Roof insulation is specified in Section 072200
   1. All joints between layers should be staggered when multiple layers of insulation are installed. Insulation greater than 2.5 inches shall be installed in multiple layers.
   2. Insulation shall be kept dry at all times. Install only as much insulation as can be covered with completed roofing membrane before the end of the day's work or prior to onset of inclement weather.
   3. Edges shall butt tightly and all cuts shall fit neatly against adjoining surfaces to provide a smooth overall surface. Gaps of greater than 1/4 inch width shall be filled with insulation.
   4. Install tapered insulation in roof field and around roof curbs, walls and penthouse to provide adequate slope for proper drainage.
   5. Insulation adhered in adhesive shall be secured in accordance with code and insurance requirements for the applicable geographic zone with the required number and type of fasteners and plates.
   6. When asphalt or cold adhesive attachment is specified, the proposed insulation shall be compatible with the roof substrate, the proposed bitumen and the requirements of the specific membrane.

3.3 INSTALLATION - GENERAL

A. Install modified bitumen membranes and flashings in accordance with manufacturer's instructions and with the recommendations provided by the National Roofing Contractors Association's Roofing & Waterproofing Manual, the Asphalt Roofing Manufacturers Association, and applicable codes.

B. General: Avoid installation of modified bitumen membranes at temperatures lower than 40-45 degrees F. When work at such temperatures unavoidable use the following precautions:
   1. Take extra care during cold weather installation and when ambient temperatures are affected by wind or humidity, to ensure adequate bonding is achieved between the surfaces to be joined. Use extra care at material seam welds and where adhesion of the applied product to the appropriately prepared substrate as the substrate can be affected by such temperature constraints as well.
   2. Unrolling of cold materials, under low ambient conditions must be avoided to prevent the likelihood of unnecessary stress cracking. Rolls must be at least 40 degrees F at the time of application. If the membrane roll becomes stiff or difficult to install, it must be replaced with roll from a heated storage area.

C. Commence installation of the roofing system at the lowest point of the roof (or roof area), working up the slope toward the highest point. Lap sheets shingle fashion so as to constantly shed water

D. All slopes greater than 2:12 require back-nailing to prevent slippage of the ply sheets. Use ring or spiral-shank 1 inch cap nails, or screws and plates at a rate of 1 fastener per ply (including the membrane) at each insulation stop. Place insulation stops at 16 ft o.c. for slopes less than 3:12 and 4 feet o.c. for slopes greater than 3:12. On non-insulated systems, nail each ply directly into the deck at the rate specified above. When slope exceeds 2:12, install all plies parallel to the slope (strapping) to facilitate backnailing. Install 4 additional fasteners at the upper edge of the membrane when strapping the plies.

3.4 INSTALLATION TORCH APPLIED 2-PLY ASPHALT ROOFING

A. Base Ply: Install torch base sheet to a properly prepared substrate. Shingle in proper direction to shed water on each area of roofing.
1. Lay out the roll in the course to be followed and unroll 6 feet.
2. Using a roofing torch, heat the surface of the coiled portion until the burn-off backer melts away. At this point, the material is hot enough to lay into the substrate. Progressively unroll the sheet while heating and press down with your foot to insure a proper bond.
3. After the major portion of the roll is bonded, re-roll the first 6 feet and bond it in a similar fashion.
4. Repeat this operation with subsequent rolls with side laps of 4 inches and end laps of 8 inches.
5. Give each lap a finishing touch by passing the torch along the joint and spreading the melted bitumen evenly with a rounded trowel to insure a smooth, tight seal.
6. Extend underlayment 2 inches beyond top edges of cants at wall and projection bases.
7. Install base flashing ply to all perimeter and projections details.

B. Modified Cap (Ply) Sheet: Over torch base sheet underlayment, lay out the roll in the course to be followed and unroll 6 feet. Stagger seams over the torch base sheet seams.
1. Using a roofing torch, heat the surface of the coiled portion until the burn-off backer melts away. At this point, the material is hot enough to lay into the substrate. Progressively unroll the sheet while heating and press down with your foot to insure a proper bond.
2. After the major portion of the roll is bonded, re-roll the first 6 feet and bond it in a similar fashion.
3. Repeat this operation with subsequent rolls with side laps of 4 inches and end laps of 8 inches.
4. Give each lap a finishing touch by passing the torch along the joint and spreading the melted bitumen evenly with a rounded trowel to insure a smooth, tight seal.

C. Fibrous Cant Strips: Provide non-combustible perlite or glass fiber cant strips at all wall/curb detail treatments where angle changes are greater than 45 degrees. Cant may be set in approved cold adhesives or mechanically attached with approved plates and fasteners.

D. Wood Blocking, Nailers and Cant Strips: Provide wood blocking, nailers and cant strips as required for new insulation heights.
1. Provide nailers at all roof perimeters and penetrations for fastening membrane flashings and sheet metal components.
2. Wood nailers should match the height of any insulation, providing a smooth and even transition between flashing and insulation areas.
3. Nailer lengths should be spaced with a minimum 1/8 inch gap for expansion and contraction between each length or change of direction.
4. Nailers and flashings should be fastened in accordance with Factory Mutual "Loss

Prevention Data Sheet 1- 49, Perimeter Flashing" and be designed to be capable of resisting a minimum force of 200 lbs/lineal foot in any direction.

E. Metal Work: Provide metal flashings, counter flashings, parapet coping caps and thru-wall flashings as specified in Section 07620. Install in accordance with the SMACNA "Architectural Sheet Metal Manual" or the NRCA Roofing Waterproofing manual.

F. Termination Bar: Provide a metal termination bar or approved top edge securement at the terminus of all flashing sheets at walls and curbs. Fasten the bar a minimum of 8 inches o/c to achieve constant compression. Provide suitable, sealant at the top edge if required.

G. Flashing Base Ply: Seal all curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
1. Prepare all walls, penetrations, expansion joints, and other surfaces to be flashed with asphalt primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
2. Adhere modified flashing base to the underlying base flashing ply with specified flashing ply adhesive. Nail off at a minimum of 8 inches o.c. from the finished roof at all vertical surfaces.
3. Solidly adhere the entire sheet of flashing membrane to the substrate. Tops of all flashings that are not run up and over curb shall be secured through termination bar 6 inches and sealed at top with polyurethane caulking.
4. Seal all vertical laps of flashing membrane with an 8” wide strip of torch applied cap sheet. Prime area of flashing membrane prior to installation of 8” strip.
5. Coordinate counter flashing, cap flashings, expansion joints, and similar work with modified bitumen roofing work.
6. Coordinate roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices with the roofing system work. When using mineralized cap sheet all stripping plies shall be installed prior to cap sheet installation.

H. Flashing Cap Ply: Install flashing cap sheets by the same application method used for the base ply.
1. Seal curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
2. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
3. Adhere to the underlying base flashing ply with specified flashing ply adhesive unless otherwise specified. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
4. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
5. Coordinate roof accessories, miscellaneous sheet metal accessory items with the roofing system work.
6. All stripping shall be installed prior to flashing cap sheet installation.
7. Heat and scrape granules when welding or adhering at cut areas and seams to granular surfaces at all flashings.
8. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed, or nailed 4 inches on center and covered with an acceptable counter flashing.

I. Roof Walkways: Provide walkways in areas indicated on the Drawings.

3.5 CLEANING

A. Clean-up and remove daily from the site all wrappings, empty containers, paper, loose particles and other debris resulting from these operations.

B. Remove asphalt markings from finished surfaces.

C. Repair or replace defaced or disfigured finishes caused by Work of this section.

3.6 PROTECTION

A. Provide traffic ways, erect barriers, fences, guards, rails, enclosures, chutes and the like to protect personnel, roofs and structures, vehicles and utilities.

B. Protect exposed surfaces of finished walls with tarps to prevent damage.

C. Plywood for traffic ways required for material movement over existing roofs shall be not less than 5/8 inch thick.

D. In addition to the plywood listed above, an underlayment of minimum 1/2 inch recover board is required on new roofing.

E. Special permission shall be obtained from the Manufacturer before any traffic shall be permitted over new roofing.

3.7 FIELD QUALITY CONTROL

A. Inspection: Provide manufacturer's field observations at start-up and at intervals of a minimum of two days per week with weekly reports provided to the Architect. Provide punch list and a final inspection report upon completion of the Work.
   1. Warranty shall be issued upon manufacturer's acceptance of the installation.
   2. Field observations shall be performed by a Sales Representative employed full-time by the manufacturer and whose primary job description is to assist, inspect and approve membrane installations for the manufacturer.
   3. Provide observation reports from the Sales Representative indicating procedures followed, weather conditions and any discrepancies found during inspection.
   4. Provide a final report from the Sales Representative, certifying that the roofing system has been satisfactorily installed according to the project specifications, approved details and good general roofing practice.

3.8 SCHEDULES

A. Base (Ply) Sheet:
   1. Torch Base: 110 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing base sheet reinforced with a fiberglass scrim. Designed for torch applications with a burn-off backer that indicates when the material is hot enough to be installed.
      a. Tensile Strength, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 210 lbf/in XD 210 lbf/in
         2) 50 mm/min. @ 23 +/- 2 deg. C MD 36.75 kN/m XD 36.75 kN/m
      b. Tear Strength, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 300 lbf XD 300 lbf
         2) 50 mm/min. @ 23 +/- 2 deg. C MD 1,334 N XD 1,334 N

c. Elongation at Maximum Tensile, ASTM D 5147
   1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 6% XD 6%
   2) 50 mm/min. @ 23 +/- 2 deg. C MD 6% XD 6%
d. Low Temperature Flexibility, ASTM D5147, Passes -30 deg. F (-34.4 deg. C)

B. Modified Cap (Ply) Sheet:
1. Modified Cap: 180 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing membrane reinforced with a fiberglass and polyester composite scrim. This membrane is designed for torch applications and has a burn-off backer that indicates when the material is hot enough to be installed.
   a. Tensile Strength, ASTM D 5147
      1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 310 lbf/in XD 310 lbf/in
      2) 50 mm/min. @ 23 +/- 2 deg. C MD 54.25 kN/m XD 54.25 kN/m
   b. Tear Strength, ASTM D 5147
      1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 510 lbf XD 510 lbf
      2) 50 mm/min. @ 23 +/- 2 deg. C MD 2269 N XD 2269 N
   c. Elongation at Maximum Tensile, ASTM D 5147
      1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 9% XD 8%
      2) 50 mm/min. @ 23 +/- 2 deg. C MD 9% XD 8%
   d. Low Temperature Flexibility, ASTM D 5147, Passes -40 deg. F (-40 deg. C)

C. Flashing Base Ply:
1. Torch Base: SBS modified, torch applied sheet material. ASTM D 6163, Type II.
   a. Tensile Strength, ASTM D 5147
      1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 210 lbf/in XD 210 lbf/in
      2) 50 mm/min. @ 23 +/- 2 deg. C MD 210 lbf/in XD 210 lbf/in
   b. Tear Strength, ASTM D 5147
      1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 300 lbf XD 300 lbf
      2) 50 mm/min. @ 23 +/- 2 deg. C MD 1334 N XD 1334 N
   c. Elongation at Maximum Tensile, ASTM D 5147
      1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 6 % XD 6 %
      2) 50 mm/min@ 23 +/- 2 deg. C MD 6 % XD 6 %
   d. Low Temperature Flexibility, ASTM D 5147:
      1) Passes -30 deg. F (-34 deg. C). Meets or Exceeds ASTM D 4601 Type II Performance Criteria.

D. Flashing Cap Ply:
1. Flashing Cap (Ply) Sheet: (Garland, StressPly IV Plus UV Mineral)
   a. Modified Cap: 195 mil SBS (Styrene-Butadiene- Styrene) mineral surfaced rubber modified roofing membrane with a fiberglass and polyester composite scrim. Designed for torch applications with a burn-off backer that indicates when the material is hot enough to be installed. Surfaced with a highly reflective Sunburst mineral.
      1) Tensile Strength, ASTM D 5147
         a) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 310 lbf/in XD 310 lbf/in
         b) 50 mm/min. @ 23 +/- 2 deg. C MD 54.25 kN/m XD 54.25 kN/m
      2) Tear Strength, ASTM D 5147
         a) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 510 lbf XD 510 lbf
         b) 50 mm/min. @ 23 +/- 2 deg. C MD 2269 N XD 2269 N
      3) Elongation at Maximum Tensile, ASTM D 5147
         a) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 9% XD 8%
         b) 50 mm/min. @ 23 +/- 2 deg. C MD 9% XD 8%

4) Low Temperature Flexibility, ASTM D 5147, Passes -40 deg. F (-40 deg. C)
5) Reflectivity, ASTM C 1549: 73% (0.73)
6) Color: White
7) SRI: 89
8) Emittance: 0.90

END OF SECTION

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the Conditions of the Contract and Division 01 Specification Sections apply to this section.

1.2 SUMMARY

A. Provide all labor, equipment, and materials to fabricate and install the following.
1. Diverter at exterior walkways
2. Fascia and counter flashings
3. Coping cap at parapets
4. Fascia and edge metal
5. Gutters and down spouts

B. Related Sections:
1. Division 07 Section - Modified Bituminous Membrane Roofing

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)
1. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (galvanized) or Zinc-Iron Alloy-Coated (galvannealed) by the Hot-Dip Process.
2. ASTM A792 Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot-Dip Process.
3. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
4. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
5. ASTM D692 Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.

B. American National Standards Institute and Single Ply Roofing Institute (ANSI/SPRI)
1. ANSI/SPRI ES-1 Testing and Certification Listing of Shop Fabricated Edge Metal

C. Warnock Hersey International, Inc., Middleton, WI (WH)

D. Factory Mutual Research Corporation (FMRC)

1. FM 1-49 Loss Prevention Data Sheet

E. Underwriters Laboratories (UL)

F. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
1. 1993 Edition Architectural Sheet Metal Manual

G. National Roofing Contractors Association (NRCA)
1. Roofing and Waterproofing Manual

H. American Society of Civil Engineers (ASCE)
1. ASCE 7 Minimum Design Loads for Buildings and Other Structures

1.4 SUBMITTALS FOR REVIEW

A. Product Data:
1. Provide manufacturer's specification data sheets for each product.
2. Metal material characteristics and installation recommendations.
3. Submit color chart prior to material ordering and/or fabrication so that equivalent colors to those specified can be approved.

B. Samples: Submit two (2) samples, illustrating typical metal edge, coping, gutters, fascia extenders for material and finish.

C. Shop Drawings
1. For manufactured and ANSI/SPRI ES-1 compliant shop fabricated gravel stops, fascia, scuppers, and all other sheet metal fabrications.
2. Indicate material profile, jointing details, fastening methods, flashing, terminations, and installation details.
3. Indicate type, gauge and finish of metal

D. Specimen Warranty: Provide an unexecuted copy of the warranty specified for this Project, identifying the terms and conditions required of the Manufacturer and the Owner.

1.5 SUBMITTALS FOR INFORMATION

A. Design Loads: Any material submitted shall show that the assembly meets the wind uplift and perimeter attachment requirements according to ASCE 7 and that the edge metal system is compliant with the ANSI/SPRI ES-1 standard.

B. Factory Mutual Research Corporation's (FMRC) wind uplift resistance classification: The roof perimeter flashing shall conform to the requirements as defined by the FMRC Loss Prevention Data Sheet 1-49.

C. A letter from the manufacturing company certifying that the materials furnished for this project are the same as represented in tests and supporting data.

D. Mill production reports certifying that the steel thicknesses are within allowable tolerances of the nominal or minimum thickness or gauge specified.

E. Certification of work progress inspection. Refer to Quality Assurance Article below.

F. Certifications.
1. Submit roof manufacturer's certification that metal fasteners furnished are acceptable.
2. Submit roof manufacturer's certification that metal furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.

1.6 QUALITY ASSURANCE

A. Engage an experienced roofing contractor specializing in sheet metal flashing work with a minimum of five (5) years' experience.

B. Maintain a full-time supervisor/foreman who is on the job-site at all times during installation. Foreman must have a minimum of five (5) years experience with the installation of similar system to that specified.

C. Source Limitation: Obtain components from a single manufacturer. Secondary products which cannot be supplied by the specified manufacturer shall be approved in writing by the primary manufacturer prior to bidding.

D. Upon request fabricator/installer shall submit work experience and evidence of financial responsibility. The Owner's representative reserves the right to inspect fabrication facilities in determining qualifications.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible.

B. Stack pre-formed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials which may cause discoloration or staining.

1.8 PROJECT CONDITIONS

A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for metal edge system.

1.9 DESIGN AN DPERFORMANCE CRIERIA

A. Thermal expansion and contraction:
   1. Completed metal edge flashing system, shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.

1.11 WARRANTIES

A. Owner shall receive one (1) warranty from manufacturer of roofing materials covering all of the following criteria. Multiple warranties are not acceptable.
   1. Pre-finished metal material shall require a written twenty (20)- year non-prorated warranty covering fade, chalking and film integrity. The material shall not show a color change greater than 5 NBS color units per ASTM D2244 or chalking excess of 8 units per ASTM D659. If either occurs material shall be replaced per warranty, at no cost to the Owner.
   2. Changes: Changes or alterations in the edge metal system without prior written consent from the manufacturer shall render the system unacceptable for a warranty.
   3. Warranty shall commence on date of substantial completion or final payment, whichever is agreed by contract.
   4. The Contractor shall provide the Owner with a notarized written warranty assuring that all sheet metal work including caulking and fasteners to be watertight and secure for a period of two years from the date of final acceptance of the building. Warranty shall

include all materials and workmanship required to repair any leaks that develop, and make good any damage to other work or equipment caused by such leaks or the repairs thereof.

5. Installing roofing contractor shall be responsible for the installation of the edge metal system in general accordance with the membrane manufacturer's recommendations.
6. Installing contractor shall certify that the edge metal system has been installed per the manufacturer's printed details and specifications.
7. One manufacturer shall provide a single warranty for all accessory metal for flashings, metal edges and copings, along with the warranty for metal roof areas, membrane roof areas, and any transitions between two different material types.

PART 2 – PRODUCTS

2.1 PRODUCTS, GENERAL

A. Refer to Division 01 Section "Common Product Requirements."

B. Basis of Design: Materials, manufacturer's product designations, and/or manufacturer's names specified herein shall be regarded as the minimum standard of quality required for work of this Section. Comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1.

2.2 MATERIALS AND ACCESSORIES

A. Metal Primer: Zinc chromate type.

B. Plastic Cement: ASTM D 4586, Flashing Bond or approved equal.

C. Sealant: Tuff Stuff Urethane Sealant or approved equal.

D. Fasteners:
1. Corrosion resistant screw fastener as recommended by metal manufacturer. Finish exposed fasteners same as flashing metal.
2. Fastening shall conform to Factory Mutual requirements or as stated on section details, whichever is more stringent.

E. Gutter and Downspout Anchorage Devices: Material as specified for system

PART 3 – EXECUTION

3.1 EXECUTION, GENERAL

A. Refer to Division 07 Sections.

3.2 PROTECTION

A. Isolate metal products from dissimilar metals, masonry or concrete with bituminous paint, tape, or slip sheet. Use gasketed fasteners where required to prevent corrosive reactions.

3.3 GENERAL

A. Secure fascia to wood nailers at the bottom edge with a continuous cleat.

B. Fastening of metal to walls and wood blocking shall comply with building code standards.

C. All accessories or other items essential to the completeness of sheet metal installation, whether specifically indicated or not, shall be provided and of the same material as item to which applied.

D. Allow sufficient clearances for expansion and contraction of linear metal components. Secure metal using fasteners as required by the system. Exposed face fastening will be rejected.

3.4 INSPECTION

A. Verify that curbs are solidly set and nailing strips located.

B. Perform field measurements prior to fabrication.

C. Coordinate work with work of other trades.

D. Verify that substrate is dry, clean and free of foreign matter.

E. Commencement of installation shall be considered acceptance of existing conditions.

3.5 SHOP-FABRICATED SHEET METAL

A. Metal work shall be shop fabricated to configurations and forms in accordance with recognized sheet metal practices.

B. Hem exposed edges.

C. Angle bottom edges of exposed vertical surfaces to form drip.

D. Lap corners with adjoining pieces fastened and set in sealant.

E. Form joints for gravel stop fascia system, coping cap with a 3/8” opening between sections. Back the opening with an internal drainage plate formed to the profile of fascia piece.

F. Install sheet metal to comply with referenced ANSI/SPRI, SMACNA and NRCA standards.

3.6 FLASHING MEMBRANE INSTALLATION

A. Parapet Wall Surface Mounted Counter Flashing Detail
   1. Position base ply of the Modified Roofing flashing membrane extending a minimum of 12” above the new roof surface. Install top ply of base flashing and extend 12” above roof surface. Mechanically terminate flashings eight (8) inches on center. Install membrane and cap sheet with proper material and procedure according to manufacturer’s recommendations.
   2. Install 24 gauge galvanized surface mounted counter flashing to tilt-wall at 12” on center. Set counter flashing in butyl tape prior to mechanically fastening to wall.

3. Counter flashing to utilize caulk trough and urethane sealant installed to drain water and hold it in the caulk trough.
4. Install 8” strip of modified cap sheet over all flashing laps. Flashing laps are not to be over 5’ apart.

B. Coping Cap Detail
1. Install new 24 gauge pre-painted metal coping on parapet walls
2. Base flashing of the Modified Roofing membrane to extend over the wall edge covering nailers completely, fastening eight (8) inches on center.
3. Install top ply of flashing membrane and terminate to wood nailer fastening 12” on center.
4. Install 8” strip of modified cap sheet over all flashing laps. Flashing laps are not to be over 5’ apart.

C. Parapet Wall Surface Mounted Counter Flashing Detail
1. Position base ply of the Modified Roofing flashing membrane extending a minimum of 12” above the new roof surface. Install top ply of base flashing and extend 12” above roof surface. Mechanically terminate flashings eight (8) inches on center. Install membrane and cap sheet with proper material and procedure according to manufacturer’s recommendations.
2. Install 24 gauge pre-painted reglet mounted counter flashing to brick wall at approximately 14” above roof surface. Set reglet counter in caulking prior to installing in reglet joint. Mechanically fasten 12” on center.
3. Install 8” strip of modified cap sheet over all flashing laps. Flashing laps are not to be over 5’ apart.

3.7 CLEANING

A. Clean installed work in accordance with the manufacturer’s instructions.

B. Replace damaged work than cannot be restored by normal cleaning methods.

3.8 CONSTRUCTION WASTE MANAGEMENT

A. Remove and properly dispose of waste products generated. Comply with requirements of authorities having jurisdiction.

3.9 FINAL INSPECTION

A. At completion of installation and associated work, meet with Contractor, Architect, installer, installer of associated work, Owner, roofing system manufacturer’s representative and other representatives directly concerned with performance of roofing system.

B. Inspect work and flashing of roof penetrations, walls, curbs, and other equipment. List all items requiring correction or completion and furnish copy of list to each party in attendance.

C. Repair or replace deteriorated or defective work found at time above inspection as required to a produce an installation which is free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

D. Notify the Owner upon completion of corrections.

E. Following the final inspection, provide written notice of acceptance of the installation from the roofing system manufacturer.

F. Immediately correct roof leakage during construction. If the Contractor does not respond within twenty-four (24) hours, the Owner will exercise rights to correct the Work under the terms of the Conditions of the Contract.

3.10 DEMONSTRATION AND TRAINING

A. At a time and date agreed to by the Owner, instruct the Owner's facility manager, or other representative designated by the Owner, on the following procedures:
   1. Troubleshooting procedures
   2. Notification procedures for reporting leaks or other apparent roofing problems
   3. Maintenance
   4. The Owner's obligations for maintaining the warranty in effect and force
   5. The Manufacturer's obligations for maintaining the warranty in effect and force.

END OF SECTION

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Mildew-resistant joint sealants.
4. Latex joint sealants.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples: For each kind and color of joint sealant required.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Preconstruction laboratory test reports.

C. Preconstruction field-adhesion-test reports.

D. Field-adhesion-test reports.

E. Sample warranties.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1.7 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
1. Dow Corning Corp., Tremco Inc., GE Advance Mat.; Polymeric Sys.

B. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.
   1. Dow corning Corp., May Nat. Assoc., Pecora corp., Tremco Inc.

2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, N T: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
   1. BASF Bldg. Sys., Pecora Corp., Sika Corp., Temco Inc.

B. Urethane, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.
   1. BASF Bldg. Sys., Pacific Polymers Inc., Sika Corp., Tremco Inc.

2.4 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

C. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

2.5 JOINT-SEALANT BACKING

A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove laitance and form-release agents from concrete.
2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.2 INSTALLATION OF JOINT SEALANTS

A. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

1. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.4 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Construction joints in cast-in-place concrete.
b. Joints between plant-precast architectural concrete units.
c. Control and expansion joints in unit masonry.
d. Joints in dimension stone cladding.
e. Other joints as indicated on Drawings.

2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.
b. Control and expansion joints in stone flooring.
c. Control and expansion joints in brick flooring.
d. Control and expansion joints in tile flooring.
e. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, P, 25, T, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Tile control and expansion joints.

c. Vertical joints on exposed surfaces of concrete walls and partitions.
d. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.

1. Joint Locations:

a. Control joints on exposed interior surfaces of exterior walls.
b. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Acrylic latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Concealed mastics.

1. Joint Locations:

a. Aluminum thresholds.
b. Sill plates.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Butyl-rubber based.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Interior standard steel doors and frames.
2. Exterior standard steel doors and frames.

B. Provide equivalent door and frame replacement to match existing conditions.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.

C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Field quality control reports.

1.5 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.6 QUALITY ASSURANCE

A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:

1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

B. Egress Door Inspector Qualifications: Inspector for field quality control inspections of egress door assemblies shall meet the qualifications set forth in NFPA 101, section 7.2.1.15.4 and the following:

1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ceco Door; ASSA ABLOY.
2. Curries Company; ASSA ABLOY.
3. Steelcraft
4. DKS Steel Door & Frame

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
2. Temperature-Rise Limit: Where indicated on Drawings or At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

C. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of 0.60 deg Btu/F x h x sq. ft when tested according to ASTM C 518.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2; SDI A250.4, Level B. At locations indicated in the Door and Frame Schedule

a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 1-3/4 inches
c. Face: Uncoated steel sheet, minimum thickness of 0.042 inch
d. Edge Construction: Model 1, Full Flush
e. Core: Kraft-paper honeycomb
f. Fire-Rated Core: Manufacturer's standard vertical steel stiffener core for fire-rated and temperature-rise-rated doors.

2. Frames:

a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch
b. Construction: Face welded

2.4 EXTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2; SDI A250.4, Level B.At locations indicated in the Door and Frame Schedule

1. Doors:

a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 1-3/4 inches
c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch , with minimum A40 or A60 coating.
d. Edge Construction: Model 1, Full Flush
e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
g. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
h. Core: Manufacturer's standard - honeycomb to comply with thermal requirements.
i. Fire-Rated Core: Manufacturer's standard vertical steel stiffener with insulation core for fire-rated doors.

2. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch with minimum A40 or A60 coating.
b. Construction: Face welded

c. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
d. Core: Manufacturer's standard – honeycomb
e. Fire-Rated Core: Manufacturer's standard [vertical steel stiffener with insulation] core for fire-rated doors

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet
3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.

D. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M; hot-dip galvanized according to ASTM A 153/A 153M, Class B.

2.6 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

G. Glazing: Comply with requirements in Section 088000 "Glazing."

2.7 FABRICATION

A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding**,** or by rigid mechanical anchors.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

2.8 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. Hollow-Metal Frames: Comply with SDI A250.11 or NAAMM-HMMA 840.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.

    a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    b. Install frames with removable stops located on secure side of opening.

2. Fire-Rated Openings: Install frames according to NFPA 80.
3. Floor Anchors: Secure with postinstalled expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

4. Solidly pack mineral-fiber insulation inside frames.
5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

d. Plumbness: Plus or minus 1/16 inch measured at jambs at floor.

B. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.

1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8 , NAAMM-HMMA 841 and NAAMM-HMMA guide specification indicated.
2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

A. Inspections:

1. Fire-Rated Door Inspections: Inspect each fire-rated door according to NFPA 80, section 5.2
2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements according to NFPA 101, section 7.2.1.15.

B. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

C. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

D. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 CLEANING AND TOUCHUP

A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 081613 - FIBERGLASS ENTRY DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fiberglass Entry Doors
B. Impact Resistant Fiberglass Entry Doors
C. Fire Rated Fiberglass Entry Doors

1.2 RELATED SECTIONS

A. 06 40 00 - Architectural Woodwork

B. 07 92 00 – Joint Sealants: Sealants and caulking

C. 08 71 00 – Door Hardware

D. 09 90 00 - Painting and Coatings

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E 90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
   2. ASTM E 283 – Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Difference Across the Specimen.
   3. ASTM E 330 – Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
   4. ASTM E 331 – Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
   5. ASTM E 413 – Classification for Rating Sound Insulation (STC).
   6. ASTM E 547 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference.
   7. ASTM E 1300 – Standard Practice for Determining Load Resistance of Glass in Buildings.
   8. ASTM E 1332 – Standard Classification for Determination of Outdoor-Indoor Transmission Class.
   9. ASTM E 1886 – Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missiles and Exposed to Cyclic Pressure Differentials.
   10. ASTM E 1996 – Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
   11. ASTM E 2235 – Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods.

B. Environmental Protection Agency and Department of Energy:
   1. Energy Star Program Requirements Product Specification for Residential Windows and Doors,

C. Code of Federal Regulations:
   1. CFR 1201 Part 2 – Safety Standard for Architectural Glazing Materials.

D. National Fenestration Rating Council
   1. NFRC 100 – Procedure for Determining Fenestration Product U-Factors.

I. National Fire Protection Association
   1. NFPA 252 – Standard Methods of Fire Tests of Door Assemblies

J. Underwriters Laboratory
   1. UL 10B – Standard for Fire Testing Door Assemblies.
   2. UL 10C – Standard for Positive Pressure Fire Tests of Door Assemblies.

1.4 PERFORMANCE REQUIREMENTS

A. N/A

B. N/A

C. Door Unit Air Leakage, NFRC 400, 1.57 psf (25 mph): 0.50 cfm per square foot of frame or less.

D. Door Unit Water Penetration: No water penetration through door unit when tested in accordance with ASTM E 331or ASTM E 547 with water applied at rate of 5 gallons per hour per square foot at 0 psf.

E. Doors shall have a minimum STC rating of 36

F. N/A

G. Doors shall have a minimum U-Factor of 0.40

H. Doors shall qualify for Energy Star Rating.

1.5 SUBMITTALS

A. Refer to Section 013300 Submittal Procedures

B. Product Data: Submit door manufacturer current product literature, including installation instructions.

C. Shop Drawings: Submit manufacturer's shop drawings, indicating dimensions, construction, component connections, anchorage methods and locations, accessories, hardware locations, and installation details.

D. Samples: Submit full-size or partial full-size verification sample of door illustrating glazing system, quality of construction, texture, and color of finish.

1.6 QUALITY ASSURANCE

A. Mockup:
   1. Provide sample unit of representative product size and using manufacturer approved installation methods to determine acceptability of door installation methods. Comply with Division 01 43 39 Quality Assurance
   2. Approved mockup shall represent minimum quality required for the Work.
   3. Approved mockup shall [not] remain in place within the Work.

C. Quality Assurance Submittals:
   1. Provide documentation for specified performance as required.
   2. Manufacturers' installation instructions.

D. Manufacturer Qualifications: Manufacturer shall have successful experience in producing the type of product required for project applications equivalent to the requirements for this project.

E. Installer Qualifications:
   1. [Optional: Installer holds current credential as a Therma-Tru® Certified Installer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 016000 Product Requirements.

B. Delivery: Deliver materials to site undamaged with labels clearly identifying manufacturer, product name, and installation instructions

C. Storage: Store materials in an upright position, off ground, under cover, and protected from weather, direct sunlight, and construction activities.

D. Handling: protect materials and finish during handling and installation to prevent damage.

1.8 WARRANTY

A. Refer to Section 017836 Warranties

B. Therma-Tru® standard limited warranty for fiberglass Therma-Tru® Door Product and genuine Therma-Tru® components, including rot-resistant frames, mullions, and brickmould sourced from Therma-Tru (excluding primed pine door frames and oak door

frames, and non-rot resistant mullions and brickmould) used in commercial and multi-residential projects will be free from material and workmanship defects for a period of three years subject to certain limitations and restrictions. For complete details and current warranty information go to www.thermatru.com.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Basis of Design: Therma-Tru Corp.
1750 Indian Wood Circle Maumee, OH 43537
(419) 891-7400
(800) 843-7628
www.thermatru.com

B. Substitutions: Approved Equal
C. Requests for substitutions will be considered in accordance with provisions of Sect. 01 60 00

2.2 FIBERGLASS ENTRY DOORS

A. Fiberglass Entry Doors: All fiberglass doors manufactured by Therma-Tru®. Specification is for doors only manufactured by Therma-Tru® and assembled by independent fabricators.

1. Select Smooth-Star®

2. Construction:

a. Smooth Star®
1/16-inch minimum thickness, proprietary fiberglass-reinforced thermoset composite, surface lightly textured. Door edges are machinable kiln-dried pine, primed, lock edge reinforced with engineered lumber core, lockset area reinforced with solid blocking for hardware backup. Door bottom edge is moisture- and decay-resistant composite. Core is foamed-in-place polyurethane, density 1.9 pcf minimum.

3. Door Style

a. Smooth-Star®
1. Enter Style

B. Frames: Provided and assembled by third party fabricators to exacting specifications from Therma-Tru to help maximize system performance. Therma-Tru® strongly recommends the use of rot-resistant frames, mullions, and brickmould sourced from Therma-Tru, however, the use of a non

C. Sills

1. Outswing: Aluminum No Thermal Break

2. Finish: Mill

2.3 HARDWARE

A. Hinges: Steel, 4 x 4 x 0.098 inches finished to match hardware, plated screws to match

1. Finish: See Section 087100 - Hardware

B. Locking Hardware:
1. Multi-point lock system includes stainless steel face plate.
2. Multi-point lock system handle set hardware.

3. Finish: See Section 087100 - Hardware

2.4 INSTALLATION ACCESSORIES

A. Sill pan

B. Corner seal pad

C. Rain deflector

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive doors. Notify Architect in writing any unacceptable conditions that would adversely affect installation or subsequent performance of the product. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install fiberglass doors in full compliance with Therma-Tru® written instructions and approved shop drawings.

B. Install 20 minute doors with permanent fire door certification label in compliance with the requirements of the labeling agency and NFPA.

C. Maintain alignment and compatibility with adjacent work.

3.3 FINISHING

A. Finish in compliance with Therma-Tru® written recommendations. Guidance for proper finishing is available at www.thermatru.com – "Recommendations for Proper Finishing and Painting or Staining."

3.3 Protection

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products prior to Substantial Completion in accordance with Therma-Tru written recommendations. Guidance for proper finishing is available at www.thermatru.com – "Recommendations for Proper Finishing and Painting or Staining."

END OF SECTION

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Five-ply flush wood doors for opaque finish.
2. Hollow-core flush wood doors for opaque finish.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Door core materials and construction.
2. Door edge construction
3. Door face type and characteristics.
4. Factory-machining criteria.
5. Factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware
3. Details of frame for each frame type, including dimensions and profile.
4. Dimensions and locations of blocking for hardware attachment.
5. Clearances and undercuts.
6. Requirements for veneer matching.
7. Doors to be equal in quality to AWI Quality Certification or WI Certified Compliance

C. Samples: For factory-finished doors.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For door inspector.

1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
3. Submit copy of DHI's Fire and Egress Door Assembly Inspector (FDAI) certificate.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Quality Standard Compliance Certificates: Equal in quality to WI Quality Certification or WI Certified Compliance Program certificates.

B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

C. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies shall comply with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

D. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies shall comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:

1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Wood Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings and temperature-rise limits , based on testing at positive pressure in accordance with UL 10C or NFPA 252.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
2. Temperature-Rise Limit At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

2.2 FLUSH WOOD DOORS , GENERAL

A. Quality Standard: In addition to requirements specified, comply with "Architectural Woodwork Standards “

2.3 FIVE-PLY FLUSH WOOD DOORS FOR OPAQUE FINISH

A. Exterior Doors

1. Manufacturers: Eggers Industreis; Lambton Doors; Oshkosh Door Co.; VT Industries or Approved Equal.
2. Performance Grade: WDMA I.S. 1A Extra Heavy Duty
3. Architectural Woodwork Standards Grade: Custom
4. Faces: MDO

    a. Apply MDO to standard-thickness, closed-grain, hardwood face veneers

5. Exposed Vertical and Top Edges: Any closed-grain hardwood.

6. Core: Either glued wood stave or WDMA I.S. 10 structural composite lumber.
7. Construction: Five plies, hot-pressed, bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.
8. Adhesives: Type I in accordance with WDMA T.M. 6.

2.4 HOLLOW-CORE FLUSH WOOD DOORS FOR OPAQUE FINISH

A. Interior Doors

1. Manufacturers: ABS-American Building; Chappell Door; General Veneer; Lambton Doors or Approved Equal.
2. Performance Grade: WDMA I.S. 1A Standard Duty.
3. Architectural Woodwork Standards Grade [Custom].
4. Faces: Any closed-grain hardwood of mill option

    a. Hardboard Faces: ANSI A135.4, Class 1 (tempered) or Class 2 (standard).

5. Exposed Vertical and Top Edges: Any closed-grain hardwood.
6. Construction: Institutional hollow core.
7. Blocking: Provide wood blocking with minimum dimensions as follows:

    a. 5-by-18-inch lock blocks at both stiles.
    b. 5-inch top- and bottom-rail blocking.

    c. 2-1/2-inch midrail blocking.

2.5 FIRE-RATED WOOD DOOR FRAMES

A. Interior Frames:

1. Manufacturers: Eggers industries; Lambton Doors; Oshkosh Door Co.
2. Architectural Woodwork Standards Grade: Custom.
3. Wood Species and Cut: Match species and cut indicated for wood doors unless otherwise indicated.
4. Species: Red oak or as selected by Owner.
5. Cut: Plain sliced/plain sawn.
6. Wood Moisture Content: 5 to 10 percent.
7. Profile: T-stop
8. Construction: Solid lumber, fire-retardant particleboard, or fire-retardant medium density fiberboard (MDF) with veneered exposed surfaces and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated on Drawings.

2.6 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated.

1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
2. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.

1. Locate hardware to comply with DHI-WDHS-3.
2. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
5. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
3. Louvers: Factory install louvers in prepared openings.

D. Exterior Doors: Factory treat exterior doors with water repellent after fabrication has been completed but before factory finishing.

1. Flash top of out swinging doors with manufacturer's standard metal flashing.

2.7 FACTORY PRIMING

A. Doors for Opaque Finish: Factory prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 099113 "Exterior Painting." Section 099123" Interior Painting."

2.8 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.

1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
2. Finish faces, all four edges, edges of cutouts, and mortises.
3. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Factory finish doors where indicated in schedules or on Drawings as factory finished.

D. Opaque Finish:

1. Architectural Woodwork Standards Grade: Custom.

2. Color: As selected by Architect or Owner from manufacturer's full range.
3. Sheen: Semigloss

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."

B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

1. Install fire-rated doors and frames in accordance with NFPA 80.

2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.

C. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.2 FIELD QUALITY CONTROL

A. Inspections:

1. Provide inspection of installed Work certifying that wood doors and frames, including installation, comply with requirements of "Architectural Woodwork Standards" for the specified grade.
2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
3. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.

B. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

C. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

D. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS (REVISED)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior storefront framing.
2. Storefront framing for punched openings.
3. Exterior Bi-Fold entrance doors and door-frame units.

1.3 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U. S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:
    a. Deflection exceeding specified limits.
    b. Thermal stresses transferring to building structure.
    c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
    d. Glazing-to-glazing contact.
    e. Noise or vibration created by wind and by thermal and structural movements.
    f. Loosening or weakening of fasteners, attachments, and other components.
    g. Sealant failure.
    h. Failure of operating units.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Loads:

1. Wind Loads:
   a. Basic Wind Speed: 100 mph.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below them to less than 1/8 inch and clearance between members and operable units directly below them to less than 1/16 inch.

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa).

G. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

H. Water Penetration under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

1. Maximum Water Leakage: No uncontrolled water penetrating aluminum-framed systems or water appearing on systems' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior and water that cannot damage adjacent materials or finishes.

I. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).

3. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

J. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.

K. Thermal Conductance: P rovide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.57 Btu/sq. ft. x h x de g F (3.23 W/sq. m x K) when tested according to AAMA 1503.

L. Sound Transmission: Provide aluminum-framed systems with fixed glazing and framing areas having the following sound-transmission characteristics:

1. Sound Transmission Class (STC): Minimum 26 S TC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
2. Outdoor-Indoor Transmission Class (OITC): M inimum 26 O ITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

M. Structural Sealant: C apable of withstanding tensile and shear stresses imposed by aluminum-framed systems without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.

1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

N. Structural-Sealant Joints: Designed to produce tensile or shear stress of less than 20 psi (138 kPa).

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Fabrication Sample: O f each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

F. Other Action Submittals:

1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

G. Qualification Data: For qualified Installer.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

I. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

J. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

D. Quality-Control Program for Structural-Sealant-Glazed System: Develop quality control program specifically for Project. Document quality-control procedures and verify results for aluminum-framed systems. Comply with ASTM C 1401 recommendations including, but not limited to, system material-qualification procedures, preconstruction sealant-testing program, procedures for system fabrication and installation, and intervals of reviews and checks.

E. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

F. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and Texas Standards.

G. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

H. Structural-Sealant Glazing: Comply with ASTM C 1401, "Guide for Structural Sealant Glazing" for design and installation of structural-sealant-glazed systems.

I. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.

J. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

K. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including, but not limited to, excessive deflection.
   b. Noise or vibration caused by thermal movements.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   d. Adhesive or cohesive sealant failures.
   e. Water leakage through fixed glazing and framing areas.
   f. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Arcadia, Inc.
2. Arch Aluminum & Glass Co., Inc.
3. Kawneer North America; an Alcoa company.
4. Tubelite.
5. United States Aluminum.
6. Dorma – Automatic Bi-folding Doors

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. S elect surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

A. Framing Members: Man ufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Structurally glazed.
2. Glazing System: Retained by structural sealant at vertical edges and mechanically with gaskets at horizontal edges.
3. Glazing Plane: Center.

B. Brackets and Reinforcements: M anufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Ma nufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

D. Concrete and Masonry Inserts: H ot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.
   1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:
   1. Structural Sealant: ASTM C 1184, single-component neutral-curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by a structural-sealant manufacturer for use in aluminum-framed systems indicated.
      a. Provide sealants for use inside of the weatherproofing system that have a VOC content of 100 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      b. Color: Black.
   2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.
      a. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      b. Color: Matching structural sealant.

2.5 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Door Control Services, Inc., Floresville, TX (830) 216-4358, Automatic Bi-folding Door, DORMA ED 1200 Series, RH Fold Out- Break Out.
   1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

   2. Door Design: Medium stile; 3-1/2-inch nominal width.

   3. Glazing Stops and Gaskets: Beveled Square, snap-on, extruded-aluminum stops and preformed gaskets.
      a. Provide nonremovable glazing stops on outside of door.

B. Entrance Door Hardware: As specified in Division 08 Section "Door Hardware."

C. Entrance Door Glazing: See Section 088000 – Glazing for insulating.

2.6 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."
   1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fitted joints with ends coped or mitered.
   3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
   4. Physical and thermal isolation of glazing from framing members.
   5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   6. Provisions for field replacement of glazing from interior.
   7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

F. Storefront Framing: Fabricate components for assembly using shear-block system.

G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
   1. At exterior doors, provide compression weather stripping at fixed stops.

H. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
   1. At exterior doors, provide weather sweeps applied to door bottoms.

I. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class II, 0.010 mm or thicker.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate structural-sealant-glazed systems.

B. Structural-Sealant-Glazed Systems: P erform quality-control procedures complying with ASTM C 1401 recommendations, including, but not limited to, system material-qualification procedures, sealant testing, and system fabrication reviews and checks.

C. Structural-sealant-glazed system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:
   1. Comply with manufacturer's written instructions.
   2. Do not install damaged components.
   3. Fit joints to produce hairline joints free of burrs and distortion.
   4. Rigidly secure nonmovement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
   6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:
   1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
   2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 08 Section "Glazing."
   1. Structural-Sealant Glazing:
      a. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
      b. Install weatherseal sealant according to Division 07 Section "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
   1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
   2. Field-Installed Entrance Door Hardware: I nstall surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weather tight installation.

3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
   1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
   2. Alignment:
      a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
      b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.4 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
   1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

END OF SECTION

SECTION 085313 - VINYL WINDOWS (PGT & PELLA) (REVISED)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Vinyl windows of the following types:
   1. Single Hung.
   2. Fixed.

1.2 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry.

1.3 REFERENCES

A. ASTM F 588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Provide elevations sections and details of construction, installation and rough opening framing requirements.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches square representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.

B. Installer Qualifications: Minimum 2 year experience installing similar products.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect or Owner.
   2. Do not proceed with remaining work until workmanship is approved by Architect or Owner.
   3. Refinish mock-up area as required to produce acceptable work.

1.6 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section at project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Handling: Handle materials to avoid damage.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.9 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:

1. PGT Windows and Doors, 1070 Technology Drive, Nokomis FL, 34275; Toll Free Tel: 800.282.6019; Tel: 941.480.1600; Web: www.pgtindustries.com. Local Distributor is: Builders First Source, Schertz, Tx. (210) 698-1959

2. PELLA Windows & Doors,6510 Blanco Rd., San Antonio, Tx. 78216; Sales Rep.: John Meyer, (210) 735-2030; JMeyer@pellasouthtexas.com

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 VINYL WINDOWS

A. Product: EnergyVue Vinyl Windows by PGT or Pella.
1. Size: Refer to drawing schedule.
2. Frame: Flange.
3. Frame: Fin.
4. Frame: Equal leg.
5. Finish: As selected by Architect or Owner
6. Glass: Clear. (Single Hung & Fixed)
7. Glass: Obscure (At Bathrooms only).
8. Glass: Lo-E SB 70XL.

2.3 SINGLE HUNG WINDOWS

A. Series: 5400 by PGT.
1. Performance:
a. Maximum Water Resistance: 9.75 PSF.
b. (52 1/8 inches (1324mm) x 84 inches (2134mm) +50 PSF/ -50 PSF.

c. Forced Entry Test (ASTM F 588): Passed.

2. Construction:
   a. 3-1/2 inches (83 mm) frame depth.
   b. 5/8 inch (13 mm) flange frame.
   c. Sloped sill.
   d. Capture-lock sash system.
   e. Lift Assist Constant Force Balance System.
   f. Snap-on glazing beads.
   g. Structural glazing.
   h. No installation fasteners required in sill.
   i. Aluminum reinforced sash.
   j. Extruded screen frame with fiberglass mesh.
   k. Extruded aluminum interlock

3. Energy Requirement:
   a. 7/8 inch (22mm) Insulated Clear
   b. U-Factor of less than 0.5 btu/hr.-ft: 59-F
   c. SHGS of 0.25 or less
   d. CRF minimum: frame 52, glazing 66
   e. VLT: not less than 0.6
   f. Comply with all local codes, ADA compliance and capable of season air condition unit installation.

4. Hardware:
   a. Recessed tilt latches.
   b. Sweep locks.
   c. Auto locks
   d. WOCD

2.4 FIXED WINDOWS

A. Series: WinGuard Series 5420-5520 by PGT.
   1. Performance:
      a. Small and Large Missile (96 inches (2438mm) x 63 inches (1600mm) +80 PSF/ -110 PSF.
      b. Forced Entry Test (ASTM F 588): Passed.
   2. Construction:
      a. Snap-on glazing beads.
      b. 3-1/2 inch (89mm) frame depth.
      c. 5/8 inch (16mm) flange frame.
      d. Strong structural glazing.
      e. Concealed installation fasteners.
   3. Energy Requirement: U Factor /SHGC / VT: (Same as Single Hung Window)
      a. 7/8 inch (22mm) Insulated Clear

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction. Test for proper operation and adjust until satisfactory results are achieved.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 087100 - DOOR HARDWARE (REVISED)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mechanical door hardware for the following:

a. Swinging doors.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

B. Keying Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product in each finish specified.

C. Door hardware schedule.

D. Keying schedule.

1.4 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.

1. Scheduling Responsibility: Preparation of door hardware and keying schedule.
2. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Provide a Minimum of two (2) years Maintenance and three (3) years warranty on all hardware products provided from date of Final Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

B. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the DOJ's "2010 ADA Standards for Accessible Design", the DOT's "ADA Standards for Transportation Facilities", the ABA standards of the Federal agency having jurisdiction, ICC A117.1, HUD's "Fair Housing Accessibility Guidelines"and local codes .

2.2 SCHEDULED DOOR HARDWARE

A. Provide products for each door that comply with requirements indicated in Part 2 and door hardware schedule.

1. Door Hardware Schedule is in Part 3

2.3 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule.

B. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

C. Bored Locks: BHMA A156.2;

1. As noted in Door Hardware Schedule

2.4 AUXILIARY LOCKS

1. As per Door Hardware Schedule

2.5 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver. Provide cylinder from same manufacturer of locking devices.

B. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.6 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock. Incorporate decisions made in keying conference.

1. Existing System:

a. Master key or grand master key locks to Owner's existing system.

B. Keys:

1. Stamping: As per instructions in keying conference:

2.7 OPERATING TRIM

A. Operating Trim: BHMA A156.6; as indicated on Door Hardware Schedule.

2.8 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16.

1. As noted in Door Hardware Schedule.

2.9 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

1. As noted in Door Hardware Schedule

2.10 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

1. As noted in Door Hardware Schedule

2.11 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in Door Hardware Schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.

1. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.

C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as directed by Owner.
2. Furnish permanent cores to Owner for installation.

E. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."

F. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

G. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

1. Do not notch perimeter gasketing to install other surface-applied hardware.

3.2 ADJUSTING

A. Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.3 DOOR HARDWARE SCHEDULE

A. HARDWARE SET # AA (1 TOTAL)

DOUBLE DOORS # MECHANICAL EACH TO HAVE:

6	EA	HINGES	5BB1 4.5 X 4.5 NRP	652	IVE
2	EA	FLUSH BOLTS	FB458-12”	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STORAGE LOCK	B581 DANE	626	FAL
1	EA	SURFACE CLOSER	SC61 (ACTIVE LEAF ONLY)	689	FAL
1	EA	COORDINATOR	3780	BLK	ABH
1	EA	ASTRAGAL	43SP-DOOR HEIGHT	SP	ZER
2	EA	DOOR STOPS	WS406CCV	630	IVE
2	EA	SILENCERS	SR64	GRY	IVE

B. HARDWARE SET # AB (8 TOTAL)

DOUBLE DOORS # ELECTRICAL EACH TO HAVE:

6	EA	HINGES	5BB1 4.5 X 4.5 NRP	652	IVE
2	EA	FLUSH BOLTS	FB458-12”	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STORAGE LOCK	B581 DANE	626	FAL
1	EA	SURFACE CLOSER	SC61 (ACTIVE LEAF ONLY)	689	FAL
1	EA	COORDINATOR	3780	BLK	ABH
1	EA	ASTRAGAL	43SP-DOOR HEIGHT	SP	ZER
2	EA	DOOR STOPS	WS406CCV	630	IVE
2	EA	SILENCERS	SR64	GRY	IVE

C. HARDWARE SET # AC (___TOTAL)

SINGLE DOORS # ADA UNITS ON EACH FLOOR TO HAVE:

3	EA	HINGES	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	FLUSH BOLTS	FB458-12”	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STORAGE LOCK	B581 DANE	626	FAL
1	EA	SURFACE CLOSER	SC61 (ACTIVE LEAF ONLY)	689	FAL
1	EA	COORDINATOR	3780	BLK	ABH
1	EA	ASTRAGAL	43SP-DOOR HEIGHT	SP	ZER
1	EA	DOOR STOPS	WS406CCV	630	IVE
1	EA	SILENCERS	SR64	GRY	IVE

D. HARDWARE SET # AD (___TOTAL)

SINGLE SECURITY GATE. EACH TO HAVE:

2	EA	HINGES	SHN-110L	BLK	Safetech
1	EA	GATE LATCH KEYED	SLV-VIPER-X1	BLK	Safetech
2	EA	HANDLES	SHDL-150	BLK	Safetech

GENERAL NOTES:

1) VERIFY KEYING REQUIREMNETS AND PROVIDE LOCKS KEYED TO THE EXISTING SYSTEM OR AS REQUIRED BY SAN ANTONIO HOUSING AUTHORITY.
2) PROVIDE A MINIMUM ONE (1) YEAR MAINTENANCE AND THREE (1) WARRANTY ON ALL HARDWARE PROUCTS PROVIDED.

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Aluminum Storefront Doors.
   2. Aluminum Storefront Entrances.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 and ICC's 2003 International Building Code by a qualified professional engineer, using the following design criteria:
   1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
      a. Basic Wind Speed: 100 mph (44 m/s).
   2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
   3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass the following products; 12 inches (300 mm) square.
   1. Tinted glass.
   2. Insulating glass.

C. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Qualification Data: For installers glass testing agency and sealant testing agency.

E. Product Certificates: For glass and glazing products, from manufacturer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass, insulating glass, glazing sealants and glazing gaskets.
   1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

C. Source Limitations for Glass: Obtain ultraclear float glass, tinted float glass and insulating glass from single source from single manufacturer for each glass type.

D. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

E. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

F. Preinstallation Conference: Conduct conference at Project site.
   1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review temporary protection requirements for glazing during and after installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
   1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.9 WARRANTY

A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
   1. Minimum Glass Thickness for Exterior Lites: Not less than ¼ inch (6.0 mm).
   2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

2.2 INSULATING GLASS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. PPG Industries, Inc., Pittsburg, PA
   2. Approved equal .

B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
   1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
   2. Spacer: Manufacturer's standard spacer material and construction.
   3. Desiccant: Molecular sieve or silica gel, or blend of both.

C. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Insulating-Glass Types" Article.

2.3 GLAZING SEALANTS

A. General:
   1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
   3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
   4. Colors of Exposed Glazing Sealants: As indicated by manufacturer's designations.

2.4 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
   1. AAMA 804.3 tape, where indicated.
   2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
   3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
   1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
   2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.5 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.6 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

2.7 INSULATING-GLASS TYPES

A. Passive Solar Low E Insulating-Glass Units:
1. Available Products: PPG Solar Ban 70XL (2) Solar Control Low-E (or equal).
2. Overall Unit Thickness and Thickness of Each Lite: one inch.
3. Interspace Content: Air
4. Outdoor Lite: Class 2 (tinted) float glass or tempered as required.
   a. Tint Color: Gray
   b. Annealed and Kind FT (fully tempered)
   c. Self-Cleaning, Low-Maintenance Coating: Pyrolytic coating on first surface.
5. Indoor Lite: Class 1 (clear) ultra clear (low iron) float glass.
6. Visible Light Transmittance: 35 percent minimum.
7. Winter Night time U Factor: 0.29 maximum.
8. Summer Daytime U-Factor : 0.31 maximum.
9. Solar Heat Gain Coefficient: 0.28 maximum.
10. Outdoor Visible Reflectance: 7 percent maximum.

B. Obscure Passive Solar Low-E Insulating Glass Units:
1. Available Products: PPG Solar Ban 70XL (2) Solar Control Low-E (or equal).
2. Overall Unit Thickness and Thickness of Each Lite: one inch.
3. Interspace Content: Air
4. Outdoor Lite: Class 2 (tinted) float glass or tempered as required.
   a. Tint Color: Gray
   b. Annealed and Kind FT (fully tempered)
   c. Self-Cleaning, Low-Maintenance Coating: Pyrolytic coating on first surface.
5. Indoor Lite: Class 1 (clear) ultra clear (low iron) float glass.
6. Visible Light Transmittance: 35 percent minimum.
7. Winter Night time U Factor: 0.29 maximum.
8. Summer Daytime U-Factor : 0.31 maximum.
9. Solar Heat Gain Coefficient: 0.28 maximum.
10. Outdoor Visible Reflectance: 7 percent maximum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward

centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

B. Evaluation reports for post-installed anchors and power-actuated fasteners.

1.4 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.

B. Studs and Tracks: ASTM C 645.

1. Steel Studs and Tracks:
   a. CEMCO; MRI Steel Framing; Steel Construction Sys.; Steel Network; Clark-Dietrich.
   b. Minimum Base-Metal Thickness 0.0179 inch.
   c. Depth: As indicated on Drawings

C. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. CEMCO; MRI Steel Framing; Steel Construction Sys.; Steel Network; Clark-Dietrich.
2. Minimum Base-Metal Thickness: 0.0179 inch.
3. Depth: 7/8 inch.

D. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.
1. CEMCO; MRI Steel Framing; Steel Construction Sys.; Steel Network; Clark-Dietrich.
2. Configuration: Asymmetrical or hat shaped.

E. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.

1. Depth: 3/4 inch.
2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

F. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.3 SUPPORT SYSTEMS (ABOVE SUSPENSION CEILINGS)

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

B. Hanger Attachments to Concrete:

1. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, AC193, AC58 or AC308 as appropriate for the substrate.

   a. Uses: Securing hangers to structure.

b. Type: Torque-controlled, expansion anchor.
c. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.

E. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a b ase-metal thickness of 0.0538 inch and minimum 1/2-inch-wide flanges.

1. Depth: Match existing.

F. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
2. Steel Studs and Tracks: ASTM C 645.

a. Minimum Base-Metal Thickness: 0.0269 inch or match existing.
b. Depth: As indicated on Drawings or match existing.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

a. Minimum Base-Metal Thickness: Match existing.

4. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.

a. Configuration: Match existing.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
2. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
3. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

E. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Shaped Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.3 INSTALLING CEILING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension

system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092300 - GYPSUM PLASTERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gypsum plastering on expanded-metal lath.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Where indicated, provide gypsum plaster assemblies identical to those of assemblies tested for fire resistance according to ASTM E 119 by a qualified testing agency.

B. Sound-Transmission Characteristics: Where indicated, provide gypsum plaster assemblies identical to those of assemblies tested for STC ratings according to ASTM E 90 and classified according to ASTM E 413 by a qualified testing agency.

2.2 EXPANDED-METAL LATH

A. Expanded-Metal Lath: ASTM C 847, cold-rolled carbon-steel sheet with ASTM A 653/A 653M, G60, hot-dip galvanized-zinc coating.

B. Manufacturers:
1. Alabama Metal Industries, CEMCO, Clark Dietrich Building System, Phillips Manufacturing Co.
2. Diamond-Mesh Lath:

a. Type: Self-furring.
b. Weight: 3.4 lb/sq. yd..

2.3 ACCESSORIES

A. General: Comply with ASTM C 841, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories:

1. Alabama Metal Industries, CEMCO, Clark Dietrich Building System, Phillips Manufacturing Co.
2. Cornerite: Fabricated from expanded-metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized-zinc coating.
3. Striplath: Fabricated from expanded-metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized-zinc coating.
4. Cornerbeads: Fabricated from zinc-coated (galvanized) steel.

    a. Smallnose cornerbead with expanded flanges; use unless otherwise indicated.

5. Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
6. Control Joints: Fabricated from zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
7. Expansion Joints: Fabricated from zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.

2.4 MISCELLANEOUS MATERIALS

A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Bonding Compound: ASTM C 631.

C. Fasteners for Attaching Metal Lath to Substrates: ASTM C 841.

D. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter unless otherwise indicated.

E. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing), produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of rated assembly.

F. Mix Additives: Use gypsum plaster accelerators and retarders from plaster manufacturer if required by Project conditions. Use only additives that manufacturer recommends in writing for use with plaster to which it is added.

2.5 BASE-COAT PLASTER MATERIALS

A. Lightweight-Gypsum Ready-Mixed Plaster: ASTM C 28/C 28M, with mill-mixed perlite aggregate.
1. National Gypsum Co., US Gypsum Corp.

B. Gypsum Neat Plaster: ASTM C 28/C 28M, for use with job-mixed aggregates.
1. Certainteed Corp., National Gypsum Co., USG Corp.

C. Aggregates for Base-Coat Plasters: ASTM C 35, sand.

2.6 FINISH-COAT PLASTER MATERIALS

A. Gypsum Ready-Mixed Finish Plaster: Manufacturer's standard, mill-mixed, gaged, interior finish.
   1. National Gypsum Co., USG Corp.

B. Lime: ASTM C 206, Type N, normal finishing hydrated lime.
   1. USG Corp.

C. Aggregates for Float Finishes: ASTM C 35, sand; graded according to ASTM C 842.

2.7 PLASTER MIXES

A. Mixing: Comply with ASTM C 842 and manufacturer's written instructions for applications indicated.

B. Mix Additives: Use accelerators and retarders, if required by Project conditions, according to manufacturer's written instructions.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fire-Resistance-Rated Assemblies: Install components according to requirements for design designations from listing organization and publication indicated on Drawings.

B. STC-Rated Assemblies: Install components according to requirements for design designations from listing organization and publication indicated on Drawings.

C. Sound-Attenuation Blankets: Where required, install blankets before installing lath unless blankets are readily installed after lath has been installed on one side.

D. Acoustical Sealant: Where required, seal joints between edges of plasterwork and abutting construction with acoustical sealant.

3.2 INSTALLING EXPANDED-METAL LATH

A. Expanded-Metal Lath: Install according to ASTM C 841.

3.3 INSTALLING ACCESSORIES

A. General: Install according to ASTM C 841.

B. Cornerbeads: Install at external corners.

C. Casing Beads: Install at terminations of plasterwork, except where plaster passes behind and is concealed by other work and where metal screeds, bases, or frames act as casing beads.

D. Control Joints: Locate as indicated on Drawings.

3.4 PLASTER APPLICATION

A. General: Comply with ASTM C 842.

B. Base-Coat Plaster:

1. Over Expanded-Metal Lath:

a. Scratch Coat: Gypsum neat plaster with job-mixed sand.
b. Brown Coat: Lightweight-gypsum ready-mixed plaster; Gypsum neat plaster with job-mixed sand.

C. Finish Coats:

1. Smooth-Troweled Finishes: Gypsum gaging plaster and lime putty Gypsum ready-mixed finish plaster.
2. Float Finishes: Gypsum gaging plaster and lime putty.
3. Sprayed Finishes: Gypsum ready-mixed finish plaster applied to match Architect's sample.
4. Textured Finishes: Gypsum ready-mixed finish plaster applied to match Architect's sample.

D. Concealed Plaster:

1. Where plaster application is concealed behind built-in cabinets, similar furnishings, and equipment, apply finish coat.
2. Where plaster application is concealed above suspended ceilings and in similar locations, omit finish coat.
3. Where plaster application is used as a b ase for adhesive application of tile and similar finishes, omit finish coat.

3.5 PLASTER REPAIRS

A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

END OF SECTION 092300

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.
3. Texture finishes.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each texture finish indicated on same backing indicated for Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C 1396/C 1396M.
1. Thickness: 1/2 inch.
2. Long Edges: Tapered.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
   1. Thickness: 1/2 inch.
   2. Long Edges: Tapered.

2.4 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.
   1. Manufacturers: Basis of Design: U.S.G. Durock Cement Board or approved equal.
   2. Thickness: 1/2 inch.
   3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
   2. Shapes:

      a. Cornerbead.
      b. Bullnose bead.
      c. LC-Bead: J-shaped; exposed long flange receives joint compound.
      d. L-Bead: L-shaped; exposed long flange receives joint compound.
      e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
      f. Expansion (control) joint.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

   1. Interior Gypsum Board: Paper.
   2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
   3. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

   1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping or drying-type, all-purpose compound.

   3. Fill Coat: For second coat, use drying-type, all-purpose compound.
   4. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:
   1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

C. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2.8 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer to match existing.

B. Polystyrene Aggregate Ceiling Finish: Water-based, job-mixed, polystyrene aggregate finish with flame-spread and smoke-developed indexes of not more than 25 when tested according to ASTM E 84.
1. Texture: Fine or match existing.

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS

A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

B. Comply with ASTM C 840.

C. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

D. Prefill open joints, rounded or beveled edges, and damaged surface areas.

E. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

F. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

G. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.

H. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

I. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.2 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Glazed wall tile.
2. Tile backing panels.
3. Waterproof membrane for thinset applications

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples:

1. Each type and composition of tile and grout for each color and finish required

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.

2. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

2.2 TILE PRODUCTS

A. Ceramic Tile Type [**CT-**<#>]: Glazed wall tile.

1. Crossville inc.; Daltile; Interceramic; American Olean; American Marazzi Tile
2. Module Size: match existing
3. Face Size Variation: Rectified.
4. Thickness: 5/16 inch
5. Face: match existing
6. Finish: match existing glaze.
7. Tile Color and Pattern: As selected by Architect or Owner from manufacturer's full range
8. Grout Color: As selected by Architect or Owner from manufacturer's full range
9. Mounting: Factory, back mounted.

10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable[and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

    a. Base: Match existing
    b. Wainscot Cap: Match existing

2.3 TILE BACKING PANELS

A. Fiber-Cement Backer Board: ASTM C 1288.

1. CertainTeed; James Hardie
2. Thickness: 1/2 inch .

2.4 WATERPROOF MEMBRANE

A. Waterproofing and Tile-Setting Adhesive: One-part, fluid-applied product intended for use as both waterproofing and tile-setting adhesive in a two-step process.

1. Bostik Inc. or approved equal

2.5 GROUT MATERIALS

A. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less.

1. Bostik Inc.; Laticrete; Mapei Corp; Summitville Tile

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

3.3 CERAMIC TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Glazed Wall Tile: 1/8 inch .

G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

H. Install tile backing panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer's written instructions.

I. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

3.4 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Wall Installations, Wood or Metal Studs or Furring:

1. Ceramic Tile Installation: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units or fiber-cement backer board.

   a. Ceramic Tile Type: match existing.
   b. Thinset Mortar: Modified dry-set or Improved modified dry-set mortar.
   c. Grout: Water-cleanable epoxy grout.

   d.

B. Shower Receptor and Wall Installations:

1. Ceramic Tile Installation : TCNA B415;[thinset mortar on waterproof membrane over cementitious backer units or fiber-cement backer board

   a. Ceramic Tile Type: match existing
   b. Thinset Mortar: Modified dry-set mortar.
   c. Grout: Water-cleanable epoxy grout.

END OF SECTION 093013

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

B. See “Section 092216 – Non-Structural Metal Framing” for Support of Panel Ceilings.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, and coordinated with each other, using input from installers of the items involved.

B. Product test reports.

C. Research reports.

D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a q ualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraints for ceiling systems.

B. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A according to ASTM E 1264.
2. Smoke-Developed Index: 450 or less.

2.2 ACOUSTICAL PANELS

A. Water-Felted, Mineral Based Acoustical Panels: P rovide acoustical panels treated with antimicrobial solution and complying with the following:

B. Products: Basis of Design: Armstrong World Industries, Prelude Cortega Lay In or an Approved Equal by:
1. American Gypsum
2. Certain Teed Corporation
3. Chicago Metallic Corporation
4. United States Gypsum Company

C. Classification: Panels fitting ASTM E 1264 for Type III' mineral base with painted finish Form 2, water felted.

D. Pattern Panels fitting ASTM E 1264 pattern designation C (perforated), small holes.

E. Color: White

F. Light Reflectance (LR): Not less than 0.80

G. Ceiling Attenuation Class (CAC): 33.

H. Noise Reduction Coefficient (NRC): 0.55

I. Edge/Joint Detail: Square.

J. Thickness: 5/8 inch.

K. Modular Size: 24 x 24 inches, as indicated on drawings.

2.3 METAL SUSPENSION SYSTEM

A. Suspension System for Acoustical Panel System: Provide acoustical panel suspension system complying with the following: Prelude XL, Armstrong W Industries; or 200 Snap-Grid, Chicago Metallic; or Classic Stab, CertainTeed Ceilings; or Donn DX, USG

B. Metal Suspension-System Standard: Manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M.

C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch-wide metal caps on flanges.

1. Structural Classification: Intermediate-duty system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Face Design: Flat, flush.
4. Cap Material: Cold-rolled steel.
5. Cap Finish: Painted white.

2.4 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

2.5 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

PART 3 - EXECUTION

3.1 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated.

B. Layout openings for penetrations centered on the penetrating items.

3.2 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.

B. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
3. Arrange directionally patterned acoustical panels as follows:

    a. As indicated on reflected ceiling plans.

3.3 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform inspections.

1. Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermoset-rubber base.
2. Rubber molding accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 THERMOSET-RUBBER BASE

A. Manufacturers: Basis-of-Design: Roppe, Pinnacle or approved equal.

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style and Location:
    a. Style B, Cove: Provide in areas with resilient floor coverings.

C. Thickness: 0.125 inch.

D. Height: 4 inches or match existing.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed

G. Inside Corners: Job formed.

H. Colors: Ref. Finish Legend on Drawings for selections.

2.3 RUBBER MOLDING ACCESSORY

A. Manufacrturers: Roppe Corp., USA; VIP Corp.

B. Description: Rubber carpet edge for glue-down applications , nosing for resilient floor covering, reducer strip for resilient floor covering joiner for tile, transition strips.

C. Profile and Dimensions: As indicated.

D. Locations: Provide rubber molding accessories in areas indicated.

E. Colors and Patterns: As selected by Architect or Owner from manufacturer’s full list of products.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

C. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.

1. Verify that substrates are dry.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until materials are the same temperature as space where they are to be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.2 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 6 inches in length.

    a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 6 inches in length.

    a. Miter or cope corners to minimize open joints.

3.3 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Vinyl composition floor tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and pattern specified.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 VINYL COMPOSITION FLOOR TILE

A. Reference Finish Schedule on drawings for selections.

B. Tile Standard: ASTM F 1066, Class 1, or solid color Class 2, through pattern.

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch.

E. Size: 12 by 12 inches.

F. Colors and Patterns: Reference Finish Schedule on drawings.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.2 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain running in one direction.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

I. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply two coat(s).

J. Cover and protect new installed floor tile from traffic until project is completed.

END OF SECTION 096519

SECTION 096536 - STATIC-CONTROL RESILIENT FLOORING (MDF ROOM ONLY)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Static-dissipative, vinyl composition floor tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of static-control resilient flooring.
   1. Samples: For each type of static-control resilient flooring.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store static-control resilient flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer.

1.6 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive static-control resilient flooring.
   1. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.

B. Close spaces to traffic during static-control resilient flooring installation.

C. Close spaces to traffic for 48 hours after static-control resilient flooring installation.

D. Install static-control resilient flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Static-Dissipative Properties: Provide static-control resilient flooring with static-control properties indicated as determined by testing identical products per test method indicated by an independent testing and inspecting agency.
   1. Electrical Resistance: Test per ASTM F 150 with 100-V applied voltage or ESD-STM-7.1.
      a. Average greater than 1 megohm and less than or equal to 1000 megohms when test specimens are tested surface to ground.
      b. Average greater than 1 megohm and less than or equal to 1000 megohms when installed floor coverings are tested surface to ground.
   2. Static Generation: Less than 300 V when tested per AATCC-134 at 20 percent relative humidity with conductive footwear.
   3. Static Decay: 5000 to zero V in less than 0.25 seconds when tested per FED-STD-101C/4046.1.

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 STATIC-DISSIPATIVE RESILIENT FLOOR COVERINGS

A. Static-Dissipative, Vinyl Composition Floor Tile: ASTM F 1066 (vinyl composition floor tile, nonasbestos formulated), Class 2 (through-pattern tile).
   1. Manufacturers: Armstrong World Industries, - SDT
   2. Thickness: Not less than 0.125 inch.
   3. Size: 12 by 12 inches.
   4. Colors and Patterns: As selected by Architect or Owner from full range of industry colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified portland cement or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Static-Control Adhesive: Provided or approved by manufacturer; type that maintains electrical continuity of floor-covering system to ground connection.

C. Grounding Strips: Provided or approved by manufacturer; type and size that maintains electrical continuity of floor-covering system to ground connection.

D. Maintenance Floor Tiles: Special floor tiles inscribed "Conductive floor. Do not wax."

E. Floor Polish: Provide protective, static-control liquid floor polish products as recommended by floor-covering manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions and with oversight by manufacturer's representative to ensure adhesion of static-control resilient flooring and electrical continuity of floor-covering systems.

B. Concrete Substrates: Prepare according to ASTM F 710 and as recommended by manufacturer. Do not use solvents for cleaning substrates.

C. Do not install static-control resilient flooring until it is same temperature as space where it is to be installed.
   1. Move static-control resilient flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Sweep and vacuum substrates to be covered by static-control resilient flooring immediately before installation.

3.2 INSTALLATION, GENERAL

A. Install static-control resilient flooring according to manufacturer's written instructions and with oversight by manufacturer's representative.

B. Embed grounding strips in static-control adhesive. Extend grounding strips beyond perimeter of static-control resilient floor-covering surfaces to ground connections.

C. Scribe, cut, and fit static-control resilient flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

D. Extend static-control resilient flooring into toe spaces, door reveals, closets, and similar openings. Extend static-control resilient flooring to center of door openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on static-control resilient flooring as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

F. Adhere static-control resilient flooring to substrates using a full spread of static-control adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.3 FLOOR-TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half floor tile at perimeter.
   1. Lay floor tiles square with room axis.

C. Match floor tiles for color and pattern by selecting floor tiles from cartons in same sequence as manufactured and packaged if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.
   1. Lay static-dissipative, vinyl composition floor tiles with grain running in one direction or with grain direction alternating in adjacent floor tiles (basket-weave pattern) as approved by Architect or Owner.

D. In each space where conductive, solid vinyl floor tile is installed, install maintenance floor tile identifying conductive floor tile in locations approved by Architect or Owner.

3.4 FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing agency to test electrical resistance of static-control resilient flooring for compliance with requirements.
   1. Arrange for testing after static-control adhesives have fully cured and static-control resilient flooring has stabilized to ambient conditions and after ground connections are completed.
   2. Arrange for testing of static-control resilient flooring before and after performing floor polish procedures.

B. Static-control resilient flooring will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of static-control resilient flooring.

B. Protect static-control resilient flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

C. Cover static-control resilient flooring until Substantial Completion.

END OF SECTION 096536

SECTION 096615 - TERRAZZO FLOORING, REPLACEMENT, REPAIRS AND REFINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplemental Conditions and division 01 apply to this section.

1.2 SECTION INCLUDES

A. Repair terrazzo floors

B. Refinishing terrazzo floors

1.3 SUBMITTALS

A. Product Data: Provide data for sealer and cleaner and grout.

B. Cleaning and Maintenance Data

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section will not have fewer than 3 years of documented experience.
   1. Installer shall be a contactor member of NTMA and shall perform all work in accordance with NTMA standards.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaner: Potable water, free of iron

B. Sealer: Penetrating liquid type to completely seam matrix surface; not detrimental to terrazzo components.

C. Grout: Color to match existing matrix.

2.2 EQUIPMENT

A. All work shall be executed with conventional terrazzo grinding equipment according to trade practice. No lighter type machines, such as floor scrubbing machines, will be accepted.

PART 3 - EXECUTION

3.1 GENERAL

A. Perform work in accordance with NTMA recommendations as posted on their website at www.NTMA.com.

3.2 PREPARATION

A. Cover and protect all adjacent finished surfaces during restoration process.

3.3 TERRAZZO FLOORING REPLACMENT

A. If any floor area is agreed by Architect or Owner to be replaced, cut out terrazzo area that is evident to lack bond with substrtate or underbed to panels defined by strips and replace to match adjacent terrazzo color mix and pattern.

3.4 CRACK REPAIR

A. Clean cracks by mechanical means (like metal dental pick or fine “Dremel” tooling) to remove dirt, debris and sealers – “V” shape routing out or significant widening is not recommended.

B. Grout cracks to match existing matrix prior initial grinding.

3.5 REFINISHING INITIAL GRINDING

A. Grind with 60-80 grit stone – all in the presence of water.

3.6 GROUTING

A. Cleanse floor with ample clean water and rinse.

B. Remove excess rinse water and machine or hand-apply grout, with color added to match the matrix of the terrazzo floor, taking care to fill voids.

3.7 CURING GROUT

A. The grout shall remain on the surface until fully cured, commonly a minimum of 12 hours or so at 70 degrees F.

3.8 FINE GRINDING

A. Grind with 120 grit stones until all grout has been removed from the terrazzo surface.

3.9 CLEANING AND SEALING

A. Rinse with clean water and allow to thoroughly dry.

B. Seal: Apply penetrating sealer, per manufacturer's directions.

C. Upon completion, this work shall be ready for final inspection and acceptance by the Owner.

D. Remove protection and clean any adjacent surfaces effected by the refinishing process.

3.10 PROTECTION

A. General Contractor shall protect the finish floor from all site activity until Substantial Completion.

END OF SECTION

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
   1. Cement Tile (Site).
   2. Steel and iron.
   3. Galvanized metal.
   4. Wood.

1.2 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523. (Traditional Matte Finish).

B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523. (Standard Egg-Shell Finish).

C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523. (Satin-Like Finish).

D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523. (Traditional Semi-Gloss).

E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523. (Traditional Gloss Finish).

F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523. (High Gloss).

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

   1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

B. Samples: For each type of paint system and each color and gloss of topcoat.

1.4 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Benjamin Moore & Co.
2. Coronado Paint.
3. Davis Paint Company.
4. Duron, Inc.
5. General Paint.
6. ICI Paints.
7. Kelly-Moore Paints.
8. Kwal-Howells Paint.
9. PPG Architectural Finishes, Inc.
10. Sherwin-Williams Company (The).
11. Tnemec Company

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Colors: As selected by Architect from manufacturer's full range; As indicated in a color schedule.

1. Ten percent of surface area will be painted with deep tones.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Fiber-Cement Board: 12 percent.
3. Masonry (Clay and CMUs): 12 percent.
4. Wood: 15 percent.
5. Portland Cement Plaster: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. On steel and iron, surface preparation to meet SSPC-SP6 Commercial Blast

D. Surface Preparationo on steel and iron: meet SSPC-SP6 Commercial Blast Cleaning or SSPC-SP11 Power Tool Cleaning to bare metal. An angular profile of 1 - 2 mils per ASTM D1447, Method C or NACE Standard RP0287 is required.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

B. At completion of construction activities of other trades, touch up a nd restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Latex System MPI EXT 3.1A:

a. Prime Coat: Latex, exterior, matching topcoat.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1)[**, MPI #10**].

B. Steel and Iron Substrates:

1. Tnemec System:

a. First Coat: Tnemec Series 1 Omnithane applied at 2.5 - 3.5 dry mils Thin only with approved thinner, Tnemec 41-2 or 41-3 Thinner.

b. Second Coat: Tnemec Series 66 Hi-Build Epoxoline applied at 3.0 - 5.0 dry mils. Thin only with approved thinner, Tnemec 41-4 Thinner.

c. Third Coat: Tnemec Series 290 CRU (semi-gloss finish) applied at 2.0 - 3.0 dry mils. Thin only with approved thinner, Tnemec 41-39 Thinner.

C. Wood Substrates: Wood trim, Doors.

1. Latex over Latex Primer System MPI EXT 6.3L:

a. Prime Coat: Primer, latex for exterior wood, MPI #6.

b. Intermediate Coat: Latex, exterior, matching topcoat.

c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete.
2. Gypsym Plaster.
3. Clay masonry.
4. Steel and iron.
5. Galvanized metal.
6. Wood.
7. Gypsum board.
8. Spray-textured ceilings.

1.2 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523. (Traditional Matte Finish).

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523. (A Velvet-Like Finish)

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523. (Standard Egg-Shell Finish).

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523. (Satin-Like Finish)

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523. (Traditional Semi-Gloss).

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523. (Traditional Gloss Finish)

G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523. (High Gloss).

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

B. Samples: For each type of paint system and in each color and gloss of topcoat.

1.4 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: S ubject to compliance with requirements, provide products by one of the following:
1. Benjamin Moore & Co.
2. Coronado Paint.
3. Davis Paint Company.
4. Duron, Inc.
5. General Paint.
6. ICI Paints.
7. Kelly-Moore Paints.
8. Kwal-Howells paint.
9. PPG Architectural Finishes, Inc.
10. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Colors: As selected by Architect from manufacturer's full range; As indicated in color schedule on Drawings..

1. Ten percent of surface area may be painted with deep tones.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Fiber-Cement Board: 12 percent.
3. Masonry (Clay and CMUs): 12 percent.
4. Wood: 15 percent.
5. Gypsum Board: 12 percent.
6. Plaster: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Latex System MPI INT 3.1A:

a. Prime Coat: Latex, interior, matching topcoat.
b. Intermediate Coat: Latex, interior, matching topcoat.
c. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.

2. Alkyd System MPI INT 3.1D:

a. Prime Coat: Primer, alkali resistant, water based, MPI #3.

b. Intermediate Coat: Alkyd, interior, matching topcoat.

c. Topcoat: Alkyd, interior, gloss (MPI Gloss Level 3), MPI #51.

B. Concrete Substrates, Traffic Surfaces:

1. Alkyd Floor Enamel System MPI INT 3.2B:

a. Prime Coat: Floor enamel, alkyd, matching topcoat.
b. Intermediate Coat: Floor enamel, alkyd, matching topcoat.
c. Topcoat: Floor enamel, alkyd, gloss (MPI Gloss Level 6), MPI #27.

C. Clay Masonry Substrates:

1. Latex System MPI INT 4.1A:

a. Prime Coat: Primer, alkali resistant, water based, MPI #3.

b. Intermediate Coat: Latex, interior, matching topcoat.

c. Topcoat: Latex, interior (MPI Gloss Level 4), MPI #43.

D. CMU Substrates:

1. Latex System MPI INT 4.2A:

a. Block Filler: Block filler, latex, interior/exterior, MPI #4.

b. Intermediate Coat: Latex, interior, matching topcoat.

c. Topcoat: Latex, interior (MPI Gloss Level 4), MPI #43.

E. Steel Substrates:

1. Alkyd System MPI INT 5.1E; MPI INT 5.1EE:

    a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79.

    b. Prime Coat: Shop primer specified in Section where substrate is specified.
    c. Intermediate Coat: Alkyd, interior, matching topcoat.

    d. Topcoat: Alkyd, interior, gloss (MPI Gloss Level 6), MPI #48.

F. Spray-Textured Ceiling Substrates:

1. Latex, Flat System MPI INT 9.1A: Spray applied.

    a. Prime Coat: Latex, interior, flat, matching topcoat.
    b. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.

G. Gypsum Board and Gypsum Plaster Substrates:

1. Latex over Latex Sealer System MPI INT 9.2A:

    a. Prime Coat: Primer sealer, latex, interior, MPI #50.

    b. Prime Coat: Latex, interior, matching topcoat.
    c. Intermediate Coat: Latex, interior, matching topcoat.

    d. Topcoat: Latex, interior (MPI Gloss Level 3), MPI #52.

END OF SECTION 099123

102117 - SEAMLESS ACRYLIC BATH TUBS AND SURROUND WALL SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope: All labor, materials and equipment necessary to provide and install acrylic/ABS bath tubs and surround wall systems and window liners as shown in the drawing(s).

B. Work Included: Without limiting the generality of the foregoing, include the following:

1. Field measurement.
2. Installation.
3. Accessories.
4. Caulking.
5. Coordination.
6. Clean-up.

1.02 QUALITY ASSURANCE

A. Standards: Acrylic/ABS bath tubs and surround wall systems and window liners to comply with referenced standards of the:

1. USA: International Plumbing Code (IPC), American National Standard Institute (ANSI) and American Society for Testing and Materials (ASTM).

B. Employees: Manufacturer approved agencies will use employees who are trained and experienced in the necessary crafts and familiar with the specifications and methods needed to properly perform the work. Manufacturer approved agency to perform the work must be in business for a minimum of 5 years.

C. Guarantee: Acrylic/ABS wall systems shall be installed by the manufacturer, manufacturer's approved agent/company and guaranteed against manufacturing defects for a period of five (5) years from date of substantial completion. Installation and labor is guaranteed for a period of one (1) year.

1.03 SUBMITTALS

A. Samples: Submit samples for review by the Architect as follows:
1. Acrylic/ABS material.
2. Any selected accessories.
3. Caulking.
4. Adhesives.
5. Fastening devices.

B. Shop Drawings: Submit detailed shop drawings for review by the Architect. These shop drawings shall show proposed methods of installation for actual field conditions. Coordinate with the manufacturer to show joint of acrylic wall with new cap and wrap of the window. If applicable.

C. Test Installation: Make one complete installation of acrylic wall and window liner for review by the Architect. Remaining work may be done only after written approval from the Architect not to be unreasonably withheld or delayed. Approved test installation will be the standard by which remaining work is judged.

D. Maintenance Information: Furnish two copies of the Cleaning Instructions.

PART 2 - PRODUCTS

2.01 MATERIALS - GENERAL

A. Materials: All materials shall be new, free of defects impairing their strength, durability or appearance and of good commercial quality for purposes noted.

B. Caulking: All caulking shall be watertight, mildew resistant silicone sealant, equal to or better than DOW Corning 784, 786 or SCS-1702. Where the seam is next to a wall that is going to be painted, a latex caulk may be used if so specified.

C. Adhesives: All adhesives used shall be fire, water and mildew resistant in their cured state.

D. Plastic: Shall be acrylic/ABS in sheet form with the following characteristics:

1. Thickness as specified for each member with a tolerance of ten percent (10%) plus or minus.
2. Meets or exceeds the requirements of HUD/FHA as stated in "Materials Bulletin Number 73A: for Plastics".
3. Retains a modest gloss finish resistant to chipping and cracking under normal use.
4. Substantially of the specified color within each installation.

E. Basis-of-Design Product: Subject to compliance with requirements.

2.02 SEAMLESS ACRYLIC BATHTUB AND SURROUNDING WALL SYSTEM

A. Acrylic/ABS Plastic: Members shall be manufactured from a sheet of acrylic plastic with a minimum thickness of .115”.

B. Type: The acrylic wall system shall extend from the bath/tub rail to ceiling with trim (unless otherwise specified as finishing lower by the architect).

C. Style: The acrylic bathtubs and surrounding wall system shall be single sheets of smooth and or simulated tile acrylic/ABS, dependent on architect’s select style, without seams/joints which are molded and customized to meet the reasonable specific requirements of each bathroom.

2.03 WINDOW LINER INSERT
A. Plastic: Multiple piece liner shall be manufactured from a sheet of acrylic plastic 0.125” thick.
B. Style: The window liner shall completely enclose the existing window frame and/or trim.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Verification: The contractor shall visit each unit and verify all dimensions and conditions for the work herein specified.

B. Working Hours: The installation shall be made during normal working hours and shall be completed on the same day in which it is commenced whenever reasonably possible.

C. Obstructions: Any reasonable/normal obstructions encountered for the installation of all products in this specification shall be removed under this contract, except that should any hazardous material be encountered, contractor shall immediately suspend work until such substance is removed by owner at owner’s sole cost and expense.

D. Wall Repair: Patch and repair any wallboard or plaster surfaces damaged or disturbed by contractor and/or subcontractors that are exposed after specified product installation.

E. Demolition: Plumbing materials removed due to the installation of the tub surround system and which are not to be reused shall become the property of the contractor who shall thereafter remove them from the premises.

3.02 SURFACE CONDITIONS

A. Bonding Surfaces: Clean, prepare and prime all existing wall surfaces and remove all foreign materials such as chipping paint, etc..; existing wall surfaces shall be in reasonably good condition, failing which additional costs will be charged to owner for preparing same.

B. Conditions: Examine the areas and conditions under which work of this section will be performed. Correct normal conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are not corrected. Any unusual condition encountered shall be corrected at Owner’s additional cost and expense.

C. Blocking: Install any required blocking for installation purposes.

3.03 INSTALLATION

A. Acrylic/ABS Bathtub and Surround Wall System

1. Remove existing damaged wall surfaces and patch holes with .5" moisture resistant gypsum board; however, should existing wall surfaces be in unusual damaged condition, contractor shall charge Owner for repair costs.
2. All wall panels and bathtub shall be integrated with the tub and walls and windows.
3. Measure panel and custom fit to fixture locations. Apply adhesive and tape on wall and position panel in place. Apply silicone waterproofing around all holes cut in panel for plumbing.
4. Install supporting flanges, shower and window curtain rods, soap dishes, etc., as specified.
5. Where bathrooms have a window located over the bathtub area install window trim as specified in paragraph 3.03, B, installation of Window Liner.
6. Trim exposed edges, ends and seams with plastic trim and specified sealants.
7. Installation shall be made with approved caulking. All perimeter edges between new panels and existing walls including corner joints between window, back wall, or the side walls must be caulked.

B. Window Liner

1. Remove existing trim from existing window. Trim or remove window sill as required.
2. Shim out sides of existing window as required.
3. Trim window liner to proper depth.
4. Apply adhesive, tape and water sealant to window and position in place.
5. Apply front edge trim to window liner as needed.
6. Installation shall be made with approved caulking. All perimeter edges between new acrylic wall panels and window liners must be caulked. Apply silicone waterproofing at all edges and seams and trim as needed for a watertight installation.

3.04 CAULKING AND WATERPROOFING

A. Clean all seam surfaces to be caulked as required by manufacturer.

B. Apply silicone/adhesive waterproofing sealant to all seams and plumbing trim for a water tight installation.

3.05 CLEAN-UP

A. Wipe down all products installed with warm soapy water and/or acrylic cleaner.

B. Remove all waste resulting from this work and leave each unit "broom clean".

END OF SECTION 102117

SECTION 102310 - GLAZED INTERIOR WALL AND DOOR ASSEMBLIES (C.R. LAWRENCE (CRL), 10 200, 487 SERIES)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Framed glazed interior wall and door assemblies.

1.2 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware.

1.3 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2013.

C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

E. ASTM C1036 - Standard Specification for Flat Glass; 2011e1.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

G. WDMA I.S.1-A - Architectural Wood Flush Doors; Window and Door Manufacturers Association; 2011.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.
   1. Require attendance by representatives of installer, other entities directly affecting, or affected by, construction activities of this section.
   2. Notify Architect four calendar days in advance of scheduled meeting date.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's descriptive literature for each component in partition assembly.

C. Shop Drawings: Drawings showing layout, dimensions, identification of components, and interface with adjacent construction.
   1. Include field measurements of openings.
   2. Include Elevations Showing:
      a. Locations and identification of manufacturer-supplied door hardware and fittings.
      b. Locations and sizes of cut-outs and drilled holes for other door hardware.
   3. Include Details Showing:
      a. Requirements for support and bracing of overhead track.

b. Installation details.
c. Appearance of manufacturer-supplied door hardware and fittings.

D. Selection Samples: Two sets, representing manufacturer's full range of available metal materials and finishes.

E. Verification Samples: Two samples, minimum size 2 by 3 inches, representing actual material and finish of exposed metal.

F. Design Data: Design calculations, bearing seal and signature of structural engineer licensed to practice in the State in which the Project is located, showing loads at points of attachment to the building structure.

G. Certificates: Contractor to certify that installer of partition assemblies meets specified qualifications.

H. Operation and Maintenance Data: For manufacturer-supplied operating hardware.

I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

J. Specimen Warranty.

K. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Minimum three years of experience designing, assembling, and installing partition assemblies similar to those specified in this section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until installation.

1.8 WARRANTY

A. See Section 017700 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one-year period after date of Substantial Completion.

C. Provide five-year manufacturer warranty against excessive degradation of metal finishes. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Framed Glazed Interior Wall and Door Assemblies:
1. C.R. Laurence Co., Inc; 10 200, CRL 487 Series, Interior Office Partition with Framed Glass System: www.crl-arch.com.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 FRAMED GLAZED INTERIOR WALL AND DOOR ASSEMBLIES (see Architectural Drawings)

A. Framed Glazed Interior Wall Assembly: Factory fabricated assemblies consisting of center-glazed rectilinear aluminum framing with screw spline or clip joinery.
   1. Configuration: As indicated on drawings.
   2. Profile Width: 1-1/2 inch.
   3. Profile Depth: 5-11/16 inch overall.
   4. Profile Face Trim: 1-1/2 inch wide by 3/8 inch deep, snap in place.
   5. Wall Construction Width, Throat Size: 4-7/8 inch maximum wall, consisting of metal studs.
   6. Frame Finish: Class I natural anodized.
   7. Provide wood blocking at sill of glazing frame to match height of floor finish.
   8. Exposed Fasteners: Aluminum.
   9. Perimeter Anchors: Steel, properly separated from aluminum framing.
   10. Coordinate wall and door assembly preparation and provide hardware as necessary for fully operable installation.
   11. Design system to withstand normal operation without damage, racking, sagging, or deflection.
   12. Factory assembled to greatest extent practical; may be disassembled to accommodate shipping constraints.

B. Pivoting Glass Doors: Dry glazed patch fittings.
   1. Door Configuration: As indicated on drawings.
   2. Height: 2-inch.
   3. Length: 6-7/16 inch.
   4. Cladding Finish: Satin anodized.
   5. Glass Thickness: 1/2 inch, tempered.
   6. Door Hardware: Locking ladder pulls, brushed stainless steel tubing.
   7. Provide accessories as required for complete installation.
   8. Basis of Design: C.R. Laurence Co., Inc; CRL Commercial Patch Hardware, Catalog No. PH20AA (Top), PH10CA (Bottom): www.crl-arch.com.

C. Sliding Framed Glass Doors: Top supported without holes required in glass.
   1. Door Configuration: As indicated on drawings.
   2. Door Weight: 200 lbs, maximum.
   3. Glass Thickness: 3/8, 1/2 inch, tempered.
   4. Door Hardware: Manufacturer Std Hardware
   5. Provide accessories as required for complete installation.
   6. Basis of Design: C.R. Laurence Co., Inc; CRL200 Series Top Hung Sliding Door System: www.crl-arch.com.

F. Pivoting Flush Wood Doors: Complying with WDMA I.S.1-A standards, Premium Grade, with AA Grade veneer faces.
   1. Door Configuration: As indicated on drawings.
   2. Door Width: 36-inch (76 mm).
   3. Door Height: 80-inch (2 m).
   4. Thickness: 1-3/4 inch (44 mm).Veneer: Rotary cut, white birch.
   5. Veneer Match: Book Running Match.
   6. Veneer Finish: Field finished.
   7. Vision Lites: As indicated on drawings, with 1 inch wide stiles, minimum.

8. Door Hardware: Refer to Section 087100.
9. Door Fire Rating and Core: 20-minute fire rated, positive pressure; particle board core (PC).
10. Provide metal backing plate at door hinges and securely fasten within partition framing.
11. Provide mounting brackets, and other accessories as required for complete installation.
12. Basis of Design: C.R. Laurence Co., Inc; CRL-US Aluminum SC Series Wood Flush Doors.

G. Pivoting Flush Double Wood Doors: Complying with WDMA I.S.1-A standards, Premium Grade, with AA Grade veneer faces.
1. Door Configuration: As indicated on drawings.
2. Door Widths: 36-inch (76 mm).
3. Door Heights: 80-inch (2 m).
4. Thickness: 1-3/4 inch (44 mm).Veneer: Rotary cut, white birch.
5. Veneer Match: Book Running Match.
6. Veneer Finish: Field finished.
7. Vision Lites: As indicated on drawings, with 1 inch (25.4 mm) wide stiles, minimum.
8. Door Hardware: Refer to Section 08 7100.
9. Door Fire Rating and Core: 20-minute fire rated, positive pressure; particle board core (PC).
10. Provide metal backing plate at door hinges and securely fasten within partition framing.
11. Provide mounting brackets, and other accessories as required for complete installation.
12. Basis of Design: C.R. Laurence Co., Inc; CRL-US Aluminum SC Series Wood Flush Doors.

H. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of another manufacturer.

I. Substitutions: See Section 016000 - Product Requirements.
1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.03 FITTINGS AND HARDWARE

A. Operable Panel Hardware: Coordinate with additional requirements as specified in Section 08 7100.

2.04 MATERIALS

A. Glass: Flat glass meeting requirements of ASTM C1036, Type I - Transparent Flat Glass, Class 2 - Tinted, Quality Q3, fully tempered in accordance with ASTM C1048, Kind FT, and as follows:
1. Thickness: As indicated.
2. Color: Grey tint; low iron.
3. Glazing Stops: Square edge, with rubber glazing gaskets.

4. Glazing Gaskets: Provide flexible vinyl for non-fire rated and elastomeric silicone for fire rated frames.
5. Prepare glazing panels for indicated fittings and hardware before tempering.
6. Polish edges that will be exposed in finished work to bright flat polish.
7. Temper glass materials horizontally; visible tong marks or tong mark distortions are not permitted.

B. Aluminum Components: Conforming to ASTM B221 (ASTM B221M), Alloy 6063, T5 Temper.

C. Sealant: One-part silicone sealant, conforming to ASTM C920, clear.

2.05 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that track supports are properly braced, level within 1/4 inch (6 mm) of required position and parallel to the floor surface.

C. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.

D. Do not begin installation until supports and adjacent substrates have been properly prepared.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean substrates thoroughly prior to installation.

B. Prepare substrates using the methods recommended by the manufacturer for achieving acceptable result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with glazed interior wall and door assembly manufacturer's instructions.

B. Fit and align glazed interior wall and door assembly level and plumb.

3.4 ADJUSTING

A. Adjust glazed interior wall and door assembly to operate smoothly from sliding or pivoting positions.

B. Adjust swing door hardware for smooth operation.

3.5 CLEANING

A. Clean installed work to like-new condition.

3.6 CLOSEOUT ACTIVITIES

A. See Section 017700 - Closeout Submittals, for closeout submittals.

B. Demonstrate operation of glazed interior wall and door assembly and identify potential operational problems.

3.7 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before date of Substantial Completion.

END OF SECTION

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Public-use shower room accessories.
3. Private-use bathroom accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: Full size, for each exposed product and for each finish specified.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Grab Bar TA-5-36” TA-6 – 42”; TA-9 – 24” x 36”; TA-12 – 30”
   1. Basis of Design: bobrick no. B-5806 and B-58616
   2. Mounting: Flanges with concealed fasteners.
   3. Material: Stainless steel, 0.05 inch thick.

      a. Finish: Smooth, No. 4 finish (satin).

   4. Outside Diameter: 1-1/2 inches.
   5. Configuration and Length: As indicated on Drawings.

B. Coat Hook: TA-7
   1. Basis of Design: Bobrick No. B-670
   2. Description: Single-prong unit.
   3. Material and Finish: Stainless steel, No. 4 finish (satin).

2.3 PUBLIC-USE SHOWER ROOM ACCESSORIES

A. Shower Curtain: TA-11
   1. Basis of Design: Bobrick No. 204-2

   2. Size: Minimum 6 inches wider than opening by 72 inches high.
   3. Material: Vinyl, minimum 0.006 inch thick, opaque, matte.
   4. Color: As selected from manufacturer's full range <**Insert color**>.
   5. Grommets: Corrosion resistant at minimum 6 inches o.c. through top hem.
   6. Shower Curtain Hooks: Chrome-plated or stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.

B. Folding Shower Seat: TA-8
   1. Basis of Design: Bobrick No. B-5191
   2. Configuration: Rectangular seat.
   3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect.
   4. Mounting Mechanism: Stainless steel, No. 4 finish (satin).
   5. Dimensions: 18” x 15”.

2.4 PRIVATE-USE BATHROOM ACCESSORIES

A. Toilet Tissue Dispenser: TA-3
   1. Basis of Design: Bobrick No. B-543
   2. Description: Single-roll dispenser.
   3. Mounting: Surface mounted.
   4. Capacity: Designed for 4-1/2- or 5-inch-diameter tissue rolls.
   5. Material and Finish: Stainless steel, No. 4 finish (satin).

B. Shower Curtain Rod: TA-10
   1. Basis of Design: Bobrick No. B-107

2. Outside Diameter: 1 inch.
3. Mounting: Flanges with concealed fasteners.
4. Rod Material and Finish: Stainless steel, No. 4 finish (satin).
5. Flange Material and Finish: Stainless steel, No. 4 finish (satin).
6. Accessories: Integral chrome-plated brass glide hooks.

C. Soap Dish: TA-1
1. Basis of Design: Bobrick No. B-680
2. Description: One piece stainless steel soap dish.
3. Mounting: Surface mounted.
4. Material and Finish: Stainless steel, No. 4 finish (satin).

D. Medicine Cabinet: TA-2
1. Basis of Design: Bobrick No. B-398
2. Mounting: Recessed, for nominal 4-inch wall depth.
3. Size: 15 by 25 inches.
4. Door: Framed mirror door concealing storage cabinet equipped with continuous hinge and spring-buffered, rod-type stop and magnetic door catch.
5. Shelves: Four, adjustable.
6. Material and Finish:

a. Cabinet: Stainless steel, No. 4 finish (satin).

E. Towel Bar: TA-4
1. Basis of Design: Bobrick No. B-674
2. Description: 3/4-inch-round tube with circular end brackets.
3. Mounting: Flanges with concealed fasteners.
4. Length: 24 inches.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

2.5 FABRICATION

A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

END OF SECTION 102800

SECTION 122113 - HORIZONTAL LOUVER BLINDS (REVISED)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Horizontal louver blinds with polymer slats.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For horizontal louver blinds, include fabrication and installation details.

C. Samples: For each exposed product and for each color and texture specified, 12 inches long.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 HORIZONTAL LOUVER BLINDS, POLYMER SLATS

A. CACO Inc.; Hunter-Douglas Contract; Levelor inc.

B. Flame-Resistance Rating: Comply with NFPA 701; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

C. Slats: Polymers that are lead free, UV stabilized, integrally colored, opaque, and will not crack or yellow; antistatic, dust-repellent treated.

1. Width: 1 inch
2. Thickness: 0.105 inches
3. Features:

a. Lift-Cord Rout Holes: Minimum size required for lift cord and located near back (outside) edge of slat to maximize slat overlap and minimize light gaps between slats.

D. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrail fully encloses operating mechanisms on three sides and ends.

1. Manual Lift Mechanism:
   a. Lift-Cord Lock: Variable; stops lift cord at user-selected position within full operating range.
   b. Operator: Extension of lift cord(s) through lift-cord lock mechanism to form cord pull.
2. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
   a. Tilt: Full.
   b. Operator: Clear-plastic wand or Dual cord.
4. Manual Lift-Operator and Tilt-Operator Lengths: Full length of blind when blind is fully closed
5. Manual Lift-Operator and Tilt-Operator Locations: Manufacturer's standard or Right side and left side of headrail, respectively, unless otherwise indicated.

E. Bottom Rail: Secures and protects ends of ladders and lift cords.
1. Type: Manufacturer's standard

F. Ladders: Braided cord

G. Valance: Manufacturer's standard

H. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.

I. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.

J. Colors, Textures, Patterns, and Gloss:
1. Slats: As selected by Architect from manufacturer's full range

2.2 HORIZONTAL LOUVER BLIND FABRICATION

A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch plus or minus 1/8 inch

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.

1. Locate so exterior slat edges are not closer than 1 inch from interior faces of glass and not closer than 1/2 inch from interior faces of glazing frames through full operating ranges of blinds.
2. Install mounting and intermediate brackets to prevent deflection of headrails.
3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

B. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

C. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.

END OF SECTION 122113

SECTION 123216 - MANUFACTURED PLASTIC-LAMINATE-CLAD CASEWORK (REVISED)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes plastic-laminate-faced cabinets of stock design.

B. Related Requirements:

1. Section 123623.13 "Plastic-Laminate-Clad Countertops."

1.2 DEFINITIONS

A. Definitions in the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" apply to the work of this Section.

B. Hardwood Plywood: A panel product composed of layers or plies of veneer, or of veneers in combination with lumber core, hardboard core, MDF core, or particleboard core, joined with adhesive, and faced both front and back with hardwood veneers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For cabinet finishes.

1.4 INFORMATIONAL SUBMITTALS

A. Quality Standard Compliance Certificates: AWI Quality Standards.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of casework that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of components or other failures of glue bond.
b. Warping of components.
c. Failure of operating hardware.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Local manufacturers as approved by Owner.

B. Source Limitations: Obtain plastic-laminate-faced cabinets from single manufacturer.

2.2 CASEWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.

1. Grade: Custom.

B. Product Designations: Drawings indicate sizes, configurations, and finish materials of manufactured plastic-laminate-faced cabinets by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes and door and drawer configurations, of same finish materials, and complying with the Specifications may be considered. See Section 016000 "Product Requirements."

2.3 CASEWORK

A. Design:
1. Flush overlay.

B. Exposed Materials:

1. Plastic Laminate: Grade HGS.

a. Colors and Patterns: As selected by Architect from manufacturer's full range.

2. Unless otherwise indicated, provide specified edgebanding on all exposed edges.
3. Solid Wood: Clear hardwood lumber of species indicated, selected for compatible grain and color.
4. Wood Species: Any closed-grain hardwood.

C. Semiexposed Materials:

1. Plastic Laminate: Grade VGS unless otherwise indicated. Provide plastic laminate for semiexposed surfaces unless otherwise indicated.
2. Thermoset Decorative Panels: Provide thermoset decorative panels for semiexposed surfaces unless otherwise indicated.

a. Provide plastic laminate of same grade as exposed surfaces for interior faces of doors and drawer fronts and other locations where opposite side of component is exposed.

2.4 MATERIALS

A. Hardwood Plywood: HPVA HP-1, particleboard core except where veneer core is indicated.

B. Softwood Plywood: DOC PS 1.

C. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.

D. Edgebanding for Plastic Laminate: Plastic laminate matching adjacent surfaces.

2.5 COLORS AND FINISHES

A. Wood Colors and Finishes: As selected by Architect from casework manufacturer's full range.

B. Thermoset Decorative Panel Colors, Patterns, and Finishes: As selected by Architect from casework manufacturer's full range.

C. Plastic-Laminate Colors, Patterns, and Finishes: As selected by Architect from plastic-laminate manufacturer's full range.

2.6 CASEWORK HARDWARE AND ACCESSORIES

A. Hardware, General: Unless otherwise indicated, provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware.

1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.

B. Frameless Concealed Hinges (European Type): BHMA A156.9, Type B01602, 135 degrees of opening, self-closing. Provide two hinges for doors less than 48 inches high, and provide three hinges for doors more than 48 inches high.

C. Pulls: Solid stainless-steel wire pulls, fastened from back with two screws. For sliding doors, provide recessed stainless-steel flush pulls. Provide two pulls for drawers more than 24 inches wide.

D. Door Catches: Zinc-plated, dual, self-aligning, permanent magnet catch. Provide two catches on doors more than 48 inches high.

E. Drawer Slides: BHMA A156.9, Type B05091.

PART 3 - EXECUTION

3.1 CASEWORK INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Install casework level, plumb, and true; shim as r equired, using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

C. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within 1/16 inch of a single plane. Align similar adjoining doors and drawers to a tolerance of 1/16 inch. Bolt adjacent cabinets together with joints flush, tight, and uniform.

D. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, masonry, framing, wood blocking, or reinforcements in walls and partitions. Align similar adjoining doors to a tolerance of 1/16 inch.

E. Fasten cabinets to adjacent cabinets and to masonry, framing, wood blocking, or reinforcements in walls and partitions to comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."

F. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.2 CLEANING

A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 123216

SECTION 123623.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS (REVISED)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes plastic-laminate-clad countertops.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For plastic-laminate-clad countertops.

1. Apply AWI Quality Program to Shop Drawings.

C. Samples: Plastic laminates in each type, color, pattern, and surface finish required.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For the following:

1. Composite wood products.
2. High-pressure decorative laminate.
3. Adhesives.

B. Quality Standard Compliance Certificates: AWI Quality Program.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1. Shop Certification: AWI's Quality Program.

B. Installer Qualifications: Fabricator of products AWI's Quality Program.

PART 2 - PRODUCTS

2.1 FABRICATORS

A. Fabricators: Subject to compliance with requirements, provide products by the following:
1. Local firm as approved by Architect or Owner.

2.2 PLASTIC-LAMINATE-CLAD COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.

1. Provide fabrication and installation equal to AWI certification standards indicating that countertops comply with requirements of grades specified.

B. Grade: Custom.

C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As selected by Architect or Owner from manufacturer's full range in the following categories:

a. Solid colors, matte finish.
b. Solid colors with core same color as surface, matte finish.
c. Wood grains, matte finish with grain running parallel to length of countertop.

E. Edge Treatment: Same as laminate cladding on horizontal surfaces.

F. Core Material: Exterior-grade plywood.

G. Core Material at Sinks: Particleboard made with exterior glue or exterior-grade plywood.

H. Core Thickness: 3/4 inch.

1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.

I. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.3 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of countertop and quality grade specified unless otherwise indicated.
1. MDF: Medium-density fiberboard, ANSI A208.2, Grade 130.

2.4 MISCELLANEOUS MATERIALS

A. Adhesive for Bonding Plastic Laminate: As selected by fabricator to comply with requirements.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

B. Installation Adhesive:
1. As selected by installer to comply with requirements.

2.5 FABRICATION

A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:

1. Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.

B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.

1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
2. Seal edges of cutouts by saturating with varnish.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

1. Secure field joints in countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a co nstant, heavy-clamping pressure at joints.

D. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Countertop Installation: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops level and true in line. Use concealed shims as required to maintain not more than a 1/8-inch-in-96-inchesvariation from a straight, level plane.
2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
3. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

F. Protection: Provide Kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION 123623.13

SECTION 21 10 00 - FIRE PROTECTION SYSTEM (REVISED)

PART 1 - GENERAL

1.1 SCOPE

A. This Section specifies a complete and working fire protection system consisting of an automatic wet pipe fire sprinkler system, an automatic dry pipe fire sprinkler system, a wet standpipe system and a fire protection pressure boosting system extending from a control pumping station to all fire main risers and fire hydrants.

1.2 APPLICABLE PROVISIONS

A. Refer to Section 23 00 00, Mechanical General Provisions.

1.3 STANDARDS

A. Make the installation in accordance with applicable statutes, ordinances, codes and regulations of National Fire Protection Association (NFPA), Underwriters Laboratories (UL), OSHA, Factory Mutual, Industrial Risk Insurers, the building insurance underwriter, the City of San Antonio Fire Department and any state, local or other governmental authorities having jurisdiction.

B. Resolve any code violation discovered in contract documents with the Engineer prior to award of the contract. After award of the contract, make any correction or addition necessary for compliance with applicable codes at no additional cost to Owner.

C. Furnish equipment and materials approved by NFPA, FM and UL. Fittings, valves, hoses and the like must bear a UL label.

D. Obtain and pay for all permits and inspections.

1.4 CONTRACTOR QUALIFICATIONS

A. Contractor for the work under this section shall be a specialist in this field and have the personal experience, training, skill and the organization to furnish a practical working system. If required, the Contractor shall furnish acceptable evidence of having contracted for and installed not less than three systems of comparable size and type to this one, that have served their Owners satisfactorily for not less than three years.

B. The foreman for this work shall have had experience in installing not less than three such systems that have been approved by the local Fire Marshal's office. Adequate and competent supervision shall be provided to ensure first class workmanship and installation.

C. The Contractor shall hold a Certificate of Registration from The State Fire Marshal per the Texas State Sprinkler Rules and Article 5.43-3 Insurance Code.

D. Work shall be executed and all materials installed in accordance with the best practice of the trades in a thorough, substantial, workmanlike manner by competent workmen, presenting a neat appearance when completed. Work shall be performed by mechanics skilled in the trade.

E. The Contractor shall be responsible for all construction techniques required for all fire protection systems specified and shown on the drawings.

1.5 AUTOMATIC SPRINKLER SYSTEM DESIGN CRITERIA

A. Requirements. Furnish a complete, working and approved automatic sprinkler system for the entire building, including all concealed spaces, attics, stairs and outside covered walkways as required by all authorities listed in this specification. Furnish a complete automatic wet pipe sprinkler system for all heated building areas and a complete dry pipe system for all unheated areas (areas subject to freezing). All portions of buildings shall be protected by automatic fire sprinkler systems. Reference floor plans for additional requirements. Drawings indicate a general arrangement of the system and are not to be considered as a complete or final design. If Contractor must deviate from general arrangement shown, such deviation shall be clearly indicated with Contractor's bid and shall submit a detailed description of the deviation with his bid. Contractor shall pay all costs incurred to change the sprinkler system design or arrangement after award of contract.

B. Flow Test. Prior to design, conduct a flow test with representatives of the Owner's Insurance Company, where applicable, and the local Fire Department present.

C. System Design. The sprinkler system contractor is required to develop, submit and install a complete and approved fire protection system design.

1. Prepare detailed drawings and submit them to Factory Mutual, the building insurance underwriter, the City of San Antonio Fire Marshal's Office, and any other state or local governing body having jurisdiction for approval. Contractor shall commence design work on submittal drawings immediately after award of contract and shall submit approved drawings to the Architect/Engineer in a reasonable amount of time (for Engineer's acknowledgement) prior to installation of any portion of the fire systems. Approved data shall bear seal of approval by the Factory Mutual, the City of San Antonio Fire Department and all other agencies having jurisdiction (insurance or otherwise). Submit approved drawings only. Do not submit drawings to Architect/Engineer without approval seal and signature. Drawings shall include all required information required by NFPA pamphlets for working plans, including all details, plans, calculations, etc. All fire sprinkler drawings shall include all information required by NFPA 13, Chapter 1.

2. Drawings shall be submitted to governmental authorities (listed in this specification), for approval immediately after award of contract to avoid delays on the construction project. Contractor shall be responsible for obtaining approvals before start of construction and shall assume all responsibilities for delays.

3. The Contractor shall be responsible for the complete design of the fire sprinkler system. All pressure losses through the distribution system and fluctuations in supply system pressures shall be adequately accounted for. Care shall be taken in making water tests to be used in designing or evaluating the capacity of sprinkler systems. Reference NFPA pamphlet No. 13 Appendix A. It shall be the sole responsibility of the Contractor to

replace or otherwise correct any portion of the fire sprinkler system that does not meet available pressures and flow rates. Future changes in water supplies shall be considered. It shall be the sole responsibility of the Contractor to determine available flow and pressures.

4. The automatic sprinkler system shall be hydraulically designed (by the Contractor).

5. All piping shall be installed above finished ceilings and below roof insulation (except for dry pipe systems). Do not route piping under lights.

6. Provisions for flushing systems. Sprinkler system shall be arranged for flushing. Readily removable fittings shall be furnished at the end of all cross mains. All cross mains shall terminate in 1-1/4-inches or larger pipe. All branch lines on sprinkler system shall be arranged to facilitate flushing. Route all drain lines to outside.

7. Contractor shall coordinate exact location of access doors with Architect/Engineer during design phase. Obtain location approval from Architect/Engineer for each and every access door.

8. All sprinkler heads shall be installed at the center of all ceiling tiles. Do not locate heads off center of tiles or near ceiling grids. Contractor shall include in his bid costs for additional pipe, sprinkler heads, etc. required to accomplish these spacing requirements.

9. Prior to installation, furnish a minimum of seven (7) copies of approved drawings to the Architect/Engineer. Do not start installation work until all required approvals have been obtained.

10. Design the system in accordance with statutes, ordinances, codes and regulations of Factory Mutual, Industrial Risk Insurers, National Fire Protection Association (NFPA), Underwriters Laboratories (UL), OSHA, International Building Code, City of San Antonio Fire Department, the building insurance underwriter, and any state, local or other governmental authorities having jurisdiction.

11. Test Procedures. Upon completion and prior to acceptance of installation, test the system as required in NFPA Pamphlet No. 13.

12. Material and Equipment. Use new and unused materials and equipment, approved by NFPA and as listed in the UL list of "Inspected Fire Protection Equipment and Materials."

1.6 GUARANTEE

A. Guarantee work for two (2) years from the date of final acceptance of the project and during that period make good any faults or imperfections that may arise due to defects or omissions in materials, workmanship or design.

2.0 PRODUCTS

2.1 PIPING AND FITTINGS

A. Furnish pipe and pipe fittings of domestic manufacturers only.

1. Above Slab. Furnish Schedule 40, black steel pipe conforming to ASTM A 135 with Class-150 standard Malleable Iron screwed fittings. For piping 4-inch and larger diameter pipe, weld the joints. Style 77, Victaulic couplings with grade "E" molded synthetic rubber gaskets (rated at 300 PSI) are acceptable alternatives to welded connections. Thin wall pipe shall not be used.

    a. Pipe Hangers. Furnish U.L. listed and FM approved, adjustable, pregalvanized carbon steel with zinc electroplated insert equivalent to Michigan Hanger Co., Inc. Model #115 and #130.

2. Underground. Furnish Class 50 ductile iron pipe meeting requirements of AWWA C-104, C-151 and ASTM A-339, wrapped with at least 8-mils of polyethylene wrap. Furnish concrete thrust blocks at all changes in direction, according to the pipe manufacturer's recommendations (minimum 4-sack mix with a compressive strength at 28 days of 2000 PSI).

2.2 FIRE MAIN VALVES

A. Furnish valves for use on fire mains as specified. Valves 2-1/2 inches and above shall be stamped with UL approval.

1. Above Ground Gate Valves. Furnish Class 175, WWP, OS & Y, bronze mounted, solid wedge, ASTM A-126 Class B cast body and bonnet, flanged end, UL stamped gate valves. Stockham G-634, Kennedy 68, Mueller A-2073-6 or Nibco F-607-O.

2. Gate Valves for Wall Indicator Post. Furnish Class 175, bronze mounted, solid wedge, ASTM A-126 Class B cast body and bonnet, non rising stem, flanged end, UL stamped gate valves with mounting plate for indicator post. Stockham G-632-O, Kennedy 70X, Mueller A-2052-6 or Nibco F-609.

3. Globe Valves. Furnish Class 125, WOG, rising stem, brass swivel disc holder, screwed end, UL listed for fire sprinkler service all bronze globe valves. United 125S or Kennedy 97W/182.

4. Check Valves. Furnish Class 175, WWP, Bolted cap, ASTM A-126 Class B cast body and cap, flanged end, UL stamped check valves with composition swing-type disc. Stockham G-940, Kennedy 126A or Nibco F-908-W.

5. Dry Pipe Valve. Furnish Reliable Automatic Sprinkler Company Inc. Model "D" dry pipe valve complete with trim and model A-2 or B-1 Automatic air maintenance device.

6. Alarm Check Valves. Furnish Reliable Automatic Sprinkler Company Inc. Model "E" alarm valve complete with trim.

7. Water Motor Gong. Furnish Reliable Automatic Sprinkler Company Inc. Model "C" mechanical sprinkler alarm, complete.

8. Ball Drip Valves. Furnish Potter Roemer No. 5982 3/4-inch ball drip valve or approved equal.

2.3 SPRINKLER HEADS

A. Install upright, pendent or sidewall sprinkler heads in exposed piping areas and flush type sprinkler heads in areas with ceilings. Furnish dry pendent type where applicable. Prior to submitting on sprinkler heads, obtain approval of specified heads from authorities listed above in this section. All heads shall be UL listed.

1. Upright or pendant. Use a brass sprinkler head, such as Reliable Automatic Sprinkler Company Inc. Model "G" "Automatic Sprinklers Spray Upright, Spray Pendant and Conventional", with polished chrome finish for upright or pendant installation.
2. Sidewall. Use a brass sprinkler head, such as Reliable Automatic Sprinkler Company Inc. Model "G" "Sidewall Sprinklers", with polished chrome finish for sidewall installation. Furnish extended coverage heads where required.

3. Flush. Use a brass sprinkler head, such as Reliable Automatic Sprinkler Company Inc. Model "G4", concealed head with flat white finish cover plate, for flush installation.

4. Dry Pendant. Use a brass sprinkler head, such as Reliable Automatic Sprinkler Company Inc. Model "G3", dry sprinkler. Furnish concealed type with flat white finish cover plate for areas with lay in ceilings and recessed pendant type with polished chrome plated cup assembly in all other areas.

B. Spare Sprinkler Head Box. Furnish a red baked enamel fire sprinkler head cabinet complete with replacement sprinkler heads (quantity as required by NFPA) and one sprinkler wrench for each type of sprinkler head. Locate and install on wall as close as possible to fire main riser.

2.4 FIRE DEPARTMENT INLET CONNECTIONS: **EXISTING TO REMAIN.**

2.5 FLOW INDICATOR SWITCHES

A. Furnish a U.L. Listed and FM approved water flow indicator with a minimum of two sets of normally open contacts and 20-second delay such as a McDonnell Miller FS-4-3D-20. A contact on the indicator will be connected to building fire alarm system. Install where shown on drawings and furnish all wire and conduit required from flow switch to the alarm panel.

2.6 SUPERVISORY SWITCHES

A. Furnish U.L Listed and FM approved, Notifier Series NIP supervisory switch for indicator post and Series NGV supervisory switch for OS&Y valve installation with two single pole, double throw microswitches. The mechanism shall be contained in a red baked enamel, weatherproof housing and shall incorporate the necessary facilities for attachment to the valve. The switch mechanism shall have a minimum capacity of 1 ampere, 125 volts a-c. The entire installed assembly shall be tamperproof and arranged to cause switch operation if the housing cover is

removed or if the unit is removed from its mounting. Install supervisory switches where shown on drawings and furnish all wire and conduit required from supervisory switch to the alarm panel. Furnish a set of additional alarm contacts for additional supervisory capability.

2.7 AUTOMATIC DRY PIPE FIRE SPRINKLER SYSTEM

A. System. Include all necessary pipe, pipe fittings and accessories as required to furnish a complete, working and approved system.

B. Dry Pipe Valve. Equip, connect and install dry pipe valve and system as required by NFPA. Furnish valve and standard system appurtenances, including priming chambers, water and air pressure gauges, priming water level indicator, alarm testing by-pass, air maintenance device, etc.

C. Air Compressor. Furnish a UL listed, completely automatic, electric motor driven air compressor unit built, sized and equipped as required by NFPA. Install where shown and connect to dry pipe system with air maintenance device. Furnish an air pressure switch wired to operate the compressor. Size the compressor as required to recover and maintain system at normal pressure plus 25 percent in less than 30 minutes minimum and as required by all authorities having jurisdiction. Contractor shall size compressor and coordinate adequate electrical power service to compressor prior to submittal of product.

1. Motor. Furnish a high efficiency, drip-proof motor suitable for use and of sufficient size to handle full load starting torque.

2. Air Receiver. Furnish a cylindrical steel tank, constructed in accordance with ASME Code for unfired pressure vessels. Furnish receiver with inlet and outlet fittings located above tank centerline and a drain on bottom. Equip outlet and drain with shut-off valves. Size air receiver as required by NFPA for dry pipe sprinkler system installation.

3. Moisture Traps. Use ball float moisture traps with case body 250 psi. Wilkerson Model 5101-8. Install where shown and at low points of the system.

4. Controls. Furnish all motor starters, control panels, pressure switches, conduit, wiring and all other appurtenances required for a complete and working automatic system.

2.8 FIRE PUMP SYSTEM

A. System. Assemble the system on the job and include the fire pump, fire pump controller, jockey pump, jockey pump controller magnetic across-the-line starters and all valves, gauges, accessories and interconnecting piping to furnish a complete and working pumping system.

B. Fire Pump. Furnish UL and FM approved horizontal, split case fire pump with an electric drive motor and shall fully conform to NFPA Pamphlet No. 20. Capacities and characteristics are scheduled on the drawings.

1. Furnish pump designed to deliver not less than 150 percent to the rated capacity at the pressure of not less than 65 percent of the rated head.

2. Furnish that shut-off pressure not exceed 120 percent of the rated pressure.

3. Hydrostatically test the pump to twice the working pressure but not less than 250 PSIG. In addition, pump shall be given a complete performance test. The certified characteristic curves obtained from the test shall be properly prepared and submitted to the Architect/Engineer. Furnish factory certified pump curves.

4. Mount the pump and driver on a common base plate of fabricated steel.

5. Connect the pump and driver directly through a flexible coupling.

6. As driver, furnish a horizontal induction electric motor of open, drip-proof type.

7. Fire pump shall be equipped with eccentric suction reducer, discharge tee, blind flange, overflow cone, hose valve header, casing pressure relief valve (not smaller than 3/4-inch). Suction and discharge pressure gauges, automatic air release valve, concentric discharge increaser fitting and engraved or permanently etched operating instructions and capacities.

8. Pump motors and related appurtenances shall be equipped for Wye-Delta starter operation.

C. Fire Pump Controller. Furnish a motor control specifically approved for fire pump use and marked "Fire Pump Controller." Furnish fire control equipment completely assembled, wired and tested at the factory. Select Joslyn Clark Controls or approved equal. Enclose all equipment in one or more approved, drip-tight enclosures. Employ combined manual and automatic, across-the-line controllers incorporating the following:

1. An externally operable, quick-break disconnect switch.

2. A time delay circuit breaker with trips on all phases for 300 percent of full load motor current.

3. A "Wye-Delta" reduced current motor starter capable of being energized automatically through the pressure switch or manually by an externally operable handle.

4. A running period timer set to keep the motor in operation after automatic start-up for at least 1 minute for each 10 horsepower of motor rating, but not to exceed 7 minutes.

5. An integral adjustable pressure switch.

6. A pilot lamp to indicate that circuit breaker is closed and power is available.

7. An alarm relay to energize an audible and visible alarm through an independent source of power to indicate phase reversal on line side of motor starter and that the circuit breaker is open or that power has failed. Furnish 4-inch vibrating bell and dual-lamp visual alarm.

8. Furnish an ammeter test link and voltmeter test studs.

9. Mount a two-position selector station on the enclosure marked "Automatic" and "Non-Automatic".

10. Furnish means on the controller to operate an alarm signal continuously while the pump is running.

11. One set of auxiliary contacts for connections to the data gathering system, one normally open one normally closed.

12. Equip controller with a "Wye-Delta" closed transition reduced current connection for starting current of 33.3 percent across-the-line starting in-rush and starting torque.

13. Furnish NEMA 2 enclosure with top drip head for controller.

D. Jockey Pump And Controller. Furnish turbine or vertical shaft centrifugal multi-stage type jockey pump with capacity and characteristics as scheduled on drawings. Equip with two pressure gauges (suction and discharge), field adjustable pressure switch initially set to maintain pressure as scheduled on drawings and a 3/4-inch relief valve set at 150 percent of the design head. Furnish a combined manual and automatic jockey pump control panel with fused disconnect switch, magnetic starter, minimum run timer and manual-off-automatic selector switch. (Furnish NEMA 1 enclosure, with top drip hood).

E. Fire Pump Test Connection. Furnish a Potter Roemer No. 5864, 4-outlet, 1000 GPM, polished chrome-plated brass, UL listed, fire pump test connection with six rising stem fire department outlet valves. Install complete with plugs, chains and cast brass plate lettered PUMP TEST CONNECTION all with polished chrome finish. Test threads on 2-1/2-inch valves, using a coupling from the local fire department hose. Make the test in presence of the Architect/Engineer, or Owner.

2.10 APPURTENANCES

A. Furnish all equipment, accessories, fittings, drains, valves, switches, controls, conduit, wire, etc. and all other appurtenances required to make a complete, working and approved system.

B. Furnish wall, polished chrome plated brass pipe escutcheons for pipe penetrations through building floors, walls and ceilings. Reference the section on Pipe and Pipe Fittings - General.

C. Valve Signs. Furnish all required lettered metal sign conforming to NFPA 13 or NFPA 14 attached to each control valve.

D. Drains. Main drains shall be piped to discharge at safe points outside building or to sight cones attached to drains to size to readily care for full flow from each sprinkler drain under maximum pressure. All drain piping located outside shall be polished chrome plated brass.

E. Sleeves

1. Furnish schedule 40 galvanized steel pipe sleeves for pipes passing through masonry walls, floors and ceilings.

2. Extend sleeve completely through construction.

3. Reference the section on Pipe and Pipe Fittings - General.

F. Pipe Escutcheons. Each exterior wall pipe penetration shall be sealed on both sides with a polished chrome plated cast brass pipe escutcheon with set screw.

2.11 PRODUCT DATA

A. Fire system installer shall furnish instruction manual describing all components and functions, complete installation instructions, procedures for placing system in operation, maintenance procedures and instructions, catalog cuts, drawings, and electrical circuit wiring diagrams.

B. Submittals. Reference the section on Mechanical General Provisions.

2.12 TEST PROCEDURES

A. Upon completion and prior to acceptance of installation, test all systems per local requirements and NFPA Pamphlets.

2.13 THREAD TEST

A. Test threads on all 2-1/2-inch valves, using a coupling from the local fire department hose. Make the test in presence of the Architect/Engineer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Contractor shall make installation according to approved drawings.

B. All sprinkler heads shall be installed within the center of all ceiling tiles. Do not locate heads off center of tiles or near ceiling grids. Contractor shall install sprinkler heads in finished areas such that symmetry is maintained throughout the building. The aesthetic integrity of the interior finished areas shall be maintained. Prior to installing any sprinkler piping, the Sprinkler Contractor shall coordinate proposed location of piping with all trades including the General Contractor. In all cases, sprinkler piping shall be installed above finished ceilings and lights (do not route piping under lights). Contractor shall include in his bid, any additional pipe, sprinkler heads, etc., required to accomplish spacing requirements listed above.

C. Route all mains and branches as close as possible to the roof structure. Support all sprinkler piping independently from the structure; do not support from ducts, pipe, conduits, or other supports.

D. All sprinkler piping shall be routed concealed and hidden from view in walls, above ceilings or in chases in all finished areas. Do not expose piping in finished areas.

E. Supervisory switches shall be mounted so that they will not interfere with the normal operation of the valve and shall be adjusted to operate within two revolutions of the valve control or when the stem has moved no more than one-fifth of the distance from its normal position.

F. All underground piping within 5-feet of building shall be embedded in sand in accordance with section VIA-1.13a of the "Standard Construction Specifications of the Water and Wastewater Department.

G. Contractor shall comply with Chapter 1, NFPA-13, for approval, acceptance Tests and Material and Test Certificate.

H. Make the installation according to approved drawings. Give the entire system a complete performance test.

3.2 COORDINATION

A. Making adjustments to field conditions is considered a part of the work required. Do not use contract drawings accompanying these specifications for rough-in locations but only for pipe sizing and general routing.

B. Contractor shall examine and familiarize himself with the Architectural, Structural, Electrical and Mechanical drawings to be knowledgeable of all connections required and space limitations.

C. The drawings are diagrammatic and are not intended to show all the fittings required. Contractor shall include in his bid, costs for items of material and labor which are not specifically called for in drawings or specifications, but which are required to make fire protection system installation. Contractor shall make any necessary changes to avoid beams, footings, columns, piers, vents, ducts, equipment or other obstructions.

D. All ductwork, lights, structural members and main runs of all other piping shall take precedence over sprinkler piping; coordinate with all other trades.

E. In any case where a pipe shown on a plan sheet differs from that shown on a riser, schematic or detail, use the larger of the two sizes shown.

END OF SECTION 21 10 00

SECTION 22 11 16 - DOMESTIC WATER PIPING AND APPURTENANCES

PART 1 - GENERAL

1.1 SCOPE

A. This Section provides requirements for furnishing and installing domestic hot and cold water piping.

1.2 RELATED WORK

A. Division 02, Site Work. Excavation, Trenching and Backfilling for Utilities.

B. Division 23, Mechanical.

1. Earthwork.
2. Access Doors.
3. Valves, Strainers and Vents.
4. Low Temperature Piping Insulation.
5. High Temperature Piping Insulation.
6. Pipe and Pipe Fittings - General.

1.3 STANDARDS

A. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.

B. Resolve any code violation discovered in contract documents with the Engineer prior to award of the Contract. After award of the Contract, make any correction or additions necessary for compliance with applicable codes at no additional cost to Owner.

C. Obtain and pay for all permits and inspections.

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS

A. Provide pipe and pipe fittings of domestic manufacturers only and with labeling to comply with NSF 61.

B. Above Ground Piping.

1. 4-inches and smaller. Provide seamless ASTM B 88 harddrawn Type L or CDA alloy 194 heavy copper water tube with wrought copper fittings, ANSI B 16.22. Tape all bare copper piping located in CMU block walls with polyvinyl tape.

2. 6-inches and larger. Provide Schedule 40, galvanized steel pipe and pipe fittings conforming to ASTM A 120 and Style 77, Victaulic couplings molded rubber gaskets (rated at 300 PSI minimum).

C. Solder. Use Harris "Stay-Safe-Bridgit", lead free, UPC and NSF approved, silver bearing solder with Harris "Stay-Clean" liquid solder flux. Apply per manufacturer's recommendations.

D. Unions. Provide Class-150, standard, 300-pound water-oil-gas service galvanized, malleable iron unions with ground joint and bronze seat. Flange joints larger than 2-inch. Provide dielectric isolating unions at all junctions or connections between metallic piping of dissimilar metal.

2.2 VALVES

A. Provide valves of one manufacturer only. Do not provide valves of more than one manufacturer throughout project.

B. Below Ground Gate Valves. Provide Class 200, WWP, AWWA, non-rising stem, IBBM, double disk with parallel seat, ASTM A-126 Class B cast body and bonnet, flanged end gate valves with 1-1/4-inch shaft and 2-inch operating nut. Stockham G-745-O, Kennedy 561X or Mueller A-2380-6.

1. Provide an adjustable, extension type cast iron valve box with screw or locking slide adjustment, flared base and locking lid with 3/16-inch minimum wall thickness. Provide valve box for each valve. Use covers with appropriate identification marking cast on cover of type service. Western Iron Works Fig. 6-1.

C. Check Valves.

1. 2-1/2-inches and smaller. Provide Class 125, ASTM B-62 cast bronze composition body and cap, screwed end all bronze check valves with brass or bronze swing type disc. Stockham B-319, Jenkins 4092, Walworth 3406 or Powell 578.

2. 3-inches and larger. Provide Class 125, bronze mounted, bolted cap, ASTM A-126 Class B cast body and cap, flanged end check valves with bronze swing-type disc. Stockham G-931, Jenkins 624C, Walworth 8928F, Powell 559 or Nibco F-918-B.

D. Ball Valves. (3-inches and smaller only) Provide 600 PSI, cast brass body, replaceable reinforced Teflon seats, conventional port, blowout proof stems, chrome plated brass ball and screwed ends. Stockham S-216-BR-RT, Apollo 70-100, Jenkins 901-A or Nibco T-580-BR.

E. Balancing Valves. Provide Bell & Gossett "CB" series "CIRCUIT-SETTER" balancing valves with NPT connections. Size, install and balance set in accordance with manufacturer's recommendations.

F. Pressure Reducing Valve. Provide a spring-loaded valve, with bronze body, threaded end with adjustable spring of corrosion-resistant steel and neoprene coated nylon diaphragm. 200 psi maximum inlet pressure and adjustable from 25 to 75 psi outlet pressure. Fisher type 75A or Watts U5B series.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Make entire installation per local code requirements.

B. Keep the inside of the piping free from foreign matter.

C. Cut all piping neatly, using approved type mechanical cutters without damaging pipe. Use wheel cutters when applicable.

D. Ream all pipe connections and remove all burrs.

E. Properly flush all water lines adequately to remove all foreign matter from within plumbing systems prior to installation of fixtures.

F. For sets of fixtures installed on 4-inch walls or in concrete masonry unit (CMU) walls, provide a separate hot and cold water supply line for each fixture (do not interconnect in wall). Connect the water supply lines above the ceiling. Maintain structural and aesthetic integrity of walls.

G. Provide all valves, unions and appurtenances shown on floor plans, details, schematics and risers. Provide line-size shut-off valves for all groups of fixtures, each major equipment connection, each floor level and at all main branch connections to mains.

H. Provide access doors to provide access to all valves and to all appurtenances requiring service or maintenance.

I. Balancing valves shall be installed where shown on the drawings and where required to properly balance the hot water return system. Reference water heater specifications for other balancing requirements.

J. Provide all fittings and appurtenances required for a complete and working system.

3.3 MINIMUM COVER

A. For piping located below floors or finished grade, install piping in trench to the required depth to insure two feet minimum cover over pipe.

B. All underground piping shall be embedded in sand in accordance with Section VIA-1.13a of the "Standard Construction Specifications of the Water and Wastewater Department.

3.4 DRAINAGE

A. Install water piping systems with uniform horizontal grade of 1/8-inch per 10 feet, to low points to provide complete drainage of the system. Where constant pitch cannot be maintained for long runs, establish intermediate low points and rise to new level.

B. Grade branches to drain to mains or risers. Unless otherwise indicated, terminate low points of risers with drain valve piped to nearest hub or floor drain. Install a 2-inch drain for pipes 2-inches in diameter and larger. Install line size drain valves for pipes smaller than 2-inches. As drain valves, use gate valves as specified in this section. Route drains to floor drains with adequate air gap for cross connection protection.

3.5 STERILIZATION

A. Sterilize the main water system with solution containing not less than 50 parts per million available chlorine. Allow chlorinating solution to remain in system for period of 8 hours. Have valves and faucets opened and closed several times during the period. After sterilization, flush the solution from the system with clean water until residual chlorine content is less than 0.2 parts per million.

3.6 ROUGH-IN AND FINAL CONNECTIONS

A. Make rough-in and final connection of all services to all fixtures requiring plumbing connections. Contractor shall be responsible for installing fixtures at locations shown on the Architectural drawings and providing all service connections at required locations.

B. Provide service connections to all plumbing fixtures specified and to all equipment furnished by others. Reference Section 23 21 00 for rough-in requirements of equipment furnished by others.

3.7 COORDINATION

A. Making adjustments to field conditions is considered a part of the work required. Do not use contract drawings accompanying these specifications for rough-in locations but only for pipe sizing and general routing.

B. Contractor shall examine and familiarize himself with the Architectural, Structural, Electrical and Mechanical drawings to be knowledgeable of all plumbing connections required and space limitations.

C. The drawings are diagrammatic and are not intended to show all the fittings required. Contractor shall include in his bid, costs for items of material and labor which are not specifically called for in drawings or specifications, but which are required to make plumbing installation. Contractor shall make any necessary changes to avoid beams, footings, columns, piers, vents, ducts, equipment or other obstructions.

D. In any case where a pipe shown on a plan sheet differs from that shown on a riser, schematic or detail, use the larger of the two sizes shown.

E. Do not route any piping above electrical control panels and related electrical equipment. Prior to installation of any piping, determine the actual space requirements and the location of all electrical panels and related electrical equipment. Make all offsets and adjustments as required.

3.8 MAXIMUM PRESSURE

A. Provide pressure reducing valves on domestic water systems where pressures exceed 70 psi. Provide a minimum downstream pressure of 60 psi. Contractor shall obtain pressure readings at building cold water supply connection and forward pressure test findings to the Architect in written letter form prior to start of construction of interior water supply piping.

B. Pressure reducing valves shall be located exposed in mechanical rooms or (where space permits) above ceilings or in walls, with access doors of adequate size.

C. Equip all pressure reducing valves with two gate valves (for shut-off), a strainer, a 1-1/2-inch diameter by-pass with throttling valve (globe valve), a pressure relief valve and two pressure gauges. Relief valve discharge shall be routed to a safe point of discharge outside of building.

3.9 PIPE EXPANSION AND CONTRACTION

A. Provide expansion joints for all hot water piping having straight lengths of 100 feet and greater. Pipe anchors, guides and supports are specified in the section on pipe and pipe fittings general.

B. Provide swing joints to all branch connections and individual pipe connections from mains. Provide a minimum of 2-elbows from main connection for each branch or individual connection. Provide all offsets, changes in direction and swing joints required to compensate for expansion of pipe whether shown or not on the drawings.

C. Contractor shall install pipe with adequate spacing between the water lines and the building construction such that the expansion of the pipe (in length) is less than the space available. Protect all pipe from rupture or damage due to expansion.

3.10 TESTING

A. Test under a cold water hydrostatic pressure of 1-1/2 times operating pressure (150 psig minimum) and carefully check for leaks. Repair all leaks and retest system until system holds for at least 24 hours and proven watertight.

B. Testing shall be verified by Architect/Engineer or appointed Owner’s representative. At Architect's/Engineer's discretion, the General Contractor shall verify and document the test results. Test findings shall be documented and forwarded to the Architect.

END OF SECTION 22 11 16

SECTION 22 11 19 - VALVES, STRAINERS AND VENTS - GENERAL

PART 1 - GENERAL

A. This Section gives general requirements which apply to all Division 23, Mechanical, sections. Valve types for specific services are specified in the Section on that service.

PART 2 - PRODUCTS

2.1 VALVE DESIGN

A. Furnish valves designed for repacking under pressure when fully opened, equipped with packing suitable for intended service, equipped with gland followers, and having pressure/temperature rating not less than design criteria applicable to components of system. Perform shell and seat tests and stamp valve to show that tests have been successfully completed. Furnish valves conforming to following specifications:

Material	Specifications
Bronze - 150 psi maximum	ASTM B 62

2.2 VALVE OPERATORS

A. Furnish single lever operator for ball valves and butterfly valves and hand wheel operators for all others.

2.3 VALVE BOXES

A. Employ cast iron boxes, extension type with screw or locking slide adjustment, and flared base. Minimum thickness of metal shall be 3/16-inch. Install boxes over each underground valve. Use covers with appropriate cast-in identification of service.

2.4 VALVE TAGS

A. Furnish valves with 1-1/2-inch diameter brass valve tag with stamped and red-filled numbers. Service designations shall be 1/2-inch letters, and valve numbers shall be 1/2-inch letters. Service designations shall be approved by Engineer. Secure tags to valves by use of brass "S" hooks and brass chain. Secure chain to valve by use of copper or monel meter seals. Mount charts and drawings listing functions of each valve and its location in a metal frame and behind glass places as directed. In addition on the record drawings, mark the symbols and furnish a valve schedule properly identifying the valve number and service with the exact location, the material being piped, and the room number of area that the valve services. This schedule shall be furnished on reproducible drafting paper or film suitable for reproduction on an Ozalid machine. The size of drafting paper shall be approved by the Owner.

2.5 STRAINERS

A. Unless specified or shown otherwise, furnish strainers ahead of tanks, traps, pumps, solenoid and control valves and other equipment indicated on drawings. Furnish "Y" or "T" pattern strainers. Arrange cap for easy removal of screen and provide with opening for blowout. Furnish strainer with blow-out nipple and plug valve of same size as blow-out connection, and pipe to nearest floor or hub drain.

2.6 WATER SYSTEM AIR VENTS

A. Use Armstrong No. AR-21 or approved equal venting traps at high points and at any other air pockets of closed circulating pipe systems. Extend 1/2-inch discharge drains to nearest floor or hub drain, or air handling unit condensate drain pan. Place a ball valve between air vent and piping system.

PART 3 - EXECUTION

A. Install valves and stops in accessible locations; furnish and install where shown or as required to make systems complete and readily maintained. Install shutoff valves to each group of plumbing fixtures and in branch chilled and heating water piping systems, whether shown or not.

B. Install valves located behind access doors so the doors can be closed with the valve in either the open or closed position.

C. Install valves so their bonnets can be removed.

D. Install horizontally-mounted valves so the valve stem is inclined 30 degrees above horizontal.

END OF SECTION 22 11 19

SECTION 22.11.23.13 - DOMESTIC WATER PRESSURE BOOSTING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes variable speed, packaged pump station for domestic water applications.

B. Sequence of operation

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. TIGERFLOW Systems, LLC (“TIGERFLOW”) or approved equivalent.

2.2 STATION

A. The station shall provide varying water flow rate at a constant pressure or ASHRAE 90.1 compliant pressure profile through the use of a PID PLC controller and variable speed drives.

B. The packaged pump station shall consist of:

1. Two pumps.

2. Check valves located on the discharge branch of each pump.

3. Ball valve or lug or grooved butterfly isolation valves for each set of pumps and check valves.

4. Common suction and discharge manifolds.

5. 4-20 mA transducer(s) located on the station discharge manifold.

6. A 4-20 mA transducer shall be provided on the suction manifold for applictions where the water source is pressured city water. Float switches shall be provided for applications where the water source is an adjacent tank. The float switches shall be installed by others.

7. Controls consisting of a Tigerflow Mark V controller and dedicated variable frequency drives for each pump or approved equivalent.

8. A common base or frame for components listed above.

2.3 COMPONENTS

A. Pumps shall be ANSI / NSF Standard 61 and ANSI / NSF 372 approved.

B. Valve, check, wafer type, 2” and larger

1. The Check Valve shall be of the silent operating type that begins to close as the forward flow diminishes and fully closes at zero velocity preventing flow reversal and resultant water hammer.

2. The valves used in potable water service shall be certified to NSF/ANSI 61, Drinking Water System Components – Health Effects, and certified to be Lead-Free in accordance with NSF/ANSI 372.

3. Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited, certifying body.

4. The valve design shall incorporate a center guided, spring loaded disc and having a short linear stroke that generates a flow area equal to the nominal valve size.

5. The operation of the valve shall not be affected by the position of installation. The valve shall be capable of operating in the horizontal or vertical positions with the flow up or down. Heavy duty springs for vertical flow down installations shall be provided when specified on 14 in. and larger valves.

6. All component parts shall be field replaceable without the need of special tools. Wafer and Globe styles shall be provided with a replaceable guide bushing held in position by the spring. The spring shall be designed to withstand 100,000 cycles without failure and provide a cracking pressure of 0.5 psi.

7. The wafer and globe disc shall be concave to the flow direction providing for disc stabilization, maximum strength, and a minimum flow velocity to open the valve.

8. The valve disc and seat shall have a seating surface finish of 16 micro-inch or better to ensure positive seating at all pressures. The leakage rate shall not exceed the allowable rate for metal seated valves allowed by AWWA Standard C508 or 1 oz (30 ml) per hour per inch (mm) of valve diameter.

9. Wafer-style valve seats shall be fully retained with full size threads, and sealed with an o-ring.

C. Valve, butterfly, lug-type

1. Body shall be one-piece lug design with extended neck to allow for 2" of piping insulation. A non-corrosive bushing and a self-adjusting stem seal shall be provided. No field adjustment shall be necessary to maintain optimum field performance.

2. Disc edge and hub on metal discs shall be spherically machined and hand polished for minimum torque and maximum sealing capability.

3. Stem shall be one-piece design. Disc to stem connection shall be and internal double "D" design with no possible leak paths in the disc-to-stem connection. External disc-to- stem connections such as disc screws or pins are not allowed. Stem shall be mechanically retained in the body neck and no part of the stem shall be exposed to the line media.

4. Seat shall be tongue-and-groove bonded seat with a primary hub seal and a molded flange O-ring suitable for weld-neck and slip-on flanges. The seat shall totally encapsulate the body isolating it from the line media and no flange gaskets shall be required.

5. Valve shall have a maximum working pressure of 250 psig. Valve shall be tested to 110% of the rated pressure.

D. Valve, ball, 1-1/4" and smaller

1. Ball valves shall be 2-piece full port design constructed of forged copper silicon alloy brass body and end adapter.

2. Seats and stem packing shall be virgin PTFE. Stem shall be bottom loaded, blowout proof design with fluorocarbon elastomer O-ring to prevent stem leaks.

3. Ball valve shall have chrome plated brass ball and adjustable packing gland.

4. Valve sizes 1⁄4" – 2" shall be rated to 600psig (41 bar) WOG non-shock. Valves shall be certified to NSF/ ANSI standard 61/8.

5. Valve shall have a weighted average lead content of <=0.25% with respect to wetted area.

E. Piping

1. Manifolds shall be constructed of either 304 or 316 stainless steel. Manifolds shall have a maximum working pressure of 300 psig.

2. Manifolds shall be grooved at both ends to allow change of suction and discharge connection geometry in the field.

3. Main and branch piping shall be sized for a maximum velocity of 10 ft/s.

F. Hydro-Pneumatic Tank

1. Provide a Section VIII, ASME Code, National Board stamped, hydro-pneumatic tank. Tank shall be provided complete with a NSF approved replaceable bladder, bottom connection, air fill valve, tank drain valve and gauge. Tank shall be: (Model TF-132E, 132 gallon, 150 PSI).

2. The hydro-pneumatic tank shall be mounted adjacent to system with a minimum 1" feed line and full port ball valve on the pump station discharge header or shall be remote mounted as shown per drawings. If the tank is adjacent mounted, it shall be the responsibility of the installing contractor to provide the feed line between the system tank feed valve and tank connection. If the tank is remote mounted, it shall be the

responsibility of the installing contractor to provide the feed line, isolation valves, and any other necessary appurtenances between the tank and building piping.

G. Controls

1. The control panel shall be a TIGERFLOW Tiger's Eye Mark V. The control panel shall consist of:

a. Single point power connection

b. Through door control power disconnect with safety interlock to prevent door from being opened while in ON position

c. A solid-state programmable logic controller (PLC) with non-volatile memory (battery backup not required)

d. Fused 120 V AC control voltage transformer

e. Fused 24 V DC power supply, 1 Watt

f. Operator interface: 6-inch color scale touch screen Human Machine Interface (HMI, Tier I) including but not limited to the following:

(1) Main Screen with the following features:

(a) Individual pump HOA (Hand – Off – Auto) virtual switches

(b) Pump run indication, including current % speed

(c) Pump Failure indication

(d) urrent pressures readings in psig (suction and system)

(e) Current flow in GPM (if flowmeter specified)

(f) Adjustable manual (hand) speed setting

(g) Direct access to menu screen

(2) Menu screen providing direct access to all system settings and status screens

(a) Pump settings screen displays current settings and allows user changes

(b) Lead and lag pump start and stop pressures, psig.

(c) Lead and lag pump ON and OFF delay times, seconds

(3) Alarm settings screen displays current settings for all alarms and allows user changes.

(a) Low suction alarm settings

[1] Low suction pressure, psig

[2] ON and OFF delays, seconds

[3] Manual or automatic reset

(b) Low system alarm settings

[1] Low system pressure, psig

[2] ON and OFF delays, seconds

[3] Manual or automatic reset

(4) High system alarm settings

(a) High system pressure, psig

(b) ON and OFF delays, seconds

(c) Manual or automatic reset

(5) High suction economy mode

(a) Economy mode suction pressure, psig

(b) Economy mode enable / disable

(c) ON and OFF delays, seconds

(6) Separate Alarm Silence and Alarm Reset buttons

(7) Current system status screen displays:

(a) Pump(s) currently running

(b) Active alarms and warning messages

(8) System event history screen displays a minimum of the last 100 system events, including pump start /stops, alarm conditions and alarm acknowledgements.

(9) Pump run time screen displays the total operating time for each pump. Provide individual resets for each pump run time

(10) Lead pump alternation options will include:

(a) Automatic alternation on lead pump shutdown

(b) Manual alternation when operator touches alternate button

(c) Timed alternation:

[1] Daily (user specified time of day)

[2] Weekly (user specified day of week and time of day)

[3] Monthly (first week of month on user specified day of week and time of day)

(11) Multi-Level Security

(a) 5-8 Password protected security levels (field changeable passwords)

(12) An alarm horn with a minimum sound level of 85 db, annunciating all alarm conditions

g. The control panel shall be listed under UL/C-UL 508 and meet NEC (NFPA 70) requirements.

h. TIGERFLOW "TAP" Technology : The Tiger's Eye "TAP" control algorithm shall allow for varying discharge pressure with varying flow rates in order to compensate for varying friction losses in the system as described in ASHRAE 90.1. The control algorithm shall meet the requirements of ASHRAE 90.1.

i. The system control algorithm shall use a speed adjust curve calculation proportional response. Step response algorithms shall not be considered equal.

j. The Tiger's Eye shall provide Building Automation System communication through Modbus or BACnet (with optional Tier II HMI) protocol. Communication shall be provided via an RS-485 port.

k. The following event reporting shall be provided via BAS communication:

(1) Individual VFD status

(2) Remote System Disable

(3) Phase Loss Alarm

(4) Flow Switch or Level Switch option enabled

(5) Individual Pump Run

(6) Individual Pump Fault

(7) Individual Pump Hand/Auto status

(8) Low System Alarm

(9) Low Suction alarm

(10) High System Alarm

(11) General Alarm

(12) Alarm Horn Silenced

(13) System Sensor Failure

(14) Suction Sensor Failure

(15) Economy Mode engaged

(16) Fatal alarm

l. The following events initiation shall be available via BAS communication:

(1) BAS System Disable

(2) Enable BAS Set Point

(3) BAS Set Point (psi)

m. If VFD's are mounted inside the control panel, drive keypads shall me door mounted and accessible without opening the control panel or disengaging power.

n. The control panel shall have a minimum short circuit current rating of 1200 kVa.

o. The PLC controller shall communicate with the variable frequency drives using Modbus protocol via RS-485 cables.

G. Variable Frequency Drives (VFD)

1. Each drive will have individual disconnects and short circuit protection. Drive manufacturer must provide a two year minimum warranty.

2. Drives will be configured to provide the following operating features:

a. Drive keypad will have manual, off and automatic mode selection and will accessible to operators without opening an enclosure.

b. When in automatic, drive will run upon closure of the respective run permissive contact.

c. When in automatic and with a run permissive signal, drive speed will responded to a 0-10 V DC speed reference signal from pump controller.

d. Drive will provide a limited number of automatic resets for fault conditions and will maintain a history of faults.

H. Suction and system pressure transducers

1. Transducer wetted parts shall be a 300 series stainless steel.

2. Transducer shall output a 4-20 mA signal with a minimum accuracy of +1%.

I. Flowmeter, paddlewheel (optional)

1. Flowmeter shall be a paddle type with:

a. Non-metallic paddle wheel

b. An accuracy of: ± 1.0% of full scale over recommended design flow range and ± 4.0% of reading within calibration range.

c. Installation in 10X upstream and 5X downstream pipe diameters straight pipe run.

d. A design flow velocity of .5-30 ft/sec

PART 3 – EXECUTION

3.1 SUBMITTALS

A. Pumps curves with condition point and pump operating capacities shall be supplied.

B. Drawings

1. System outline drawing(s) including elevation, plan and detail views shall be provided.

2. Drawings shall include system connection and bolt-down sizes and locations as well as recommended NEC clearances.

3. Wiring diagrams in .pdf format shall be provided.

4. Installation, Operation and Maintenance manuals (IO&M's) shall be provided for the pump station.

5. A copy of the manufacturer's certificate of insurance showing as a minimum, general liability coverage of $1,000,000 and an excess liability coverage of $5,000,000.

3.2 QUALITY ASSURANCE

A. Manufacturers seeking authorization to furnish their product shall be a registered ISO9001:2008 manufacturer, and shall hold a current Quality Management Certificate for the

assembly of custom packaged pumping systems and controls for use in commercial, irrigation, municipal, industrial, and fire applications.

B. The pump station shall be listed UL/cUL under category QCZJ for Packaged Pump Stations.

C. The manufacturer shall be listed under UL508 for the manufacturer of control panels.

D. The manufacturer shall have a minimum of 30 years' experience in the fabrication of packaged pump station.

E. The station shall be certified under NSF/ANSI Standard 61, Drinking Water System Components and NSF/ANSI 372 Lead Content Compliance.

F. The pump station shall be hydrostatically tested to maximum working pressure (MWP) the station is rated at for a minimum of 1 hour. Maximum working pressure is rated 125psig, 175psig, 230psig or 300psig based on the pump selected.

G. The pump station shall be factory run tested to insure condition point is maintained at the expected power draw.

H. The pump station test facility instrumentation shall be NIST traceable and have current calibration certificates.

I. Piping shall be built in compliance with ASME B31.1. Piping shall be fabricated by ASME Section IX certified welders.

J. Structural steel weldments shall we fabricated by AWS D1.1 certified welders.

K. Welder's certifications shall be available upon request.

3.3 INSTALLATION

A. Installation of the system shall be per the manufacture's recommendations and shall meet applicable federal, state and local codes.

B. Coordination of building trades and subcontractors and compliance with federal, state, and local codes shall be performed by the contractor with unit responsibility.

C. Unless otherwise negotiated, remote mounted instrumentation, control wiring and mapping of BAS communication points shall be the responsibility of the controls engineer/contractor.

D. Unless otherwise negotiated, interfacing of the Tier II HMI to the building's network to allow for web-enabled access shall be coordinated of the contractor having unit responsibility and the buildings IT professionals.

3.4 START-UP

A. Four (4) hours of start-up service and field training will be provided by the manufacturer's representative unless otherwise negotiated.

B. Prior to start-up, the station will be installed per manufacturer's instruction with power and water connected, communication lines connected, data point mapped and electrical inspection performed and approved. Sufficient water flow supply and demand shall be available to emulate full station designed performance.

C. The manufacturer's representative shall be given a minimum two (2) weeks of notice for start-up.

D. During start-up, the station shall be tested for start and stop conditions, pump condition point and full station flow. *Note if no flowmeter is purchased, it is the responsibility of the site to provide an accurate method for measuring or inferring flow.

E. Unless otherwise negotiated, each TIGERFLOW system shall be warranted for a period of (18) months from date of shipment or (12) months from date of startup, whichever occurs first. Warranty specifics are defined in TIGERFLOW Warranty terms.

END OF SECTION 22 11 23.13

SECTION 22 13 00 - DRAINS, HYDRANTS, CLEANOUTS AND APPURTENANCES

PART 1 - GENERAL

1.1 SCOPE

A. This Section provides requirements for furnishing and installing floor drains, cleanouts and water hammer arresters.

1.2 RELATED WORK

A. Division 23 - Mechanical.

1. Access Doors.
2. Pipe and Pipe Fittings – General.
3. Domestic Water Piping.
4. Soil, Waste and Sanitary Drain Piping, Vent Piping

1.3 JOB REQUIREMENTS

A. Furnish drains, hydrants and cleanouts shown or specified with all necessary trimmings. Provide drains, drain bodies, hydrants, cleanouts and similar devices of one manufacturer.

B. Provide that all porcelain enameled surfaces be acid resistant.

1.4 STANDARDS

A. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.

B. Resolve any code violation discovered in contract documents with the Engineer prior to award of the contract. After award of the contract, make any correction or additions necessary for compliance with applicable codes at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 DRAINS

A. Floor Drains, Finished Areas, Square Top (FD-1). Furnish a primer coated cast iron floor drain with flashing flange, bottom outlet, seepage openings and 6-inch square, adjustable, heavy duty stainless steel strainer, Mifab F1000-5; Watts Drainage; Wade or approved equivalent.

2.2 CLEANOUTS

A. Finished Floors and Concrete Floors, square top (FCO). Furnish a primer coated cast iron floor cleanout with combination cover and plug, threaded adjustable housing and ferrule, membrane flange, secured/vandal proof, square, heavy duty, satin finished nickel bronze or stainless steel scoriated top that adjusts to finished floor after concrete has set. Mifab C1100 C-5-3, Watts Drainage CO-200-S-6; Wade W-6030-XS-1-5-26-75 or approved equivalent.

B. Outside Areas, square top (EXTERIOR FCO). Furnish a primer coated cast iron, heavy traffic duty floor cleanout with combination cover and plug, threaded adjustable housing with flanged ferrule, secured/vandal proof, square, extra heavy duty, satin finished nickel bronze or stainless steel scoriated top (adjustable to finished grade level). Cast cleanouts flush in a 18-in. by 18-in. by 6-in. thick concrete pad. Concrete pad and cleanout shall be installed such that the top of pad and cleanout top are both set flush with finished grade. Mifab C1100-C-XR-3, Watts Drainage CO200-RX; Wade W-6010-XS-1-5-75 or approved equivalent.

C. Finished Walls (WCO). Furnish a primer coated cast iron cleanout tee with countersunk, taper thread bronze plug, No-Hub connections and round, smooth, stainless steel secured access cover with secured/vandal proof screw. Mifab C1460-RD-3, Watts Drainage CO-460-RD; Wade W-8460-NH-R6-5 (No-Hub connections) or approved equivalent.

D. Unfinished Areas (WCO). Furnish a primer coated cast iron cleanout tee with countersunk head, taper thread bronze plug and No-Hub connections. Mifab C1460, Wade W-8560NH-D; Watts Drainage CO-460; (No-Hub connections) or approved equivalent.

2.3 WATER HAMMER ARRESTERS

A. Type. Provide 250 psig, heavy-duty, balanced expansion, nesting bellows type hydraulic water hammer arresters contained in a permanently factory charged and sealed pressurized compression chamber. Chamber shall consist of a stabilized 18-8 stainless steel casing having sufficient displacement volume to dissipate the calculated kinetic energy generated in the piping system and sealed with fusion weld under an argon gas shield. Provide bellows precharged with clinically pure air or nitrogen, completely sealed and operating free of casing. Water hammer arresters shall be tested and certified in accordance with the Plumbing and Drainage Institute (PDI) "Standard P.D.I. WH-201" and the American Society of Sanitary Engineering Standard ASSE-1010. Mifab CLB series, Watts Drainage SS Series; Wade W-Shockstop series or approved equivalent. O-ring type water hammer arresters are not considered equals. Do not submit or install water hammer arresters that depend on O-rings for seals.

B. Size. Provide all arresters size and quantity as required and recommended by both the Plumbing and Drainage Institute Standard PDI-WH-201 and the manufacturer's sizing and placement recommendation data sheets.

1. Contractor shall be responsible for obtaining and installing the proper number and size of water hammer arresters, including all arresters where special requirements occur. Where fixture unit counts/totals exceed the scheduled ratings, provide factory engineered, rechargeable water hammer arresters complete with pressure gauge and air valve.

2. Water Hammer Arrester sizes shown on drawings are minimum size requirements only (quantities are partial requirements only). Water hammer arresters shall be of sufficient size and shall be installed throughout the water systems such that there will be no noise, movement in the piping system or damage to equipment due to water hammer. Adequately protect all equipment and fixtures requiring water hammer protection to all washing machines, kitchen sinks, dishwashers, tub and showers, and waterclosets.

3. Access Doors. Provide a 10-inch (minimum) square access door for single arrester installations and a 14-inch square (minimum) door for two arrester installations in walls. Provide minimum 14-inch square access door for all arresters located above ceilings except for arresters located directly above lay-in-place acoustic tile ceilings.

2.4 WATERPROOFING MEMBRANE

A. When a membrane is not provided in floor or roof construction, provide a membrane of size that extends a minimum of 12-inches on either side of floor drain, roof drain or cleanout.

B. Membrane shall be 4-pound per square foot sheet lead, Number 24 B & S gauge sheet copper or three layers of standard grade 15-pound asphalt impregnated roofing felt with each layer thoroughly hot mopped to ensure a completely watertight installation.

C. Coordinate waterproofing with appropriate trades.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General.

1. Install in accordance with manufacturer's recommendations and as shown on the drawings.

B. Floor Drains and Hub Drains.

1. Coordinate flashing work with work of other trades. Coordinate with floor slab work to interface drains with concrete.

2. Install floor drains at the low points of the surface areas to be drained. Set top of drains 1/2-inch below finished floor elevation unless otherwise shown on mechanical or structural drawings. Set floor drain grates such that top of grate is installed flush with surrounding floor elevation.

3. Adequately grout around all floor drain tops. Fill in gaps between floor drain and floor with grout (or other rigid concrete based material) that matches the surrounding finished flooring in both color and texture.
4. Install drain flashing collar of flange such that no leakage occurs between drain and adjoining flooring. Maintain watertight integrity of penetrated waterproof membranes.

5. Position drains such that installed drains are accessible and easy to maintain.

6. All floor drains and hub drains shall be individually vented to outside or nearest vent of adequate size. Provide a vent line for each floor drain and hub drain whether or not shown on drawings. Provide a 2-inch diameter (minimum) individual vent line.

C. Cleanouts.

1. Location.

a. Cleanouts shown on drawings are partial requirements only. Contractor shall provide and install all cleanouts shown on drawings, specified in this specification section as well as any additional cleanouts required by code authorities having jurisdiction.

b. Provide cleanouts wherever necessary to make accessible all parts of the drainage soil or waste systems.

c. Provide a line size cleanout on each horizontal drain line 5-feet or greater in length.

d. Locate cleanouts in runs not more than 50-feet apart and provide all additional cleanouts required by local authority having jurisdiction. 50-foot spacing between cleanouts shall include length of vertical risers at cleanouts. All portions of the drain system shall be accessible to a 50-foot drain and sewer cleaning/rodding machine through cleanouts.

e. Provide cleanouts where soil or waste lines change in direction of more than 90□ as well as any other cleanouts required by local authority having jurisdiction.

f. Provide cleanouts at the end of each continuous waste line and at the end or each battery of fixtures.

g. Provide a line size wall cleanout at each sink and each urinal.

h. Provide cleanouts at the base of each soil or waste stack.

i. Provide a full size upper terminal cleanout at each run of piping which is more than 50-feet in total developed length or fraction thereof, except on horizontal drain lines less than five feet in length unless such line is serving sinks or urinals (cleanouts are required at all sinks and at all urinals).

j. Provide a full size, cast iron, double, two-way cleanout with two exterior floor cleanouts extended to grade and casted into a 18-inch by 24-inch by 6-inch concrete pad for each drain line extending from building. Risers from double two way cleanout fitting to cleanouts shall be standard weight, cast iron, DWV, bell and spigot soil pipe and pipe fittings.

2. Size. Install cleanouts the same size as the soil waste lines in which the cleanouts are placed; however, no cleanout should be larger than 4-inches in diameter.

3. Installation.

a. Set top of floor clean-outs such that top is flush with finished floor (including tile). Top of exterior floor cleanouts shall be installed flush with finished grade.

b. Where cleanouts occur in pipe chases, bring the cleanouts through the walls and install covers. Wall cleanout plugs shall be installed within 3-inches (in depth) from access door and shall be centered in respect to access door opening for easy access.

c. Install cleanout flashing collar of flange such that no leakage occur between cleanout and adjoining flooring. Maintain watertight integrity of penetrated waterproof membranes.

d. Cleanouts shall be readily accessible and shall be located at a minimum of 18-inches from any wall, fixture, equipment or other obstruction.

e. Adequately grout around all floor cleanout tops. Fill in gaps between cleanouts and floor with grout (or other rigid concrete based material) that matches the surrounding finished flooring in both color and texture.

4. Waterproofing. Coordinate flashing work with work of other trades.

D. Water Hammer Arresters.

1. Provide hydraulic water hammer arrestors in cold and hot water supply lines to each fixture, if single fixture, and to each battery of fixtures; and at each automatic, solenoid-operated or quick-closing valve serving mechanical, kitchen or laundry equipment.

2. Hammer Arresters shown on drawings are partial requirements only. Water hammer arresters shall be installed throughout the water systems such that there will be no noise, movement in the piping system or damage to equipment due to water hammer. Adequately protect all equipment and fixtures requiring water hammer protection.

3. All water hammer arresters shall be installed directly behind such access doors and shall be readily accessible for easy replacement.

3.2 PROTECTION OF FINISH

A. All floor drains, cleanouts and wall hydrants shall be adequately protected from physical damage during construction. Grates, covers and tops that have been marred or damaged shall be replaced with new or equivalent design, material and finish at no cost to the Owner. Grates, covers and tops shall have a new and unmarred look at time of construction end.

3.3 COORDINATION

A. Making adjustments to field conditions is considered a part of the work required. Do not use

contract drawings accompanying these specifications for rough-in locations but only for pipe sizing and general routing.

B. Contractor shall examine and familiarize himself with the Architectural, Structural, Electrical and Mechanical drawings to be knowledgeable of all plumbing connections required and space limitations.

C. The drawings are diagrammatic and are not intended to show all the fittings required. Contractor shall include in his bid, costs for items of material and labor which are not specifically called for in drawings or specifications, but which are required to make plumbing installation. Contractor shall make any necessary changes to avoid beams, footings, columns, piers, vents, ducts, equipment or other obstructions.

END OF SECTION 22 13 00

SECTION 22 13 16 - SOIL, WASTE AND SANITARY CAST IRON DRAIN PIPING, VENT PIPING AND APPURTENANCES

PART 1 - GENERAL

1.1 SCOPE

A. This section provides requirements for furnishing and installing piping within buildings.

1.2 RELATED WORK

A. Division 23, Mechanical.

1. Pipe and Pipe Fittings.

2. Low Temperature Piping Insulation. For above ground drain piping receiving condensate.

3. Plumbing Fixtures and Fixture Carriers.

4. Drains, Hydrants and Cleanouts

1.3 STANDARDS

A. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.

B. Resolve any code violation discovered in contract documents with the Engineer prior to award of the Contract. After award of the Contract, make any correction or additions necessary for compliance with applicable codes at no additional cost to Owner.

C. Obtain and pay for all permits and inspections.

D. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

E. All standard duty couplings for Hubless cast iron soil pipe and fittings shall conform to CISPI 310 and be certified by NSF International.

PART 2 - PRODUCTS

2.1 DRAIN PIPES AND FITTINGS

A. Provide piping within building and underground laterals extending from building and as otherwise noted.

B. Pipe and pipe fittings.

1. Above Ground Piping: Hot dipped coated, standard weight, cast iron DWV, no-hub soil pipe and pipe fittings with stainless steel couplings and neoprene gaskets.

a. Standards. No-hub piping shall meet testing requirements of ASTM A 74 and all requirements of CISPI 301 and 310. When requested by the engineer, the contractor shall furnish acceptable evidence if pipe tests.

b. Identification. No-Hub Pipe and pipe fittings shall bear the "CI NO-HUB" mark as evidence of adherence to CISPI standards.

c. Neoprene Gaskets. Gaskets shall conform to all requirements of ASTM C 564 standard and shall bear the mark "NEOPRENE" and "ASTM C 564".

d. Installation. Torque NO-Hub clamps.

C. For piping 2-inches and 3-inches in diameter, provide No-Hub pipe clamps manufactured by the No-Hub pipe and pipe fitting manufacturer. All pipe, pipe fittings, gaskets and clamps shall be of one domestic manufacturer. Do not interconnect pipe of one manufacturer with pipe fittings, gaskets and clamps of another. Purchase pipe, pipe fittings, gaskets and clamps as a system.

D. For piping 4-inches in diameter and larger, provide No-Hub pipe joints using Factory Mutual (F.M.) and Uniform Plumbing Code (UPC) approved and labeled No-Hub Pipe Clamps

1. Clamps shall be made of 24 gauge (.024-inch thick), Type 304 Stainless Steel shields. Each clamp shall consist of a neoprene gasket with a stainless steel outer band which effectively captures the gasket material and provides a 15-psi rated working pressure.

2. Each clamp shall bear the FM and UPC stamp and shall be approved to Class I of Factory Mutual Standard #1680.

3. Clamps shall have FM certification from a third party indicating clamp assemblies have been inspected and procedures have been verified to assure materials have been controlled to meet the FM #1680 requirements. Each clamp shall bear the FM and UPC stamp. Test shall include testing for blockage, bending moment, deflection angle, sealing sleeve, clamp strength, thrust as well as hydrostatic strength and salt spray.

4. Clamps shall be designed for 100 lbs. torque max. MiFab or approved equivalent. All elbows and tees shall be braced against thrust loads which might result in joint separation due to dynamic forces caused by sudden, heavy impulse loading (water hammer) conditions.

E. Install all clamps in accordance with the manufacturer’s recommendations, using tools recommended by the manufacturer of the pipe clamps. MiFab heavy duty couplings shall be made tight with a torque wrench and torqued to a minimum of 80 to 100-inch pounds, or as recommended by the manufacturer.

PART 3 - EXECUTION

3.1 NOTICE AND FEES

A. Give proper notice and pay all fees and other costs for complete sewer service.

3.2 GRADE AND COVER

A. Give horizontal pipe a uniform grade of 1/4-inch per foot where possible, but not less than 1/8-inch per foot, unless otherwise shown. Verify all flowline elevations and pipe grades with local authorities for approval of all sanitary piping with grades less than 1/4-inch per foot. Field verify all flow lines shown on drawings.

B. Prior to installation of any portion of piping, determine the actual space requirements including the space required for proper slope of pipe. Do not install any piping until such flow line elevations and offsets are determined to be acceptable within the limitations of these documents and local code requirements. Make all offsets and adjustments required for proper installation.

C. For piping located below floors or finished grade, install piping in trench to the required depth to ensure two feet minimum cover over the pipe.

3.3 DRAIN PIPE AND FITTINGS

A. Offsets and Fittings.

1. Use reduction fittings to connect two pipes of different diameter.

2. Change directions by appropriate use of 45-degree wyes, long-sweep quarter-bends, and sixth-, eighth-, and sixteenth-bends. Sanitary tees may be used on vertical stacks. Use long sweeps at the base of risers.

3. Do not route any piping above electrical control panels and related electrical equipment. Prior to installation of any piping, determine the actual space requirements and the location of all electrical panels and related electrical equipment. Make all offsets and adjustments as required.

B. Floor Drains. Provide all required floor drains complete with drain lines, vent lines and trap primers as required by the section on Drains, Hydrants and Cleanouts.

C. Cleanouts.

1. Provide drainage lines with properly specified cleanouts. Provide all as required by the section on drains, hydrants and cleanouts.

3.4 VENT PIPING

A. All vent and vent branch pipes shall be graded and connected to drip back to sanitary waste piping by gravity.

3.5 SANITARY DRAIN LINES RECEIVING CONDENSATE

A. Unless otherwise approved by local authority, all drains receiving condensate and located above ceilings or in rooms that are return air plenums shall be piped as follows;

1. Connect condensate drains to nearest sanitary drain line that is at least 3-inches in diameter.
2. Connect condensate drain through a 2-inch diameter deep seal P-trap.
3. Extend both 3-inch drain line and 2-inch P-trap inlet full size through roof and terminate at roof with a lead flashing as specified in this section for vent lines.
4. Connect condensate drain lines from equipment to side of 2-inch inlet drain line.
5. Insulate all above ground drain piping receiving condensate per Sections 23 07 00 and 23 07 19.53.

3.6 ROUGH-IN AND FINAL CONNECTIONS

A. Make rough-in and final connection of all services to all fixtures requiring plumbing connections. Contractor shall be responsible for installing fixtures at locations shown on the Architectural drawings and providing all service connections at required locations.

B. Rough-in and final connection of services to all equipment shall be installed in accordance with the latest edition of the manufacturer's rough-in measurements manual. Contractor shall obtain all such documents.

C. Use threaded sanitary tapped tee pipe fittings for p-trap connections at walls.

D. Provide service connections to all plumbing fixtures specified and to all equipment furnished by others. Reference Section 23 21 00 for rough-in requirements of equipment furnished by others.

E. Install all piping and associated equipment in accordance to manufacturer's recommendations using recommended tools.

F. Provide all fittings and appurtenances required for a complete and working system.

3.7 COORDINATION

A. Making adjustments to field conditions is considered a part of the work required. Do not use contract drawings accompanying these specifications for rough-in locations but only for pipe sizing and general routing.

B. Contractor shall examine and familiarize himself with the Architectural, Structural, Electrical and Mechanical drawings to be knowledgeable of all plumbing connections required and space limitations.

C. The drawings are diagrammatic and are not intended to show all the fittings required. Contractor shall include in his bid, costs for items of material and labor which are not specifically called for in drawings or specifications, but which are required to make plumbing installation. Contractor shall make any necessary changes to avoid beams, footings, columns, piers, vents, ducts, equipment or other obstructions.

D. In any case where a pipe shown on a plan sheet differs from that shown on a riser, schematic or detail, use the larger of the two sizes shown.

3.8 TESTING

A. Below Floors.

1. Test pipe below floors before backfilling and connecting to sewers.

2. Maintain not less than 15-feet of hydrostatic head.

3. Repair all leaks and repeat until system holds for 2-hours without a drop in water level.

B. System Test. After all the various sections of soil, waste and vent piping are installed, but before fixtures are connected, test the system by:

1. Plugging all outlets.

2. Filling the entire system with water and maintaining not less than 10-feet of hydrostatic head to any portion of the sanitary or vent piping system. Apply water tests to drainage, waste and vent systems either in its entirety or in sections. Provide extension pieces, wyes, supports, clamps, plugs and all other fittings and materials as required to facilitate plugging and testing.

3. Repair all leaks and repeat until system holds for 6-hours without a drop in water level.

C. Furnish all equipment and labor required to conduct tests.

D. Testing shall be verified by Architect/Engineer or appointed owners representative. At Architect's/Engineer's discretion, the General Contractor shall verify and document the test results. Test findings shall be documented and forwarded to the Architect.

E. Prior to ceiling and wall cover-up, Contractor shall conduct smoke test of the entire waste and vent system to assure no leaks occur. Prior to test Contractor shall seal all vent through roofs, pump smoke in system. Once complete and accepted by the Architect/Engineer Team, Contractor shall unplug all vent through roofs. Contractor shall conduct a second smoke test when all plumbing fixtures are installed and introduce smoke in piping system as mentioned above. Both tests are to be witnessed and accepted by the Architect/Engineer Team prior to completion of the project.

END OF SECTION 22 13 16

SECTION 22 40 00 - PLUMBING FIXTURES (REVISED)

PART 1 - GENERAL

1.1 SCOPE

A. This section provides requirements for furnishing and installing water closets, lavatories, sinks, mop sinks, showers, thermostatic mixing valves, eye/face wash fixtures and wall boxes.

1.2 APPLICABLE PROVISIONS

A. Refer to Section 23 00 00, Mechanical General Provisions.

1.3 JOB REQUIREMENTS

A. Furnish plumbing fixtures shown or specified with all necessary trimming. Furnish faucets, fittings, supply stops and similar devices of one manufacturer.

B. Unless otherwise specified, all sink faucets shall be washerless. Seats on faucets specified with renewable/replaceable seats shall be Monel.

C. Furnish chair carriers for all wall hung fixtures.

D. All porcelain enameled surfaces shall be acid resistant porcelain.

E. All plumbing fixtures shall be new and unused, free from imperfections, true as to line, angles, curves and color. Smooth, watertight and complete in every respect.

1.4 STANDARDS

A. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.

B. Furnish and install required plumbing fixtures for use by handicapped as required by the latest edition of the Texas State Purchasing and General Services Commission Act or Elimination of Architectural Barriers and any other state or local code requirements.

C. Obtain and pay for all permits and inspections.

D. All fixtures shall comply with A112.19 and all subsections.

E. All faucets, valves, stops, etc. conveying water for human ingestion shall conform to NSF 61, Section 9.

F. EPC requirements:

Lavatories, private	1.0 gpm @ 60 psi
Shower heads	1.5 gpm @ 80 psi
Sink faucets	1.5 gpm @ 60 psi
Water closets	1.28 gallon per flush cycle

PART 2 - PRODUCTS

2.1 WATER CLOSETS

A. Floor Mounted Water Closets, Wheel Chair (WC1). (Adult ADA/TAS)

1. Fixture. Furnish and install a white vitreous china, siphon jet flushing action, elongated front, floor mounted measuring 16-1/2 inches high from finished floor to top of rim with 1-1/2 inch top spud. Water closet fixture shall be designed to flush efficiently with a maximum 1.28 gallons per flush and shall be equipped with two (2) white bolt covers/caps. American Standard No. 2857.128 with two American Standard No. 48310 100 bolt covers or approved equivalent.

2. Trim. Equip fixture with a diaphragm or piston operated, quiet flush, exposed water closet flush valve made of brass with metal oscillating non hold open type handle, 1 inch IPS screw driver operated back check angle stop with protective cap, renewable main valve seat, adjustable threaded union tailpiece, vacuum breaker, 1 1/2 inch by 11 1/2 inch flush tube and connection with spud coupling for 1 1/2 inch top spud, spud securing nut, wall and spud flanges, 1.28 gallon flush regulator, solid ring pipe support all with polished chrome finish. Flush control shall be mounted on wide side of handicapped toilet area or as directed by Architect. Sloan No. 111 – 1.28.

3. Seat. Furnish and install a white, extra heavy duty/extra heavy weight, injection molded solid plastic, institutional/industrial grade toilet seat. Seat shall be manufactured of high impact resistant, polystyrene or polypropylene plastic with open front, elongated toilet seat design, less cover. Toilet seat shall be equipped with series 300 stainless steel combination self sustaining/concealed check hinges. Self sustaining mechanisms and hinge posts in both hinges shall be series 300 stainless steel and shall be integrally molded into seat assembly. Hinge posts shall be fitted Sta-Tite Fastening System. Toilet seats shall have integral bumpers permanently molded into the seat and shall be of color matched molded plastic. Church "MOLTEX" No. 9500SSC or approved equivalent.

4. Heavy duty Torque set cast iron flange with integral compression seal to waste line and test cap. Jonespec No. CF2982 and closet flange Jonespec No. 2980.

5. Closet Bolt Assemblies. Furnish and install two solid brass water closet floor flange bolt assemblies (plated brass is not acceptable). Each bolt assembly shall consist of a solid brass slotted head bolt, two solid brass nuts, two heavy solid brass washers and two resilient rubber washers.

2.2 LAVATORIES

A. Wall Hung Lavatories (LAV 1).

1. Fixture. Furnish and install a white vitreous china, wall hung, lavatory with back and side splash guards. Lavatory fixture shall measure 20 inches wide by 18 inches deep and shall be drilled for concealed arm carrier. Furnish fixture with faucet holes on 4 inch centers and front overflow ports. American Standard No. 0355.012 or approved equivalent.

2. Trim. Furnish and install solid brass all polished chrome center set and rigid copper tube inlets. Faucet shall be equipped with 1 gpm flow restricting aerator. Furnish complete with 1 1/4-inch polished chrome plated brass grid assembly and tail piece. Furnish and install condensate tail piece where noted on plans. American Standard No. 8123F.

3. Supplies. Furnish and install 1/2 inch IPS, all brass lavatory supply assembly with 1/2 inch x 3/8 inch loose key handle angle valve with 1/2 inch IPS female thread inlet, 3/8 inch O.D. by 12 inch long flexible tube riser and brass pipe escutcheon all with polished chrome finish. Entire assembly shall be made of brass. Supply stops with plastic internal parts are not acceptable. McGuire No. 2165 LK, Specified Trim No. ST2165LK, or approved equivalent. Equip each supply stop with a polished chrome plated, ASTM B 43 80, threaded, red brass pipe nipple.

4. Traps. Furnish and provide 1 1/2 inch adjustable cast brass "P" trap with tubing drain to wall, 1 1/4 inch inlet, 1 1/2 inch outlet, ground swivel joint, cast brass nuts, cast brass clean out plug and brass escutcheon, all with polished chrome finish. McGuire No. 8902, Specified Trim No. 8902C, or approved equivalent.

5. Mixing Valve. Furnish and install point of use valve, lead free, ASSE 1070 certified. Bradley S59-4016 or approved equivalent.

6. Insulate all exposed drain pipes and hot water supply piping as required by the latest edition of Texas State Purchasing and General Services Commission

7. (Texas State Building Commission) Rules and Regulations on the Elimination of Architectural Barriers.

2.3 SINKS

A. Double Compartment Sinks (SK 1).

1. Fixture. Furnish and install self rimming, double compartment, 18 gauge type 302 stainless steel sink with 4 faucet holes and fully undercoated underside. Elkay "LUSTERTONE" No. LR 3319 4 33 inch x 19 1/2-inch x 7 1/2-inch deep or approved equivalent.

2. Faucet. Furnish and install a concealed mount, dual handle, washerless, 9-1/2 inch inlet to outlet projection spout with 1/2 inch inlets, removable/replaceable cartridges, stainless steel cartridge stem, 2.2 GPM flow restrictor, forged brass wing handles, swing spout, aerator and retractable spray and hose, all with polished chrome finish. American Standard No. 9316.401.002 or approved equivalent.

3. Trim. Furnish and install sink complete with a stainless steel strainer fitting with stainless steel conical strainer basket, neoprene stopper and stainless steel 1 1/2 inch tailpiece. Elkay "DUO STRAINER" No. LK 35B, Specified Trim No. ST151A, or approved equivalent.

4. Supplies. Furnish and install a 1/2 inch IPS angle stops with 1/2 inch O.D. by 12 inch flexible tube riser, escutcheon and loose key control all with polished chrome finish. McGuire No. 2167 LK, Specified Trim No. ST2167LK, or approved equivalent.

5. Traps. Furnish and install a 1 1/2 inch adjustable cast brass "P" trap with tubing drain to wall, ground swivel joint, clean out plug and cast brass escutcheon, all with polished chrome finish. McGuire No. 8912, Specified Trim No. ST8912C, or approved equivalent.

6. Equip trap complete with a 1 1/2 inch polished chrome plated, brass, continuous waste or drain connection tubing with end outlet for double compartment sink interconnection. Elkay No. LK 53 or approved equivalent.

B. Double Compartment Sinks (SK-2) (ADA/TAS compliant).

1. Fixture. Furnish and install self-rimming, double compartment, 18-gauge Type 302 stainless steel sink with 4-faucet holes and fully undercoated underside. Elkay “LUSTERTONE” No. LRAD-3319-4 33-inch x 19-1/2-inch x 5-1/2 inch deep or approved equivalent.

2. Faucet. Furnish and install a concealed mount, dual handle, washerless swing spout faucet with 1/2-inch inlets, removable/replaceable cartridges, stainless steel cartridge stem, 1.5 GPM flow restrictor, forged brass wing handles, swing and aerator, all with polished chrome finish. American Standard No. 9316.401.002 or approved equivalent.

3. Trim. Furnish and install sink complete with a stainless steel strainer fitting with stainless steel conical strainer basket, neoprene stopper and stainless steel 1-1/2-inch tailpiece. Elkay “DUO-STRAINER” No. LK-35B or approved equivalent.

4. Supplies. Furnish and install a 1/2-inch IPS angle stops with 1/2 –inch O.D. by 12-inch flexible tube riser, escutcheon and loose key control all with polished chrome finish. McGuire No. 2167-LK, Specified Trim No. ST2167LK, or approved equivalent.

5. Traps. Furnish and install 1-1/2-inch adjustable cast brass “P” trap with tubing drain to wall, ground swivel joint, clean-out plus and cast brass escutcheon, all with polished chrome finish. McGuire No. 8912, Specified Trim No. ST8912C, or approved equivalent.

6. Equip trap complete with 1-1/2-inch polished chrome plated, brass, continuous waste or drain connection tubing, with end outlet for double compartment sink interconnections. Elkay No. LK-53 or approved equivalent.

2.4 MOP SINKS (MS-1)

A. Fixture. Furnish and install a terrazzo mop sink with continuous stainless steel cap on all four

sides and tilting flange on two sides. Stern Williams "SERVICEPTOR" No. SB 702 BP2 32 inch x 32 inch x 12 inch deep or approved equivalent.

B. Equip fixture complete with nickel bronze strainer and Stern Williams "BP" stainless steel splash catcher panels on two sides.

C. Trim. Furnish and install a Stern Williams No. T 15 VB mop service sink faucet with integral stops, spout with bucket hook, 3/4 inch hose thread end, vacuum breaker, adjustable top brace, inlets on 8 inch centers, all with polished chrome finish. Furnish a Stern Williams No. T 35 36 inch long hose with 3/4 inch polished chrome coupling and stainless steel wall bracket with rubber grip and T 40, 24 inch long stainless steel mop hanger with three rubber spring loaded grips.

2.5 SHOWERS

A. Stall Showers, Tile walls (SH 1)

1. Fixture. Reference Architectural drawings and specifications for fixture wall and floor construction.

2. Trim. Furnish a pressure balance valve with integral stops, volume control, 1.5 GPM shower head with arm and shower arm flange all with polished chrome finish. American Standard No. T508.507.

3. Drain. Furnish a 2 inch FD 1 as specified in section 22 13 00 within architectural shower construction. Ensure drain top is installed flush with finished tile of shower floor and incorporate drain body and clamping device into shower pan (membrane) to ensure a completely watertight drain installation.

B. ADA Stall Showers, Tile walls (SH-2)

1. Fixture. Reference Architectural drawings and specifications for fixture wall and floor construction.

2. Trim. Furnish a thermostatic mixing valve with integral stops, volume control, vacuum breaker, 30” slide bar handheld shower, metal hose, showerhead to be 1.5 GPM all polished chrome finish. American Standard No. 1662.600.

3. Drain. Furnish a 2 inch FD 1 as specified in section 22 13 00 within architectural shower construction. Ensure drain top is installed flush with finished tile of shower floor and incorporate drain body and clamping device into shower pan (membrane) to ensure a completely watertight drain installation.

2.6 EYE/FACEWASH (EW-1)

A. Furnish and install a pedestal mounted eye wash with self closing eye wash valves, floor flange, 1 1/2 inch supply connection, and "EMERGENCY EYE/FACE SHOWER" identification sign. Guardian No. G1760 or approved equivalent.

2.7 WALL BOXES

A. Wall Boxes, Washing Machine (WB 1). Furnish and install Guy Gray No. WB 200HATM, top supply washing machine supply and drain box with 2 inch drain and 1/2 inch supply inlet single lever valve with hammer arresters or approved equivalent.

2.8 FIXTURE CARRIERS

A. Lavatory Carriers. For high back lavatories, furnish and install a ZURN ZR 1224 series concealed chair carriers with concealed arms or approved equivalent.

2.9 PROTECTIVE DEVICES

A. Approved backflow preventers shall be used to connect piping to plumbing fixtures or equipment that do not have an approved integral device for cross connection protection.

B. Reduced Pressure Principle Type. Furnish a Watts Number U 909 S HW QT Reduced Pressure Principle backflow preventer. Equip complete with bronze strainer, stainless steel check modules, quarter turn ball valves and integral body unions.

1. For each backflow preventer valve, furnish a Watts 909 AG Fixed Air Gap Fitting with inlet compatible with outlet of backflow preventer relief valve opening. Furnish a full size drain line from air gap fitting to floor drain or hub drain.

2.10 FLOW RESTRICTORS AND TEMPERING VALVES

A. Furnish and install flow restrictors and tempering valves to all fixtures requiring water flow and/or temperature regulation as required to meet local code requirements and to regulate water flow for instantaneous water heaters. Furnish either in line or faucet end type flow restrictors (Use of either type is acceptable). Furnish access to all in line flow restrictors located in walls or above ceilings.

2.11 CHROME FINISH

A. All exposed fixture trim, including (but not limited to) p traps, supplies, riser supports, flex tube risers, etc. shall have a polished chrome finish. Furnish all polished chrome finished nipples, extension pieces, escutcheons, etc. required to meet this requirement.

2.12 ACCEPTABLE MANUFACTURERS

A. Plumbing Fixtures: American Standard, Eljer, Kohler.

B. Trim: American Standard, Chicago Faucet, Eljer, Elkay, Kohler, McGuire, Speakman, T&S Brass, Watersaver, Moen

C. Water Closet Seats: Bemis, Beneke, Church, Sperzer.

D. Mop Sinks: Stern Williams, American Standard, Eljer, Elkay, Kohler.

E. Stainless Steel Sinks: Elkay, Just.

F. Flush Valves: Sloan, Zurn.

G. Emergency Showers and Eyewashes: Bradley, Haws, Guardian.

H. Mixing Valves: Leonard, Powers, Symmons, Bradley.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set fixtures at heights as directed and approved by Architect.

B. Rigidly secure all water supply piping to wall structure. The piping in the wall shall be secured to wall such that flush valve or supply piping will not have any movement during valve activation or when jarred (typical for all plumbing fixtures).

C. Furnish and install adequate pipe supports in walls at all supply and drain lines extending through walls to rigidly secure all supply lines to all fixtures with special concentration on water closet and urinal supply lines. Contractor shall install additional pipe supports, metal framing, Unistrut, nuts, bolts, clamps and metal channels as required to adequately and rigidly secure all valves and supply piping in pipe chases and to prevent damage to plumbing fixtures. Movement of piping within wall due to valve activation or jarring will not be acceptable.

D. At each water supply stop serving lavatories and sinks, furnish and install a plastic support bracket as manufactured by P & M Company to adequately secure piping in wall. In lieu of such brackets, cast brass drop ear elbow fittings may be used when adequate blocking is installed in wall and brass elbow is rigidly secured to blocking in wall (secure to wall with brass screws or copper nails). In either case install an additional copper tubing strap located not more than 1 inch from elbow at supply stop and adequately secure to blocking in wall with brass screws or copper nails. Connect supply stop to elbow in wall using ASTM B 43 80, threaded, red brass pipe nipples. Conceal pipe nipples in wall. Where pipe nipples cannot be concealed, install polished chrome plated, threaded, red brass pipe nipples. Under no circumstances shall steel nipples be used.

E. All escutcheons shall be installed flush to wall (no gap between wall and escutcheon plate). Caulk all wall penetrations behind pipe escutcheons. Air tight with Dow Corning No. 2000 Fire Stop Sealant or approved equivalent. Wall penetrations shall not be larger than the escutcheon installed. All escutcheons of same type service shall be of same physical size. Reference the section on Pipe and Pipe Fittings General for additional requirements on pipe escutcheons.

F. All plumbing trim shall be installed in a neat and well organized manner with services running parallel with the primary lines of the building construction.

G. Install all appurtenances required for a complete and working system.

H. Install all fixtures and trim in accordance with the manufacturer's recommendations and as shown on drawings.

3.2 ROUGH-IN AND FINAL CONNECTIONS

A. Make rough in and final connection of all services to all fixtures requiring plumbing connections. Contractor shall be responsible for installing fixtures at locations shown on the Architectural drawings and providing all service connections at required locations.

B. Rough in and final connection of services to all equipment shall be installed in accordance with the latest edition of the manufacturer's rough in measurements manual. Contractor shall obtain all such documents.

C. Install service connections to all plumbing fixtures specified and to all equipment furnished by others. Reference Section 23 21 00for rough in requirements of equipment furnished by others.

3.3 QUALITY AND PROTECTION

A. All plumbing fixtures shall be free from imperfections, true as to line, angles, curves and color, smooth, watertight and complete in every respect. Chipped, scratched, marred or disfigured fixtures shall be replaced with new fixtures. Contractor shall replace all fixtures found to be damaged or defective.

3.4 COORDINATION

A. Making adjustments to field conditions is considered a part of the work required. Do not use contract drawings accompanying these specifications for rough in locations but only for pipe sizing and general routing.

B. Contractor shall examine and familiarize himself with the Architectural, Structural, Electrical and Mechanical drawings to be knowledgeable of all plumbing connections required and space limitations

C. The Drawings are diagrammatic and are not intended to show all the fittings required. Contractor shall include in his bid, costs for items of material and labor which are not specifically called for in drawings or specifications, but which are required to make plumbing installation. Contractor shall make any necessary changes to avoid beams, footings, columns, piers, vents, ducts, equipment or other obstructions.

D. Contractor shall coordinate physical requirements of all countertop fixtures with all other trades. Prior to submittal on these fixtures, the contractor shall verify space limitations.

3.5 CLEANING AND ADJUSTING

A. Thoroughly clean and disinfect all plumbing fixtures, including all exposed trim. At work completion all plumbing fixtures and trim shall be clean and free from any stains, sediment, waterspouts, oils, factory shipping wrapping/protective covers, installation instruction stickers/labels, etc. Disinfect all plumbing fixtures using commercial disinfecting agents.

B. Properly flush all water systems, clean and service all strainers and plumbing connections to facilitate proper operation of fixture valves. Install servicing until all water systems and appurtenances prove to be clean, free of debris and operating properly.

C. Adjust all flush valves and self closing valves for proper flushing or operation, but without excess use of water. Water closets shall not exceed 1.6 gallons per flush, urinals shall not exceed 1 gallon per flush and lavatory faucets shall remain open for a minimum of 10 seconds, and a maximum of 20 seconds. Demonstrate to the Architect (or representative) that the entire system and all components thereof are functioning properly.

D. Install such equipment and personnel as required to conduct tests and demonstrate the acceptability of the various plumbing systems.

E. Have the authorized representatives of the various manufacturers available if requested

END OF SECTION 22 40 00

SECTION 22 40 00.16 - PIPING AND PIPING APPURTENANCES FOR COLDWATER MAKE-UP AND EQUIPMENT DRAINS

PART 1 - GENERAL

1.1 SCOPE

A. This Section provides for the furnishing and installation of piping and piping appurtenances to drain air handlers, pumps, boilers and other equipment requiring drains, and for cold water make-up piping.

1.2 APPLICABLE PROVISIONS

A. Refer to Section 23 00 00, Mechanical General Provisions.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Furnish seamless, hard-drawn, Type L, copper water tube conforming to ASTM B 88, and wrought copper fittings.

2.2 VALVES AND STRAINERS

A. For pressure-reducing and relief valves, furnish Bell & Gossett dual unit No. D-250.

2.3 TRAPS

A. On each air handling unit condensate drain, furnish a trap deep enough to overcome pressure of the unit. All drain piping shall be Type L copper pipe.

2.4 BACKFLOW PREVENTER

A. Furnish a Watts Number U-909-S-HW-QT Reduced Pressure Principle backflow preventer on the city water header providing make-up water to all equipment, e.g., chillers, boilers, expansion tanks and any other items serving mechanical requiring cross connection protection. Equip complete with bronze strainer, stainless steel check modules, quarter turn ball valves and integral body unions.

1. At the Contractor's option, a backflow preventer may be installed at each piece of equipment.

2. For each backflow preventer valve furnish a Zurn Z-1025 Fixed Air Gap Fitting and full size drain line from air gap fitting to floor drain or hub drain.

PART 3 - EXECUTION

A. Install in strict and complete accordance with manufacturer's recommendations.

END OF SECTION 22 40 00.16

SECTION 23 00 00 – MECHANICAL GENERAL PROVISIONS (REVISED)

PART 1 - GENERAL

1.1 SUMMARY

A. Except as modified in this section, General Conditions, Supplementary Conditions, applicable provisions of Division 01, General Requirements, and other provisions and requirements of the contract documents apply to work of Division 23, HVAC.

B. Applicable provisions of this section apply to all sections of Division 23, HVAC.

C. It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details of special construction may be required for work indicated or specified in this section or work specified in other sections, it shall be the responsibility of the Contractor to provide same as well as to provide material and equipment usually furnished with such systems or required to complete the installation, whether mentioned or not.

1.2 CODE REQUIREMENTS AND PERMITS

A. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.

B. Resolve any code violation discovered in contract documents with the Engineer prior to award of the contract. After award of the contract, make any correction or additions necessary for compliance with applicable codes at no additional cost to Owner.

C. Obtain and pay for all permits and inspections.

1.3 REFERENCE SPECIFICATIONS AND STANDARDS

A. Materials which are specified by reference to Federal Specifications; ASTM, ASME, ANSI, or AWWA Specifications; Federal Standards; or other standard specifications must comply with latest editions, revisions, amendments or supplements in effect on date bids are received. Requirements in reference specifications and standards are minimum for all equipment, material, and work. In instances where capacities, size or other feature of equipment, devices or materials exceed these minimums, meet listed or shown capacities.

1.4 CONTRACTOR QUALIFICATIONS

A. An acceptable contractor for the work under this division shall be a specialist in this field and have the personal experience, training, skill and the organization to provide a practical working system. If required, he shall be able to furnish acceptable evidence of having contracted for and installed not less than three systems of comparable size and type to this one, that have served their owners satisfactorily for not less than three years.

B. The foreman for this work shall have had experience in installing not less than three such systems and shall be approved before the work is begun. Adequate and competent supervision shall be provided to ensure first class workmanship and installation.

C. Work shall be executed and all materials installed in accordance with the best practice of the trades in a thorough, substantial, workmanlike manner by competent workmen, presenting a neat appearance when completed. Work shall be performed by mechanics skilled in the trade.

D. The Contractor shall be responsible for all construction techniques required for all mechanical systems specified and shown on the drawings.

1.5 REQUEST FOR INFORMATION

A. The Contractor may, after exercising due diligence to locate required information, request from the Consultant clarification or interpretation of the requirements of the Contract Documents. The consultant shall respond to such Contractor's requests for clarification or interpretation. However, if the information requested by the Contractor is apparent from field observations, is contained in the Contract documents or is reasonably inferable from them, the Contractor shall be responsible to the Owner for all reasonable costs charged by the consultant to the Owner for the Additional Services required to provide such information.

1.6 CONTRACT DRAWINGS

A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work or show all offsets or required fittings. Determine exact locations from field measurements. Making adjustments to field conditions is considered a part of the work required.

B. When the mechanical and electrical Contract Documents do not give exact details to the elevation of pipe, conduit and ducts, the Contractor shall physically arrange the systems to fit in the space available at the elevations intended with proper grade for the functioning of the system involved. Piping, exposed conduit and the duct systems are generally intended to be installed true and square to the building construction, and located as high as possible against the structure in a neat and workmanlike manner. The Contract Documents do not show all required offsets, control lines, pilot lines and other location details. Work shall be concealed in all finished areas.

C. Prior to locating mechanical equipment, plumbing fixtures, water heaters, water coolers and other plumbing or mechanical items, obtain approval as to exact method and exact placement and location of equipment in the various areas shown on the drawings. In no case shall the locations be determined by scaling the drawings. Plumbing fixtures shall be mounted at the heights directed by the Architect and local code authorities. Relocate equipment and devices and pay all costs of modifying work of all trades necessitated by failure to comply with this requirement.

D. These specifications are accompanied by drawings of the building and details of the installation indicating the locations of equipment, piping, ductwork, outlets, switch controls, circuits, lines, etc. The drawings and these specifications are complementary to each other, and what is required by one shall be as binding as if required by both.

E. It is the Contractor's responsibility to properly use all information found on the Architectural, Structural, Mechanical and Electrical Drawings where such information affects his work.

F. The drawings show diagrammatically the location of the various outlets and apparatus. Exact locations of these outlets and apparatus shall be determined by reference to the general drawings and to all detail drawings, equipment drawings, rough-in drawings, etc., by measurements at the building, and in cooperation with the other trades. The Owner reserves the right to make any reasonable change in location of any outlet or apparatus before installation, without additional cost to the Owner.

G. Should the drawings or specifications disagree within themselves, or with each other, the better quality or greater quantity of work or materials shall be estimated upon, and unless otherwise directed by the Architect in writing, shall be performed or furnished.

1.7 OFFSETS

A. The Contract Documents are diagrammatic as stated above. Not all offsets are shown. This applies to all ductwork, piping, flues, or any other component that is routed underground or throughout the structure. The Contractor shall be responsible to layout all piping in a manner that allows for complete maintenance access. Contractor shall provide and install, without additional costs, all offsets necessary to complete this project and to provide a complete, working, accessible, and maintainable system.

1.8 BUILDING DEMOLITION

A. All salvage shall remain the property of the Owner and be delivered to a location, on site, as designated by the Owner. In the event the Owner does not desire to retain the salvage material, the material becomes the property of the Contractor and shall be disposed of by the Contractor.

B. Existing mechanical services and controls to items being removed by others must be disconnected as a requirement of this section.

C. Wherever a new to existing mechanical connection is required, the Contractor shall provide all materials and labor required to make the connections.

D. The Contractor shall be responsible to maintain all mechanical systems, in an operational condition, in all areas not included under this contract that may be affected during the demolition.

E. All concrete slab penetrations shall be coordinated and approved by the structural engineer. The Contractor shall X-ray the proposed slab penetration area prior to performing any work, to ensure that there are no existing conduit systems, concrete load bearing structural members, etc., that may otherwise be damaged by core drilling the concrete slab.

F. Equipment and devices not scheduled for removal and their associated mechanical systems shall remain in their original operating condition.

1.9 MOTORS CONTROLLED BY VFD

A. General Requirements - Shaft Grounding:

1. All motors operated on variable frequency drives shall be equipped with a maintenance free, conductive micro fiber, shaft grounding ring with a minimum of two rows of circumferential micro fibers to discharge damaging shaft voltages away from the bearings to ground, AEGIS Bearing Protection Ring.

a. Application Note: Motors up to 100HP shall be provided with one shaft grounding ring installed either on the drive end or non-drive end. Motors over 100HP shall be provided with an insulated bearing on the non-drive end and a shaft grounding ring on the drive end of the motor. Grounding rings shall be provided and installed by the motor manufacturer or contractor and shall be installed in accordance with the manufacturer's recommendations.

B. General Requirements - High Frequency Bonding:

1. All motors operated on variable frequency drives shall be bonded from the motor foot to system ground with a high frequency ground strap made of flat braided, tinned copper with terminations to accommodate motor foot and system ground connection.

a. Application Note: Proper grounding of motor frame for all inverter-driven induction motors.

C. References: ABB Technical Guide No. 5
Allen Bradley Publication 1770-4.1 Application Data, Industrial Automation Wiring and Grounding Guidelines

PART 2 - PRODUCTS

A. Not used.

PART 3 - EXECUTION

Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material which is not suitable in this respect.

3.1 OBSTRUCTIONS

A. The drawings indicate certain information pertaining to surface and subsurface obstructions which have been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.

B. Before any cutting or trenching operations are begun, verify with Owner's representative, utility company, municipalities, and other interested parties that all available information has been provided. Verify locations given.

C. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.

D. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

3.2 CUTTING AND PATCHING

A. The Contractor shall be responsible for timely placing of all equipment and piping to avoid cutting new construction.

3.3 OPENINGS

A. Framed, cast or masonry openings for piping or equipment is specified under other divisions. However, drawings and layout work for exact size and location of all such openings are included under this division.

3.4 COORDINATION

A. Contract Documents are diagrammatic in showing certain physical relationships to other trades. Interface and coordination with other work including utilities and electrical work is the exclusive responsibility of the contractor.

B. Contractor shall coordinate with Division 26 and other divisions as required. This is to include but not be limited to verification of power, voltage, phase and other characteristics as being compatible with that called for on the electrical drawings and Division 26 specifications, as well as that called for in Division 23 drawings and specifications or other divisions requiring electrical connections or interface with this division. This shall be done prior to placing orders for equipment. Controls contractor to coordinate with electrical contractor for all required 120 volt power for all DDC panels, 120 volt motor actuators, 120 volt motorized dampers, etc. prior to bids. If it is not coordinated prior to bid, mechanical is responsible for <u>all</u> 120 volt conduit, breakers, conductors, etc.

C. Arrange mechanical work in a neat, well organized manner with services running parallel with primary lines of the building construction, and with the maximum overhead clearance possible.

D. Locate operating and control equipment properly to provide easy access. Arrange entire mechanical work with adequate access for operation and maintenance.

E. Advise other trades of openings required in their work for the subsequent move-in of large units of mechanical work.

F. Verify exact locations of existing equipment and determine exact requirements for connections prior to routing services to equipment.

3.5 CONCEALED WORK

A. Where the word "concealed" is used in connection with insulating, painting, piping, ducts and the like, the word is understood to mean hidden from sight as in chases, furred spaces or suspended ceilings. "Exposed" is understood to mean open to view.

3.6 PROTECTION

A. The Contractor shall be responsible for the protection of all materials and equipment to be installed under this Division from physical and weather damage.

B. Provide all hoisting and scaffolding equipment required for proper installation of equipment. The contractor shall take full responsibility for the safety of the materials and equipment using such hoisting equipment and scaffolding.

C. Adequately protect work, equipment, fixtures, and materials. At work completion, all work shall be clean and in good condition.

3.7 AIR FILTERS AND PIPE STRAINERS

A. Immediately prior to final acceptance of project, clean and service strainers and replace disposable type air filters. If air handling units are operating during construction, install high efficiency filters in units and replace at end of construction. High Efficiency filters in the air handling units consist of minimum 2" pleat Farr 30/30 prefilter and final filter of 12" thick (if air unit frame is for 6" filter than use 6" thick) and minimum 85% efficient. As far as plenum exposed heating coils in fan powered VAV boxes, the plenum inlet shall have a minimum 2" pleat Farr 30/30 filter with a prefilter attached (preferably, the contractor will cover the inlet when debris is present). However, if the air units, fans, VAV boxes are operated during construction, and if the fan wheels, fan housings, coils, etc. are fouled by dust or debris, the Contractor, at his expense, shall clean all fouled components.

3.8 GUARANTEE

A. Guarantee work for two (2) years from the date of final acceptance of the project and during that period make good any faults or imperfections that may arise due to defects or omissions in materials or workmanship.

3.9 MATERIALS AND EQUIPMENT

A. Furnish new and unused materials and equipment of Domestic Manufacturers meeting requirements of the paragraph specifying acceptable manufacturers. Where two or more units of same type or class of equipment are required, provide units of a single manufacture.

3.10 ACCEPTABLE MANUFACTURERS

A. The following is a list of acceptable manufacturers for items of equipment specified under Division 23, Mechanical. Manufacturers names and catalog numbers specified under sections of Division 23 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, equal to that specified, manufactured by a manufacturer named below will be acceptable on approval.

B. A request for prior approval of equipment not listed must be submitted 14 days before bid due date. Only manufacturers specified in sections of Division 23, on drawings or listed below (including subsequent addenda) will be acceptable. There will be no exceptions to this requirement. Submit complete design and performance data to the Architect.

Item	**Manufacturer**
Wall Penetration Seals	Link Seal
Plumbing Fixtures	American-Standard, Kohler
Plumbing Fixtures, Trim	American-Standard, Chicago-Faucet, Moen Commercial, Elkay, Kohler, McGuire, Symmons, T & S Brass, Watersaver
Water Closet Seats	Bemis, Beneke, Church, Sperzel
Mop Sinks	Stern-Williams
Shower	American Standard, Kohler
Drinking Fountains	Elkay, Halsey-Taylor, Haws, Sunroc-Western
Stainless Steel Sinks	Elkay, Just
Flush Valves	Sloan, Delaney, Zurn
Mixing Valves	Leonard, Powers, Symmons
Drains, Cleanouts Carriers and Hydrants	J.R. Smith, Josam, Wade, Zurn
Water Hammer Arresters	J.R. Smith, Wade, Zurn
Trap Primers	Precision Plumbing Products
Access Doors	Inryco/Milicor, Karp
Domestic Water Pressure	Aurora, Paco, Syncroflo
Gas Regulators	Fisher, Rockwell
Water Treatment Products	Bruner, Water Refining Industrial

Fire Protection Accessories	Central, Grinnell, Potter-Roemer, Reliable, Viking
Fire Main Valves	Kennedy, Mueller, Nibco, Stockham
Fire Pumps	Aurora, Allis Chalmers
Fire Pump Controllers	Joslyn Clark
Grooved Pipe Fittings	Grinnell, Gustin-Bacon, Stockham, Victaulic
Valves	Hammond, Nibco, Powell, Stockham, Walworth
Backflow Preventer Valves	Beeco/Hersey, Febco, Watts
Pumps	Aurora, Bell and Gossett, Grundfos, Taco
Lubrication Equipment	Graco, ARO
Insulation	Certainteed, Johns-Manville, Knauf, Owens-Corning, Kingspan
Expansion Tanks	Taco, Wood Industrial, Amtrol
Controls	Johnson, Siemens, CSI
Circuit Setters	Bell & Gosset, Taco
Fire/Smoke Dampers	Nailor-Hart, Prefco, Ruskin, Greenheck
Automatic Air Vents	Clark, Metraflex
Filters	American Air Filter, Farr
Air Devices	Titus, Price, Metalaire
Vibration Isolation	Amber-Booth, Mason Industries
Air Cooled Condensing Units/ Heat Pumps	Carrier, Trane, York
Variable Frequency Drives	ABB, Danfoss, Magnatek, Robicon
Air Handling Units	Trane, York, Temtrol, Thermal, Governaire
Fans	Greenheck, Cook, Twin City
Fan Coil Units	Carrier, Trane, York, Magic-Aire
Thermometers and Gauges	Ashcroft, Dwyer, Marsh, Trerice
Flexible Duct	Flexmaster (only)

Chillers	Carrier, Trane, York, Artic Cool

C. Manufacturers listed in schedules, on the drawings or in a specific section of the specifications for a specific product is the basis of design. Any other submitted product will be construed to be a proposed substitute, even if listed in the acceptable manufacturers list, and must comply with the following paragraphs.

D. Acceptance of materials and equipment will be based on manufacturer's published data and will be tentative subject to the submission of complete shop drawings indicating compliance with the contract documents and that adequate and acceptable clearances for entry, servicing, and maintenance will exist. Acceptance of materials and equipment under this provision shall not be construed as authorizing any deviations from the contract documents, unless the attention of the Architect has been directed in writing to the deviations.

E. Each proposed substitute shall be referenced to the trade name of the specified product, and the paragraph and page number of the specifications where the specified items occur. Each proposed substitute shall be accompanied by adequate supporting information including catalog cuts, diagrams, representative samples, published ratings, drawings, and other such descriptive information as may be required to properly illustrate the complete characteristics of materials and equipment. In addition, a detailed statement indicating item-by-item and paragraph-by-paragraph wherein the product to be offered deviates from the specification shall be submitted for each proposed alternate. Any such alternate proposal must include all necessary changes and additions to other work occasioned by such substitution. In addition, each alternate proposal must stipulate that the substituted product will fit the space allotted the specified product and provide the same or greater clearances for maintenance, removal and/or access.

F. When requested by the Architect, the Contractor shall provide a sample of the proposed substitute item. In some cases, samples of both the specified item and the proposed item shall be provided for comparison purposes.

G. Should a substitution be accepted, and should the substitute material prove defective, or otherwise unsatisfactorily for the service intended within the guarantee period, this material or equipment shall be replaced with the material or equipment specified at no additional cost to the Owner.

3.11 SUBMITTAL DATA AND SHOP DRAWINGS

A. The submittals shall include a specification compliance analysis for review and approval before work shall begin. The compliance document shall address each paragraph of the specification by indicating COMPLY, EXCEED, or EXCEPTION. Do not indicate COMPLY unless the proposed system exactly meets the paragraph requirement. If EXCEED or EXCEPTION is indicated, then provide a clear and concise explanation of the variance from the specifications and the net effect this would have on the specified system performance. This is to be included with each submittal.

B. Submittal data. Submit descriptive literature, physical data, and performance data by the appropriate specification section or the specific sheet where products are shown on the contract drawings that are not referenced by the specification for review. All specification sections

require a submittal. Submit each spec section separately but at one time. Submittals can be contained in one binder or binders, however, each specification section must be submitted as a single submittal and each section must be clearly marked or tagged with the specification section number. Each submittal shall bear the specification section number it is related to. Any submittal received without referring to the appropriate specification section number will be returned without review. Include identifying symbols and equipment numbers used in plans and specifications, with reference to specification paragraphs, and drawing numbers of all equipment and material submitted. Submittal data shall specifically list all proposed deviations from the contract documents. Submittals that are not clearly marked will be rejected for that reason.

C. Contractor's Check. Shop drawings and submittal data will be submitted only by the Contractor. Indicate by signed stamp that the drawings and submittal data have been checked, that the work shown on the drawings and submittal data is in accordance with contract requirements and that dimensions and relationship with work of other trades have been checked. If drawings and submittal data are submitted for approval that have not been checked and signed by the Contractor, they will be returned for checking before being considered by the Architect.

D. Equipment Rooms. Submit shop drawings of mechanical equipment rooms, mechanical yards, and HVAC closets, and where directed, other complex areas. Shop drawings shall include plan views and elevations, show actual equipment to be installed, with piping fully detailed to show clearances, headroom, pipe routing, valve positions, pipe hangars, insulation, and other pertinent information. Prepare drawings to a scale of at least 3/8 inch per foot.

E. Coordination Drawings: Coordination Drawings in electronic media and hard copy shall be prepared by the Contractor indicating Mechanical, Plumbing, Fire Protection, Electrical work, low voltage cable management systems (or cable tray, as applicable) miscellaneous steel for the general work, lights, air devices, speakers, ceiling heights, etc., drawings shall indicate all duct work, mechanical lines 2" and greater (except all lines that require gravity draining are to be shown), all plumbing lines 2" and greater, trunk lines of fire protection system, and all sprinkler heads. Electrical conduit 2" and greater as well as pull boxes or other elements over 6" x 6" shall be shown. Major pieces of equipment by all trades are to be indicated.

F. Coordination drawings shall depict the routing of all above ceiling items and shall identify elevations of these items as necessary to fit above specified ceiling systems. Preparation of section details at certain congested corridor locations will be required. The Contractor shall identify which, if any, above ceiling items cannot be installed as schematically shown on the Contract Documents and shall timely notify the Designer of these items with proposed resolution. Contractor shall submit to the designer a complete set of coordination drawings for all of this project, showing non-conflicting routing of all above-ceiling items. No above-ceiling installations shall proceed in any project area until the coordination drawing for that area is completed. These drawings shall bear the original signature of all Contractor (trade) superintendents, indicating that they agree with the routing of above-ceiling items shown. Dimensions are not required and will not be reviewed. Spool drawings are not required. Showing pipe joints and duct joints is not required or desired and will not be reviewed.

G. It is preferred that the Contractor provide these services with in-house personnel. If this is not possible, Contractor must submit at least two (2) firms or individuals proposed to provide these documents. The Engineer will advise the Contractor which firm or individual is acceptable,

prior to services being procured. The Contractor's bid shall include all costs for those services noted herein.

H. The Contractor may obtain Revit files (if available) or AutoCAD files from the Engineer after signing the Engineer's release and receipt of $250 paid to the Engineer.

I. The Revit files from the Engineer will contain some clashes and it is important to note the engineers Revit files will not include fire sprinkler, electrical conduit, miscellaneous steel, etc. that may require the Contractor to modify routing/sizing of MEP systems to account for these additional systems. It is the Contractor's responsibility to recommend any required changes and update their Revit/Navisworks/AutoCAD 3-D models. At the completion of construction, Contractor shall provide the updated Revit file which shall include all changes/modifications due to RFI's, ASI's, change orders, etc. and will serve as as-built files (also provide 3 sets of full size prints). If 3-D drawings are not required by the Engineer, AutoCAD drawings must be provided by the Contractor for coordination and as-builts.

1. Drawings shall be produced in CAD at 1/4" scale, except that mechanical rooms, air handling equipment rooms, and the like, shall be produced in 1/2" scale.

    a. Single line drawing shall not be acceptable.

2. The suggested production of Drawings is as follows, however, the Contractor is solely responsible for the means, methods and sequences used:

    a. Mechanical trade shall initiate these drawings including furnishing of floor plan backgrounds. Sequence of preparation shall be:

        (1) Ductwork

        (2) Remainder of mechanical work including equipment and piping.

3. Plumbing trade shall show piping (supply, waste, vent, etc.) overlaid on the floor plan furnished by mechanical trade.

4. Fire protection work shall be shown on the same floor plan after completion of plumbing work drawings.

5. Electrical trade work shall be shown on the same floor plan after completion of the above.

6. General trade work shall be shown on the same floor plan after completion of the above.

J. Upon completion of coordination drawings, the project manager or superintendent for the HVAC, Plumbing, Fire Protection, Electrical, and General trades shall be required to sign each sheet of the coordination drawings. Signature shall attest to a diligent review and agreement to alleviate future space conflicts at no cost to the Owner. Any trade that installs elements of its work in locations other than those indicated on the coordination drawings that impacts the work of other trades, or installs elements of its work that is not shown on the coordination drawings, the trade in violation of the coordination drawings shall be required to either:

1. Move his work to resolve the conflict, or

2. Reimburse the affected trade(s) to move his work to resolve the conflict, or

3. Reimburse the Owner to move his work to resolve the conflict.

4. For record only, Coordination Drawings must be complete and submitted to the Designer within 90 days of award of contract. No review or approval will be forthcoming. Coordination drawings are required for the benefit of the Contractor and all trades as an aid to coordination of their work so as to eliminate or reduce conflicts that may arise during the installation of their work.

5. Copies of the project coordination drawings shall be submitted as part of the required closeout document package.

Owner:	1 copy
Architect:	1 copy
MEP Engineers:	1 copy

K. Engineer's approval of submitted material constitutes an acknowledgment only and in no way relieves the contractor of full responsibility for providing all systems complete in accordance with the intent of the drawings and specifications. Contractor is responsible for confirming and correlating dimensions at job site, for information which pertains to fabrication processes or construction techniques and for coordination of work with all other trades. Any materials or equipment provided by this contractor without approved shop drawings constitutes the contractor's agreement to comply with the engineer's intent whether specified, shown or implied.

3.12 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Secure three copies of operating and maintenance instructions, service manuals, and parts listed applicable to each item of equipment furnished. Deliver three bound sets for the Owner's use. Include nameplate data and design parameters in operation and maintenance manuals. Clearly distinguish between information which applies to the equipment and information which does not apply. Also include all approved submitted data, all warranties on equipment, contractor's warranty and all test and balance reports. Delivery of required documents is a condition of final acceptance.

B. Upon completion of work, and at time designated by Architect, provide services of a competent representative of the contractor for a period of at least 24 hours to instruct the owner's representative in the operation and maintenance of the entire system.

3.13 PROJECT RECORD DOCUMENTS

A. Preparation. Maintain at the job site a separate set of white prints of the contract drawings for the sole purpose of recording the "as built" changes and diagrams of those portions of work in which actual construction is significantly at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, drawings clearly indicating locations of various lines, valves, traps, equipment, and other pertinent items, as installed. Include flow-line elevation of sewer lines. Record underground and underslab piping installed, dimensioning exact location and elevation of such piping.

B. Deliver. At conclusion of project, obtain without cost to Owner, sepias of original mechanical drawings and transfer as-built changes to these. Delivery of as-built prints and reproducibles is a condition of final acceptance.

C. Throughout progress of the work of this Contract, maintain an accurate record of all changes in the Contract Documents. Upon completion of the Work of this Contract, transfer the recorded changes the AutoCAD drawing files and specification word processing files. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff. Thoroughly coordinate all changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to properly show the change. Include all addenda items, request for information Architect's Supplemental Instructions and any other document that causes a change in the Construction Documents. Accuracy of records shall be such that future search for items shown in the Contract Documents may reasonably rely on information obtained from the approved Record Documents.

D. The Contractor shall mark any deviations on a daily basis. The Architect will visit the site and will require to see the "As-Built" documentation periodically. If the Contractor does not keep an accurate set of as-built drawings, the pay request may be altered or delayed at the request of the Architect. Mark the drawings with a colored pencil. Record installed feeder conduits. Dimension the location and elevation of the conduit.

E. Record Documents shall consist of the following:

1. Job Set: Promptly following award of Contract, secure from the Architect, at no charge to the Architect, one complete set of all mechanical documents comprising the Contract.

2. Final Record Documents: Obtain the AutoCAD drawings files at the Contractor's expense ($200 and signed release form).

    a. The Contractor shall transfer all change data shown on the job set of to the corresponding electronic files, coordinating the changes as required, and clearly indicating at each affected detail and other drawing the full description of all changes made during construction and the actual location of items. Call attention to each entry by drawing a "cloud" around the area or areas affected.

3. Submit the completed total set of Record Documents to the Engineer as described above. Participate in review meeting or meetings as required by the Engineer, make all required changes in the Record Documents, and promptly deliver the final Record Documents to the Architect. Upon completion of Work, the Contractor shall certify the "Record Drawings" for correctness by signing the following certification:

CERTIFIED CORRECT (3/8" high letters)

(Name of the Contractor)

By _____

Date _____

(Name of the Sub-Contractor)

By _____

Date _____

4. Deliver record drawings to the Architect in the number and manner specified in Division 01 - General Requirements.

3.14 NOISE AND VIBRATION

A. Select equipment to operate with minimum noise and vibration. If objectionable noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions without cost to the Owner.

3.15 OPERATING TESTS

A. After all mechanical systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequence and operation throughout the range of operation. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections.

3.16 LUBRICATION, REFRIGERANT AND OIL

A. Provide a complete charge of correct lubricant for each item of equipment requiring lubrication.

B. Provide complete and working charge of proper refrigerant, free of contaminants, into each refrigerant system. After each system has been in operation long enough to ensure completely balanced conditions, check the charge and modify it for proper operation as required.

3.17 EQUIPMENT NAMEPLATES

A. All air handling units, fan-coil units, air terminal boxes, VAV boxes, condensing units, chillers and furnaces shall have an engraved Setonply Nameplate, black background, white letters, 1-1/2" x 4". Nameplate shall have equipment mark (same as indicated on drawings) in white. Plate shall be attached to equipment mark (same as indicated on drawings) in white. Plate shall be attached to equipment without using screws, per manufacturer's recommendations. All fans shall have an engraved aluminum plate with fan number, black background, white letters, 3/4" x 2-1/2". Fan nameplate shall also list rooms served by fan on one line and the service on the third line. Attach to fan per manufacturer's recommendations.

3.18 SUBSTITUTIONS REQUIRING CHANGES

A. Manufacturers and power requirements indicated on the mechanical and electrical drawings are the basis of design. If changes are required for the equipment submitted, such as changes in conduit size, conductors, breakers, disconnects, panels, etc., it shall be made at no additional cost to the Owner.

3.19 AIR BALANCE

A. Contractor shall provide an air balance of all ducted systems. Adjust sheaves, belts, drives, dampers, etc., to obtain air quantities shown. Verify proper operation of all systems. Verify all volume dampers are installed. Perform TAB operations as required by the NEBB Test and Balance Procedures Manual and Record Tests (of all ducted systems) in a report and submit to the Architect for review.

3.20 CONTROLS

A. Provide and install all wiring, conduit and other devices required for a complete and working HVAC system, including all interlocks and stop/start wiring from time clock. This includes but is not limited to 120 volt and low voltage wiring. Materials and method of execution are specified in Division 26 - Electrical.

B. Provide a motorized low leakage volume damper for outside air to each unit. Volume damper shall close when air-unit is de-energized.

3.21 PIPE SLEEVES

A. Fit with sleeves all pipes passing through masonry and concrete construction. Fabricate sleeves of schedule 40 galvanized steel pipe. Size sleeve for minimum clearance between pipe or insulation and sleeve.

B. Extend each sleeve through the floor or wall. Cut the sleeve flush with each surface, except that in exposed locations, extend floor sleeves 3 inches from finished wall or above finished floor line.

C. Caulk all sleeves water and airtight. Seal annular space between pipes and sleeves with fire stop material, see specification on fire stopping found elsewhere in this specification. Install per manufacturer's recommendations to meet or exceed fire rating of penetrated wall (minimum 1-1/2 hour). Reference architectural drawings for wall fire ratings.

D. Sleeve pipe through concrete foundations, below grade with Thunderline Link-Seal wall penetration seals. Equip seals with stainless steel nuts , bolts and pressure plate.

3.22 FIRESTOPPING

A. All piping, tubing, ductwork, conduit, etc. passing through fire rated floors and/or walls shall have the void area between the material passing through floor and/or wall sealed with an approved fire-stop material to maintain the fire rating of the floor and/or wall. Depending on the particular installation, the contractor shall use FS900 series fire stop caulk or FS500/600 series fire-stop components as manufactured by International Protective Coatings or approved equivalent.

B. All fire stop systems shall be installed as required by the manufacturer and U.L. requirements for each application.

C. The Contractor shall procure the services of an independent inspection service to review and provide a certified letter to the Contractor, Engineer and the City of Austin, stating all firestopping has been installed per UL listing and the manufacturer's recommendations. Independent service shall have experience in the inspection of firestopping materials and methods installed.

3.23 EXISTING FACILITIES

A. The Contractor shall be responsible for loss or damage to the existing facilities as used by his workmen, and shall be responsible for repairing or replacing such loss or damage. The Contractor shall send proper notices and receive written permission from the Owner to enter existing areas. Before beginning work in existing areas, make the necessary arrangements and perform other services required for the care, protection, and in service maintenance of all electrical, communication, plumbing, heating, air conditioning, and ventilating services for existing facilities. The Contractor shall erect temporary barricades with necessary safety devices, as required to protect personnel from injury, removing all such temporary protection upon completion of the work.

B. The Contractor shall provide temporary or new services to all existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being accomplished under this project.

C. Where existing construction is removed to provide working and extension access to existing utilities, the Contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, air conditioning ductwork, and equipment, etc., to provide this access and shall reinstall same upon completion of work in the areas affected.

D. Where partitions, walls, floors, or ceilings of existing construction are indicated to be removed and equipment located in these areas is required to remain in operation, the Contractor shall remove and reinstall all equipment required for the operation of the remaining electrical systems. This is to include but is not limited to electrical switches, relays, fixtures, conduit, etc.

3.24 OUTAGES

A. Outages of services as required by the project will be permitted but only at time approved by the Owner. The Contractor shall notify the Owner in writing two weeks in advance of the requested outage in order to schedule required outages. No outages shall be taken unless written approval has first been received from the Owner. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, shall be included in the contract amount.

3.25 PRECEDENCE OF MATERIALS

A. The specifications determine the nature and setting of materials and equipment. The drawings establish quantities, dimensions and details.

B. The installation precedence of materials shall be as follows. Note that if an interference is encountered, this shall guide the Contractor in the determination of which trade shall be given the "Right-of-Way".

C. Building lines

D. Structural Members

E. Soil and Drain Piping

F. Condensate Drains

G. Vent Piping

H. Supply, Return, and Outside Air Ductwork

I. Exhaust Ductwork

J. HVAC Water, Chilled Water Supply/Return, Hot Water Supply/Return

K. Steam Condensate Piping

L. Fire Protection Piping

M. Natural Gas Piping

N. Domestic Water (Cold and Hot)

O. Refrigerant Piping

P. Electrical Conduit

END OF SECTION 23 00 00

SECTION 23 00 01 - PAINTING

PART 1 - GENERAL

1.1 SCOPE

A. This section specifies painting of mechanical items located outdoors, in building equipment rooms, in tunnels and on roof. Painting includes preparing, painting and color coding the work. Mechanical items to be painted include, but are not limited to, piping, pipe hangers, insulation, equipment supports, and tanks (outdoors).

1.2 RELATED WORK

A. Division 09 - Finishes. Painting.

PART 2 - PRODUCTS

2.1 PIPING AND ALL MECHANICAL ITEMS LOCATED OUTDOORS

A. First Coat. Rust-inhibitive primer. Use galvanized iron primer where applicable. Omit first coat on pre-sized insulated pipe.

B. Second Coat. Enamel.

C. Third Coat. Enamel.

2.2 PIPE CODING

A. All piping shall be color-coded as follows:

Sprinkler Piping	To Match Structural
Fire Riser	Red
Condensate Return	Orange with black band 5' on center
Domestic Water	Blue
Process Cold Water	Light Blue
Gas	Yellow
Mechanical Items Outdoors	To match building exterior or as directed by architect.

PART 3 - EXECUTION

A. Thoroughly clean surfaces receiving paint of dirt, grease, oil, rust and scale.

B. Unless otherwise specified, paint using three coats of selected colors. Mix and use exactly as specified by the manufacturer. Allow each coat to dry thoroughly before applying succeeding coats. Painting may be done by spraying where feasible.

END OF SECTION 23 00 01

SECTION 23 00 02 - EARTHWORK

PART 1 - GENERAL

A. This section provides for the excavating and backfilling required for pipe trenches for underground piping, and miscellaneous excavation for structures installed as part of mechanical work.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavate trenching for underground piping to the required depth to ensure two feet minimum cover over the pipe.

B. Cut the bottom of the trench or excavation to uniform grade so that pipe or structure will bear on undisturbed soil. Provide additional excavation at joints as required to allow full length of pipe to lay on undisturbed soil.

C. Should rock be encountered, excavate 6 inches below grade, fill with gravel and tamp well.

D. Carefully lay out alinement of pipe trenches to avoid obstructions.

3.2 BACKFILL

A. Backfill will not be placed until the work has been inspected, tested and approved. Complete backfill to the surface of natural ground or to the lines and grades shown on drawings. Except where special materials are requested, use suitable soils from the excavation as backfill material. Do not use peat or other organic matter, silt, muck, debris or similar materials. Deposit backfill in uniform layers and compact each layer as specified.

B. Compacting Backfill. Place material in uniform layers of prescribed maximum thickness and wet or dry the material to approximately optimum moisture content. Compact with power-driven hand tampers to the prescribed density. Place regular backfill in 8-inch maximum layers, loose measure. Compact to not less than 95% of maximum soil density as determined by AASHTO Method T-99.

C. Restoration. Compact backfill where trenching or excavation is required in improved areas such as pavements, walks, and similar areas, to a condition equal to undisturbed earth, and restore surface of the area to the condition existing prior to trenching or excavating operation.

3.3 DISPOSAL OF EXCESS MATERIAL

A. Remove excess excavation material or material unsuitable for backfill from site.

END OF SECTION 23 00 02

SECTION 23 01 30.51 - HVAC AIR DUCT CLEANING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section provides the cleaning procedure to be used for cleaning of all HVAC ductwork. Exhaust systems are excluded from required cleaning.

1.2 RELATED WORK

A. Division 23 - HVAC

1. Air Balance

2. Insulation

1.3 LOCATIONS

A. Ducting is located on mezzanines, suspended above lay-in ceilings and gypboard ceilings.

1.4 QUALITY ASSURANCE

A. Contractor shall make available for use by the Owner's authorized representative(s) and the independent testing service representative all ladders, scaffolding, portable lighting, etc., required for sample gathering and observation of the work.

B. Quality control testing and sample gathering for the cleaning and sanitizing shall be performed by an Independent testing service which is to be secured by and paid for by the Contractor. The independent testing service shall not have any direct or indirect organizational or financial association, other than a contract for the requested services, with the Contractor. Number of samples and sampling location(s) shall be as specified in other portions of this document. Inspection and test results shall meet or exceed the following:

C. Cleaning: The methods employed shall be the Vacuum Test and visual inspection requirement as set forth in the National Air Duct Cleaners Association (NADCA) Standard 1992-01, Mechanical Cleaning of Non-Porous Air Conveyance System Components. The maximum weight of debris collected shall be 1.0 mg/100 square cm. System shall be free of foreign matter and chemical residue for visual inspection acceptance.

D. Sanitizing: The method employed shall be the direct contact surface sample. The maximum total count per each media sample shall be 10 colony forming units (CFU) per square centimeter of bacteria and/or fungi. The maximum CFU count of opportunistic pathogens for any single sample shall not exceed 3 CFU. ALL UNITS ARE PER SQUARE CENTIMETER.

E. A test report for quality assurance shall be submitted at the end of the cleaning and sanitizing process. The report shall be well organized and include as a minimum the type and location of each sample, sampling method, date taken, sample media lot number, genus and amount (CFU) of each bacteria and/or fungi found, if any. Include pertinent information concerning the bacteria and/or fungi found, if any. Also, weight of material collected, and results of visual inspection shall be included. The data for each sample taken shall be cross referenced to a location indicted on a duct layout diagram, to be included in the report, by a number or letter designation.

F. Should post cleaning and sanitizing test results be in excess of the levels set forth above, the system shall be recleaned and retested at a time specified by the Owner at no additional cost to the Owner.

G. The Owner reserves the right to independently test any portion of the Contractor's Work at any time for compliance with these specifications. The results of such testing may be used as the sole determination for compliance with these specifications.

PART 2 - PRODUCTS

2.1 INSULATION

A. Insulation used for patching shall be equal to or greater in rating and characteristics than insulation removed.

2.2 CAULK

A. Caulk shall be a silicone based product with a rating for use on HVAC system galvanized sheet metal duct.

2.3 CHEMICALS

A. All chemicals used shall be approved by the manufacturer for use on HVAC systems. Chemicals shall be non-volatile, non-toxic to humans, and non staining in nature. Chemicals shall not adversely affect, over the short and long term, the equipment finishes, etc., to which they are to be applied. Biocides shall be EPA registered for use on HVAC systems.

B. Acceptable Manufacturer(s), (Biocide):

1. Bio-Cide International, Inc.

C. Acceptable Products(s), (Biocide):

1. OXINE® also sold under the trade name "MICRO TREAT SANITIZER".

PART 3 - EXECUTION

3.1 SITE EXAMINATION

A. Prior to commencing the Work, thoroughly examine and become familiar with the system and associated facility to ensure execution of the Work can be completed in an orderly, safe manner and within the time frame allotted. Report immediately to the Owner's representative the existence of any unsafe condition(s) which would prevent the execution of the Work in a safe and timely manner.

3.2 SITE PREPARATION

A. Prior to commencing the Work in any area, clearly post any warning or informational signage determined by the Contractor to be required, or as required by regulations, etc. Post in such places and at such a time to ensure adequate dissemination of the information contained thereon. Barricade work areas as required to prevent entry of unauthorized persons.

B. Any equipment, utilities, piping, etc., which must be removed or relocated to gain access to the Work shall be properly supported, protected, capped, disconnected, barricaded, etc.

C. Prior to commencing Work, COVER all equipment, furnishings, etc. Do not block the flow of air through operating electronic equipment requiring same.

D. Provide scaffolding, ladders, etc., as required to gain access to the work areas. do not stand on or support platforms, etc., from furnishings or equipment.

3.3 SAFETY

A. Execute the Work in a safe manner and in strict compliance with the requirements of all applicable codes, ordinances, statutes, rules, and regulations, etc.

B. Ensure all personnel are thoroughly trained in the use of equipment, materials, and procedures to be sued in the execution of the Work.

C. Ensure the work areas is well ventilated. Provide additional ventilation to any area in which undesirable vapors may accumulate.

D. Maintain at the site at all times Material Safety Data Sheets for all chemicals brought on to the site. Notify all personnel on site of the location of the aforementioned information. Material Safety Data Sheets for chemicals not brought on to the site shall not be mixed in with those for chemicals on site.

E. Disconnect all sources of electricity from any equipment which is to be cleaned as part of the Work. Lock the disconnecting means in an open position with a padlock or a device that is in compliance with the rules and regulations, etc., which govern that portion of the Work.

F. Take appropriate measures to ensure automatic actuated devices, such as pneumatic or motor actuated dampers, cannot operate while executing the Work.

3.4 EQUIPMENT

A. The equipment used in the execution of the Work shall be the appropriate type for the task with which its use has been assigned.

B. All equipment shall be well maintained and in proper working order before it is used in the execution of the Work.

C. The air compressor(s) used in the Work shall be capable of supplying all air devices required to complete the Work in the time frame allotted. The total capacity of all air devices connected to a compressor shall not exceed the capacity of the compressor to provide the required amount of air at the required pressure(s).

D. All portable negative air machines (vacuums) used in the cleaning of the systems shall be equipped with high efficiency particulate air (HEPA) filtering systems which shall be capable of a collection efficiency of 99.97% for 0.3 micron size particles using the dioctylphthalate (DOP) testing procedure. All filters in portable equipment shall be clean at the beginning of the Work. Negative air equipment located outside the facility, such as truck mounted units, shall not be required to have HEPA filter. However, they shall not be located in such proximity to the building that exhausted air could enter the building.

E. All negative air machines(vacuums) attached to the HVAC system shall be capable of maintaining a minimum of 0.8" WG negative pressure inside the duct system at ALL times.

F. All protective equipment shall be approved by NIOSH, MSHA, OSHA, or other appropriate regulatory authority, as a minimum, for the use to which it will be subjected.

G. Provide any adapter fittings, hoses, special plugs, receptacles, cords, etc., to distribute the Contractor provided utility to the point of use. Any temporary connection to a potable water source shall incorporate a backflow preventer provided by the contractor. Any additional electrical circuit protection devices required shall be the responsibility of the Contractor to provide.

3.5 CUTTING AND PATCHING

A. Access points to the duct system shall be accomplished by complete removal of the sheet metal plug. Cutting and bending back of the sheet metal to gain access will not be allowed.

B. Sheet metal coverplates shall be fastened with sheet metal screws and all seams taped with foil scrim kraft tape. In addition, sheet metal patches shall have a continuous bead of silicone caulk applied between the duct and patch.

C. Insulation patches shall completely fill all voids and all seams shall be taped with a foil scrim kraft tape.

D. Repair loose or missing insulation which has resulted from prior maintenance and inspection activities on the HVAC system. Tape repaired areas with a foil scrim kraft tape.

3.6 DAMPER/TURNING VANE DAMAGE

A. Any damage to dampers, splitters, or turning vanes, during the course of the cleaning operation, shall be repaired by the Contractor at no cost to the Owner.

3.7 CLEANING AND SANITIZING

A. General

1. Maintain the minimum negative air pressure in the duct system at all times during the cleaning process.

2. All openings in the duct system shall be sealed prior to agitating the interior surfaces of the duct. An access point shall be opened only during the time period the cleaning activity is being conducted at that point.

3. All chemicals, materials, etc., shall be applied, handled, transported, stored, and disposed of in strict conference with the manufacturer's recommendations and applicable regulatory requirements.

4. Recleaning and resanitizing shall follow the same procedures as set forth in this document.

B. Additional requirements for cleaning and sanitizing will depend upon the type of insulation, duct, and equipment as follows:

C. Externally Insulated and Noninsulated Sheet Metal Duct:

1. Loosen, dislodge and completely remove by mechanical brushing, reverse-air sweeping, hand scrubbing, power vacuuming, and other appropriate methods, all particulate, debris, dust, dirt and foreign matter from the internal surfaces of the duct. Follow up with a thorough application of a soluble biocide to ALL interior surfaces. Fogging biocide into the operating air handler inlet will not be allowed.

D. Flexible Duct:

1. Inspect interior surfaces of all flexible ducting. If flexible ducting is dirty in appearance, remove dirt by reverse-air sweeping, hand scrubbing, power vacuuming, or other appropriate methods, which will not damage the interior of the flexible ducting.

2. If flexible ducting is damaged by the cleaning method utilized, flexible ducting shall be replaced, at no added cost to the owner.

3.8 SITE CLEANING

A. Remove from the site all the Contractor's equipment and materials, including any materials the Contractor gains ownership of through the execution of the Work.

B. Clean all areas of scrap materials, dirt, and debris at the end of each work day. Remove from the site. At no time shall the Contractor open the debris compartment of negative air equipment while the equipment is inside the building.

C. Dust, vacuum, and mop all areas at the completion of each days/weekend work activities. Perform this work in such a manner as to not contaminate the equipment, supplies, etc., located in the area.

D. Install and securely fasten a filter media in all diffusers prior to placing the unit back in service. Filter media shall be such that it shall prohibit the discharge of any particulate from the duct system into the areas served by the unit.

E. Return HVAC system to full operation with adequate time allowed for all testing and balancing work to be performed as specified.

3.9 VISUAL INSPECTIONS

A. To ensure all interior duct surfaces have been cleaned per these specifications the Owners representative shall perform random visual inspections of the ductwork. Contractor shall provide all inspection openings wherever needed. Openings required shall be 5/8" in diameter. Contractor shall plug opening with an approved plastic plug after inspection has been accomplished.

3.10 TESTING

A. To ensure quality control the minimum amount of testing shall be as specified below. Contractor shall provide access holes for testing at locations designated by the independent testing service.

B. Direct surface contact samples shall be taken for the air handling systems per the schedule which follows:

1. Preclean: One (1) set of samples shall be taken in the air handling unit of each system. One (1) set of samples shall be taken at a random location in the duct work of each system.

2. Postclean: Two (2) sets of samples shall be taken in the air handling units of each system, one on the supply side and one on the return side of the coil unit(s). Two (2) sets of samples shall be taken in the duct work of each system at random locations.

C. Samples shall be taken on horizontal surfaces where practical. For clarification a set of samples si defined as one test media of 2% malt extract (ME) and one test media of difco tryptic soy agar (TSA). All malt extract test media used shall be from the same manufactured lot. All difco tryptic soy agar test media used shall be from the same manufactured lot.

END OF SECTION 23 01 30.51

SECTION 23 05 19 - GAUGES, THERMOMETERS AND FLOW METERS

PART 1 - GENERAL

1.1 This section provides for furnishing and installing pressure gauges, thermometers and flow meters. This specification applies to all of Division 23. Flow meters for control functions are specified in the controls section and are to be supplied by the controls subcontractor.

PART 2 - PRODUCTS

2.1 PRESSURE GAUGES

A. Application. Provide pressure gauges where shown. Provide Ashcroft or approved equal, 3-1/2-inch gauges with 2% accuracy.

B. Provide 0-30 psi gauges for service.

C. Provide 0-60 psi gauges for service.

D. Provide 0-100 psi gauges for service.

E. Provide 0-160 psi gauges for service.

F. Provide liquid glycerine filled compound pressure gauges with a graduation ratio of 30 psi to 30 inches of mercury across basket strainer at suction of condensing water pump, and at suction of condensing water pump.

G. Provide liquid glycerine filled gauges across all pumps and air compressors of ranges indicated above. This does not include control air compressor.

H. Use. Pressure gauges need not be furnished across in-the-line circulators. Where air compressors and receivers are for control air only, standard 2-inch instrument gauges will be acceptable. Equip steam gauges with coil siphons.

I. Valves.

J. For all gauges, provide globe valves. Provide:

Jenkins 750	Stockham B-66
Crane 362E	Powell 120

K. Globe valve shall be 300-pound steam, 1000-pound WOG, union bonnet, regrinding, bronze body globe valve with malleable iron handwheel.

L. Refrigeration. Provide flush-mounted compound refrigeration gauges having a saturation temperature scale opposite the pressure gauge. Furnish gauge scale labeled to indicate

refrigerant in system. Mount each set of refrigeration suction and discharge gauges in pairs on a suitable permanent panel, identified with engraved white on black phenolic nameplates.

2.2 THERMOMETERS

A. Placement. Furnish, where shown and as indicated below, thermometers of suitable range for the service required. Mount thermometers on the supply and return sides of all air handling units, in each zone supply duct of multi-zone units, and on the hot and cold decks of double duct units.

B. Sockets. Provide thermometer sockets at all thermometer locations. Provide, at locations shown, thermometer sockets only, fitted with plug and chain and conforming to the requirements specified for thermometers. Install all sockets vertical or at a 45º vertical angle to permit filling with conducting liquid for tests.

C. Details. Provide thermometers which are 9 inches long, with an etched glass enclosed scale of 2º increments, a cast aluminum, case, red reading mercury. Furnish an adjustable, angle-top scale with a swivel nut connection into 3/4-inch brass separable sockets. Use a 3-1/2-inch stem length for all pipe sizes through 8 inches, and a 6-inch stem length for pipe sizes 8 inches through 10 inches and a 9-inch stem length for pipe sizes larger than 10 inches.

D. Extensions. Where thermometers are installed in insulated lines, use extension-neck separable sockets.

E. Remote. Furnish remote bulb thermometers where specified and shown. Provide thermometers with corrosion-resistant movements set in cast aluminum cases with black enamel finish.

1. Furnish dials 4-1/2 inches in diameter, with black numbers on white dials.

2. Use copper capillary tubing protected by a spiral or double-braided bronze armor.

3. Locate cases 5-1/2 feet above the finished floor.

4. Provide a liquid-filled thermal system which is ambient compensated and suitable for duct mounting.

2.3 BI-METAL THERMOMETERS

A. Provide bimetal thermometers similar to Dwyer Series BT, adjustable angle connection, +/- 1% full scale accuracy, 304 stainless steel stem, dual scale dial, 5" dial, 4" or 6" stem length as required.

2.4 FLOW ELEMENTS

A. Provide and install annubar elements, complete with bar stock valved connections for piping to flow transmitter. Also, furnish quick-disconnect valves and bar stock shutoff valves for connection to portable meter. Construct elements of 316 stainless steel. Provide annubars manufactured by Ellison.

B. Furnish a metal identification tag and chain giving pipe size, design flow rate, meter reading at design flow rate, metered fluid and station number. Curves shall be marked for each annubar, laminated and mounted on the wall.

C. For station sizes 1/2-inch through 1-1/2-inches, use Ellison 71 nipple section type. For station sizes 2 inches and larger, use Ellison 73 or 75 standard insert type.

D. Select flow sensors so that the design flow rate occurs between 10 and 40 inches of water pressure differential with permanent pressure loss of not more than 5 inches of water. An accuracy of +/- 2.5% of actual flow rate from 40 to 120% of design flow rate is required.

2.5 FLOW ELEMENTS

A. Furnish and install venturi flow stations, complete with bar stock valved connections for piping to flow transmitter. Provide quick-disconnect valves and bar stock safety shutoff valves for connection to the portable meter.

B. Provide a brass identification tag on the chain giving the pie size, venturi series, station identification, and meter reading at the specified flow rate. Curves shall be marked for each venturi, laminated and mounted on the wall.

C. For 3/4-inch through 2-inch size, use one-piece brass screwed venturi station. Make sizes 2-1/2-inches through 8 inches of plated cast iron with a venturi insert held between specially machined, self-centering, 150-pound steel weld neck flanges. Make sizes 10 inches and larger of fabricated steel plate with welding ends.

D. Provide a dry type master meter with a 6-inch diameter round dial, scaled to read gallons per minute for each flow element. Meter to be permanently mounted. Provide with 1/4-inch quick disconnect socket valves, venting valves, installation and operating instructions.

END OF SECTION 23 05 19

SECTION 23 05 29 - EQUIPMENT SUPPORT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section specifies furnishing and installation of concrete equipment pads for all direct and isolated floor mounted equipment, and structural equipment supports for horizontal tanks, heat exchangers and similar equipment, where required.

1.2 RELATED WORK

A. Division 03 - Cast-in-Place Concrete.

B. Division 05 - Miscellaneous Metals.

C. Division 09 - Painting.

D. Division 23 - HVAC. Inertia blocks are specified in the section on Vibration Isolation.

1.3 SUBMITTALS

A. Submit shop drawings on all structural supports in accordance with Division 01 - General Requirements.

PART 2 - PRODUCTS

2.1 CONCRETE

A. Provide Class A concrete as specified in Division 03 - Concrete.

2.2 STRUCTURAL METAL

A. Furnish structural metal as specified in Division 05 - Metals.

PART 3 - EXECUTION

3.1 CONCRETE PADS

A. Pour 4-inch pads on roughened floor slabs unless otherwise noted. Extend outer edges of pads a minimum of 2 inches beyond equipment. Secure equipment with anchor bolts in accordance with equipment installation instructions.

3.2 STRUCTURAL SUPPORTS

A. Construct floor stands of structural members or steel pipe. Bolt the floor stands to 6-inch concrete pads.

B. Install ceiling-mounted equipment from suitable brackets, platform framing or similar supports fabricated of structural members.

C. Paint all steel with minimum two coats of primer. Finish coats shall be in accordance with Division 09.

3.3 FAN AND EQUIPMENT SUPPORTS

A. If fan curbs or equipment curbs are not furnished with the equipment, provide prefabricated roof curbs, compatible with the roofing system installed (metal material to be modified if required); slope curbs for sloped roofs so top of curb is parallel with floor below (level). Curbs to be similar to Thycurb model TEMS; attenuated curbs to be similar to Thycurb model TC-VB (24" height). All seams and joints to be welded and hot dip galvanized. No shop fabricated products allowed.

END OF SECTION 23 05 29

SECTION 23 05 48 - VIBRATION ISOLATION

PART 1 - GENERAL

A. Refer to Section 23 00 00 for General Requirements for Mechanical Work.

1.1 SCOPE OF WORK

A. Unless otherwise noted on the equipment schedule, all mechanical equipment shall be mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure.

B. Vibration isolators shall be selected in accordance with weight distribution so as to product reasonably uniform deflection. Deflections shall be as noted on the equipment isolator schedule noted here in.

C. All vibration isolation devices, including steel bases/forms shall be designed and furnished by a single manufacturer or his qualified representative.

D. All equipment is to be externally isolated to insure that all paths of vibration have been addressed. **Internal Factory Isolation Is Unacceptable.**

1.2 RELATED WORK

A. Division 23 - HVAC.

1. Refer to the section on Ductwork for flexible connections between fans and ducts.

2. Refer to the section on equipment Supports for equipment foundation pads.

1.3 SUBMITTALS

A. Submit product data showing type, size, load, deflection and other information required. Include clearly outlined procedures for installing and adjusting isolators.

B. Completely detail concrete bases including the 6-inch-thick foundation pad.

PART 2 - PRODUCTS

2.1 ISOLATOR DESIGN

A. Materials. Design and treat vibration isolators for resistance to corrosion. Furnished phosphatized steel components with industrial-grade, corrosion-resistant material. Coat components exposed to the weather with PVC coating or fabricate of galvanized steel. Furnish

zinc electroplated nuts, bolts and washers. Clean steel bases thoroughly of welding slag and prime with zinc-chromate or metal etching primer.

B. Design.

1. Unless otherwise instructed, use spring-type vibration isolators for all equipment driven by motors of 3 horsepower and larger. The isolator manufacturer must calculate the amount of spring deflection required for each isolator to achieve optimum performance and to prevent the transmission of objectionable vibration and noise.

2. All spring isolators must be completely stable in operation and must be designed for not less than 30% reserve deflection beyond actual operating condition.

3. Design isolators for equipment installed outdoors to provide adequate restraint due to normal wind conditions. The isolators must withstand wind loads of 30 pounds per square foot applied to any exposed surface of the isolated equipment.

4. Air handling equipment subjected to excessive horizontal air thrust shall be furnished with isolated thrust resisters to limit displacement to 1/4 inch.

5. Height saving brackets used with isolators having 2-1/2-inch deflection or greater shall be of the precompression type to limit exposed bolt length.

2.2 ISOLATOR TYPES

A. Type MH-1 Mountings

1. Neoprene mountings shall have a minimum static deflection of 0.35". All metal surfaces shall be neoprene covered and have friction pads both top and bottom. Bolt holes shall be provided on the bottom and a tapped hole and cap screw on top. Steel rails shall be used above the mountings under equipment such as small vent sets to compensate for the Overhang. Mountings shall be type ND or rails type DNR as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

B. Type MH-2 Mountings

1. Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cap or ¼" neoprene acoustical friction pad between the base plate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Installed and operating heights shall be equal. The ratio of the spring diameter divided by the compressed spring height shall be no less than 0.8. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflection, compressed spring height and solid spring height. Mountings shall be type SLF, as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

C. Type MH-3 Mountings

1. Equipment with large variations in the operating and installed weight, such as chillers, boilers, etc., and equipment exposed to the wind such as cooling towers, roof mounted

fans and roof mounted air handling equipment shall be mounted on spring mountings, as described in Engineering Specification B, including the neoprene acoustical pad within a rigid sided housing that includes vertical limit stops to prevent spring extensions when weight is removed and temporary steel spacers between the upper and lower housings. Housings shall serve as blocking during erection. When the equipment is at full operating weight, the springs shall be adjusted to assume the weight and the spacers removed, without changing the installed and operating heights. All restraining bolts shall have large rubber grommets to provide cushioning in the vertical as well as horizontal modes. The hole through the bushing shall be a minimum of 0.75" larger in diameter than the restraining bolt. Horizontal clearance on the sides between the spring assembly and the housing shall be a minimum of 0.5" to avoid bumping and interfering with the spring action. Vertical limit stops shall be out of contact during normal operation. Cooling tower mounts are to be located between the supporting steel and the roof or the grillage and dunnage as shown on the drawings when there is no provision for direct mounting. Housings and springs shall be powder coated and hardware electro-galvanized. Mountings shall be SLR as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

D. Type MH-2 Hangers

1. Vibration hangers shall contain a steel spring and 0.2" deflection neoprene element is series. The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Hangers shall be type **DNHS** as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

E. Type MH-4 Horizontal Thrust Restraints

1. When total air thrust exceeds 10% of the isolated weight, floor mounted or suspended air handling equipment shall be protected against excessive displacement by the use of horizontal thrust restraints. The restraint shall consist of a modified Specification B spring mounting. Restraint springs shall have the same deflection as the isolator springs. The assembly shall be preset at the factory and fine tuned in the field to allow for a maximum of ¼" movement from stop to maximum thrust. The assemblies shall be furnished with rod and angle brackets for attachments to both the equipment and duct work or the equipment and the structure. Restraints shall be attached at the center line of thrust and symmetrically on both sides of the unit. Horizontal thrust restraints shall be WB as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

F. Type R-1 All-Directional Acoustical Pipe Anchors

1. All directional acoustical pipe anchors, consist of two sizes of steel tubing separated by a minimum ½" thickness of 60 durometer or softer neoprene. Vertical restraint shall by provided by similar material arranged to prevent up or down vertical travel. Allowable loads on the isolation material shall not exceed 500 psi and the design shall by balanced for equal resistance in any direction. All directional anchors shall be type ADA as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

G. Type R-2 Acoustical Pipe Guides

1. Pipe guides shall consist of a telescopic arrangement of two sizes of steel tubing separated by a minimum ½ thickness of 60 durometer or softer neoprene. The height of the guides shall be preset with a shear pin to allow vertical motion due to pipe expansion or contraction. Guides shall be capable of ±1 $^{5}/_{8}$" motion, or to meet location requirements. Pipe guides shall be type VSG as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

H. Type IB-1 Bases

1. Vibration isolator manufacturer shall furnish rectangular structural beam or channel concrete forms for floating foundations. Bases for split case pumps shall be large enough to provide support for suction and discharge base ells.

2. The base depth need not exceed 12" unless specifically recommended by the base manufacturer for mass or rigidity. In general, bases shall be a minimum of 1/12th of the longest dimension of the base, but not less than 6". Forms shall include minimum concrete reinforcement consisting of 3/8" bars or angles welded in place on 6" centers running both ways in a layer 1½" above the bottom, or additional steel as is required by the structural conditions. Height saving brackets shall be employed in all mounting locations to maintain a 2" clearance below the base. Bases shall be type KSL/BMK as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

I. Type FC-1 for Following: Locations Within MER & Water Applications up to 180 Degrees

1. Rubber expansion joints shall be peroxide cured EPDM throughout with Kevlar tire cord reinforcement. Substitutions must have certifiable equal or superior characteristics. The raised face rubber flanges must encase solid steel rings to prevent pull out. Flexible cable wire is not acceptable. Size 1½" through 14" shall have a ductile iron external ring between the two spheres. Sizes 16" through 24" may be single sphere. Sizes ¾" through 2" may have one sphere, bolted threaded flange assemblies and cable retention.

2. Minimum ratings through 14" shall be 250psi at 170□F and 215psi at 250□F. 16" through 24" 180psi at 170□F and 150psi at 250□F. Higher published rated connectors may be used where required.

3. Safety factors shall be a minimum of 3/1. All expansion joints must be factory tested to 150% of maximum pressure for 12 minutes before shipment.

4. The piping gap (distance between companion flanges) shall be equal to the length of the expansion joint under pressure. Control rods passing through ½" thick Neoprene washer bushing large enough to take the thrust at 1,000psi of surface area may be used on unanchored piping where the manufacturer determines the condition exceeds the expansion joint rating without them. Submittals shall include two test reports by independent consultants showing minimum reductions of 20 DB in vibration accelerations and 10 DB in sound pressure levels at typical blade passage frequencies on this or a similar product by the same manufacturer. All expansion joints shall be installed on the equipment side of the shut off valves. Expansion joints shall be SAFEFLEX SFDEJ, SFEJ, SFDCR or SFU and Control Rods CR as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

J. Type FC-2 – (Steel Pipe) for Following: Locations Outside MER, Water Applications (over 180 degrees), Air and Steams

1. Flexible stainless steel hose shall have stainless steel braid and carbon steel fittings. Sizes 3" and larger shall be flanged. Smaller sizes shall have male nipples.

2. Length shall be as tabulated:

FLANGED	MALE NIPPLES
3 X 14 10 X 26½ X 9	1½ X 13
4 X 15 12 X 28¾ X 10	2 X 14
5 X 19 14 X 301 X 11	2½ X 18
6 X 20 16 X 32	1¼ X 12
8 X 22	

3. Hoses shall be type BSS or UPCS furnished by As furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

K. Type FC-3 – (Copper Lines)

1. Flexible bronze hose shall have bronze braid with sweat connections for copper piping up to 3" diameter. Above 3" diameter, both hose and braid shall be stainless steel with brass sweat ends.

2.3 APPLICATION

A. Horizontal Pipe Isolation

1. Isolate piping as follows to create a floating mechanical system:

2. Piping 1½" and larger, connected to isolated equipment in the central plant and mechanical equipment rooms.

3. Pumped water and refrigerant piping 2" and larger outside mechanical equipment rooms.

4. To create a floating piping system, install piping hangers at regular intervals according to pipe hanger schedule. Coordinate selection of piping supports with equipment supports to accommodate expansion and contraction without creating excessive stresses at equipment connections.

5. For the two supports nearest a piece of equipment on each pipe connected to the equipment, select isolators with an operating spring deflection not less than that specified for the equipment isolators. All other supports for horizontal piping must have a minimum operating deflection of ¾" with a capability of an additional 50% travel-to-solid.

B. Vertical Riser Isolation

1. All vertical risers shall be supported by spring isolators designed to support the riser filled with water, if it is a water line. Assigned loads must be within the building design

limits at the support points. Neutral central resilient anchors close to the center of the run shall direct movement up and down. The anchors shall be capable of holding an upward force equal to the water weight when the system is drained. If one level cannot accommodate this force, anchors can be located on 2 or 3 adjacent floors. Resilient guides shall be spaced and sized properly depending on the pipe diameter. Submittals must include the initial load, initial deflection, change in deflection, final load and change in load at all spring and anchor support locations, as well as guide spacing. The initial spring deflection shall be a minimum of 0.75" or four times the thermal movement at the isolator location, whichever is greater. Calculations shall include pipe stress at end conditions and branch off locations and the manufacturer must include installation instructions. Submittal must by stamped and signed by a licensed professional engineer in the employ of the vibration vendor for at least 5 years. The isolator manufacturer shall be the same firm supplying the mechanical contract. Support spring mountings shall be MH-3, anchors Specification R-1, telescoping guides Specification R-2.

2.4 ISOLATOR APPLICATIONS

EQUIPMENT	BASE TYPE	FLEX TYPE	ISOLATOR TYPE	DEFLECTION
Chillers (Slab on grade or basement)	—	* FC-1	MH-1	0.35"
Pumps:				
Pumps (slab on grade or basement) <5HP	IB-1	* FC-1	MH-1	0.35"
Base-mounted	IB-1	* FC-1	MH-2	1.50"
Booster (House) - not at grade or >5HP	IB-1	* FC-2	MH-2	1.50"
Condensate Pump	IB-1	* FC-2	MH-2	1.50"
Packaged AHU:				
Indoors	***	* FC-1/2	MH-2	1.50"
Fan Coil Units	—	FC-2	MH-2	0.75"
Fans:			MH-2	
In-line/Cabinet - up to 5HP	—	—	MH-2	0.75"
Vane Axial: Floor - Up to 5HP	** IB-1	—	MH-2	.75"
Vane Axial: Ceiling - Up to 5HP	—	—	MH-2	.75"
Centrifugal				
- Up to 5HP	IB-1	—	MH-2	0.75"
Condensing Units/Condensers (Slab on grade or basement)	—	* FC-1/2	MH-1	0.35"
Engine Driven Generators	—	* FC-1/2	MH-3	1.50"
Dry Type Transformers	—	—	MH-2/3	0.75"

Piping	(Refer to Specification Paragraph for Requirements)

* Note Location, Temperature and Pressure Limitations noted in Specification Paragraphs listed above.
** If System Static Pressure is 3.5 inches or greater, install Horizontal Thrust Restraints MH-4.
*** Where necessary, unit manufacturer shall provide base rail assembly to allow attachment of external isolators.

2.5 PIPING

A. Provide a floating piping system in the central plant and in all mechanical rooms. To create a floating piping system, install piping hangers at regular intervals according to the pipe hanger schedule. Where floor supports are required provide sufficient spring capacity to absorb expansion and contraction of piping and yet, to permit piping to function as a floating system. Size hangers for 200% rated load. Size isolators for a minimum of 1-inch static deflection. Provide Amber/Booth Type BS or BSS spring hangers and Type SW-1 support isolators. Coordinate selection of piping supports with equipment supports to accommodate expansion and contraction without creating excessive stresses at equipment connections.

PART 3 - EXECUTION

A. Stock Requirements. The isolation manufacturer's representative must maintain an adequate stock of springs and isolators of type used so that changes made during construction and installation can be made.

B. Factory Representation. After installation, furnish factory-trained representative of the isolation manufacturer to check various isolators and report measured versus anticipated deflection on all isolators. Have the representative certify that isolators have been installed in accordance with manufacturer's recommendations and approved submittals.

END OF SECTION 23 05 48

SECTION 23 07 00 - INSULATION - GENERAL

PART 1 - GENERAL

1.1 SCOPE

A. This section specifies the general requirements for furnishing and installing insulation. These requirements apply to all other Mechanical Division sections specifying insulation.

1.2 INTENT

A. The intent of insulation specifications is to obtain superior quality workmanship resulting in an installation which is absolutely satisfactory in both function and appearance. Provide insulation in strict accordance with the specifications for each type of service and apply as recommended by the manufacturer.

1.3 RELATED WORK

A. Division 09, Finishes. Painting and color coding.

B. Division 23, HVAC.

C. Air Handling Units. Internal insulation for air units is specified in the sections on air handling units. The units do not require external insulation.

D. Insulation. Refer to specific sections on individual insulation types.

1.4 APPROVALS

A. Submittals. Submit product data on each insulation type, adhesive, and finish to be used in the work. Make the submittal as specified in Division 01, General Requirements and obtain approval before beginning installation.

B. Sample Application. Make an application of each type of insulation to display the material, quality and application method. Obtain approval of the sample application before proceeding with the work.

1.5 FIRE HAZARD RATING

A. All duct and piping insulation used on the project must have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50 as determined by test procedures ASTM E 84, NFPA 255 and UL 723. These ratings must be as tested on the Composite of insulation, jacket or facing, and adhesive. Components such as adhesives, mastics and cements must meet the same individual ratings as the minimum requirements.

PART 2 - PRODUCTS

2.1 WIRE (CALCIUM SILICATE INSULATION ONLY)

A. Use galvanized wire of gauge and spacing specified below for securing insulating materials (other than fiberglass pipe insulation) to pipe, valves, fittings, vessels, and other items.

Installation	Wire Gauge	Loop Spacing
Pipe, 4" and smaller	16	9" intervals
Pipe, 4" to 8"	14	9" intervals
Pipe, 8" and larger	12	6" intervals
Pumps, vessels, other large items	12	As required to prevent Overstressing

PART 3 - EXECUTION

3.1 WIRE (CALCIUM SILICATE INSULATION ONLY)

A. Draw wire loops tight over vapor barrier jacket, with ends of wire bent down. Take care not to puncture vapor seal.

3.2 INSULATION

A. Insulate valves, fittings, flanges, and special items to the full thickness required for corresponding piping.

B. Replace insulation damaged by either moisture or other means. Insulation which has been wet, whether dried or not, is considered damaged. Make repairs where condensation is caused by improper installation of insulation. Also repair any damage caused by the condensation.

C. Do not insulate any piping until all pressure tests have been performed in accordance with specifications.

D. Where existing insulated piping, ductwork or other surfaces are tapped or damaged, remove existing insulation back to undamaged sections and replace with new insulation of the same type and thickness as existing insulation. Apply as specified for insulation of the same service.

END OF SECTION 23 07 00

SECTION 23 07 13 - EXTERNAL DUCT INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section provides for the furnishing and installation of external insulation on low-velocity supply, return and outside air ducts, all VAV box hot water coil housings and tube bends, and all round low-velocity supply ductwork.

B. External insulation of concealed and exposed ducts is included in this section. Internal acoustic duct linings are specified under Ductwork and not included in this section.

C. External fire rated wrapping for ductwork is included in this section.

1.2 RELATED WORK

A. Division 23 - HVAC. Insulation - General.

PART 2 - PRODUCTS

2.1 INSULATION

A. Concealed Duct, Round, Flat Oval, or Rectangular. Insulation R-values shall comply with the current International Energy Conservation Code requirements. Provide flexible glass fiber insulation with factory-applied, reinforced Foil-Kraft vapor retarder facing. A minimum thermal resistance of 6.0 (sq.ft. x degrees F x hrs. per BTU) at 75□F is required, after installation (not in bag). Provide minimum 1-pound density insulation, which complies with ASTM C1290, C1136, C553.

B. 1 and 2-Hour Duct Wrap. Ducts serving pressurized stairwells and ducts supplying air to atriums to have wrap equal to the fire rating of the enclosures they are serving. Air ducts to be wrapped per requirements of NFPA 96, UBC, UMC, SBC for 1- and 2-hour enclosures. Duct wrap to be similar to Premier Refractories Pyroscat FP fire barrier, duct wrap, 1-1/2" thick per 1-hour requirement. Requirement of 1-hour or 2-hour to be per local code authority. Insulation to meet requirements of UL 263, UL 723, UL 1479, ISO6944, UL-C FRD 6. Wrap to be listed for zero clearance.

C. Standing Seams. Insulate standing seams and stiffeners that protrude through the insulation with 0.6-pound-per-cubic-foot density, 1 ½ inch thick, unfaced, flexible blanket insulation. As a vapor seal, use 8-ounce canvas with vapor barrier coating. Insulation should not prevent adjustment of damper operators.

2.2 COATING AND ADHESIVE

A. Coating. Provide Foster 30-65 or Childers CP-34 vapor barrier coating.

B. Adhesive. Provide Foster 85-60 or Childers CP-127 vapor barrier adhesive.

PART 3 - EXECUTION

3.1 FIRE SAFETY REQUIREMENTS

A. Do not extend duct coverings through walls or floors required to be firestopped or required to have a fire resistance rating. Interrupt duct coverings in the immediate vicinity of heat sources, such as electric resistance or fuel-burning heaters.

3.2 CONCEALED DUCT, ROUND, FLAT OVAL OR RECTANGULAR

A. Insulation shall be wrapped tightly on the ductwork with all circumferential joints butted and longitudinal joints overlapped a minimum of 2 inches. In addition, secure insulation to the bottom of rectangular ductwork over 24 inches wide by the use of mechanical fasteners at no more than 18 inches on center.

B. On circumferential joints, the 2-inch flange on the facing shall be stapled with 9/16-inch flare-door staples on 6-inch centers, and taped with a minimum 3-inch-wide strip of glass fabric and coating, or a 3-inch-wide strip of 8-ounce canvas adhered with adhesive. Cover all seams, joints, pin penetrations and other breaks with coating reinforced with glass fabric.

C. On circumferential joints, the 2-inch flange on the facing shall be stapled with 9/16-inch flare-door staples on 6-inch centers, and taped with a minimum 3-inch-wide strip of glass fabric and coating, or a 3-inch-wide strip of 8-ounce canvas adhered with adhesive. Adhesive systems employing release paper will not be acceptable.

END OF SECTION 23 07 13

SECTION 23 07 16 - CHILLERS, VESSELS AND HEAT EXCHANGER INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section provides for furnishing and installing insulation for both high and low temperature vessels.

B. Low temperature installations include chillers, expansion tanks, air eliminators and other vessels containing liquids and gases below 60°F.

1.2 RELATED WORK

A. Division 23 - HVAC. Insulation - General.

PART 2 - PRODUCTS

2.1 INSULATION

A. High Temperature Vessels. Furnish hydrous calcium silicate in the following thicknesses:

Vessel	Thickness, in Inches
Converters and other Heat Exchangers	1-1/2
Expansion Tanks	1
Tanks, Miscellaneous and Hot Water Heater	1-1/2

B. Low Temperature Vessels. Provide fiberglass insulation with glass cloth vapor barrier facing. A minimum 3-pound density is required. Thickness as follows:

Vessel	Thickness, in Inches
Chillers and other Heat Exchangers	2
Expansion Tanks and Air Eliminators	1

C. Low Temperature Vessels. Provide 1/2-inch thick, standard Armstrong Armaflex AP sheet insulation to chillers, expansion tanks, air eliminators, and other heat exchangers.

2.2 CEMENT AND COATINGS

A. Cement. Provide Johns-Manville No. 375 cement to seal insulation for high temperature vessels.

B. Coating. Furnish Foster 46-50 or Childers CP-10/11 coating to provide a finish coat and to secure finish cloth.

C. Sealant. Use Foster 95-44 or Childers CP-76 to seal the joints of insulation on low temperature vessels.

D. Finish. Use Foster 30-65 or Childers CP-34 finish to adhere and coat the canvas finish on low temperature vessels.

PART 3 - EXECUTION

3.1 LOW TEMPERATURE VESSELS (FIBERGLASS)

A. Apply a first layer of insulating board. Score and bend insulation to fit the contour of the equipment. Wire or band the board on immediately after application, using wire loops or bands on 12-inch centers, drawn tight and securely fastened.

B. Apply successive layers of insulation as specified for the first layer with joints staggered. Seal the joints with Benjamin-Foster 95-44 sealant. After the insulation has been applied, fill the joints and chipped places with finish reinforced with white, 20 x 20 glass fabric. Apply 8-ounce canvas adhered and given a smooth brush flood coating of Benjamin-Foster 30-70.

C. To insulate removable heads, provide two equal sections of heavy-gauge galvanized sheet metal covers, angle reinforced and lined with insulation board. Make covers easily removable to allow free access to the heads for inspection, cleaning and dismantling. Provide suitable flanges on the sections with neoprene gaskets between them, permitting a tight seal when the two sections are bolted together. Fill the voids with glass fiber wall cavity insulation.

3.2 LOW TEMPERATURE VESSELS (ARMAFLEX)

A. Adhere Armaflex sheet insulation to clean, oil-free metal surfaces by compression fit method and full coverage of Armstrong 520 adhesive. Seal butt joints with same adhesive.

B. Apply a minimum of two coats of white Armaflex finish to insulation with sufficient coats to provide satisfactory hiding qualities.

END OF SECTION 23 07 16

SECTION 23 07 16.02 - CHILLED WATER PUMP INSULATION (ARMAFLEX)

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section provides for furnishing and installing Armaflex sheet insulation to chilled water pumps.

1.2 RELATED WORK

A. Division 23 - HVAC. Insulation - General

PART 2 - PRODUCTS

2.1 INSULATION

A. Provide standard Armstrong Armaflex sheet insulation, 1 inch thick.

2.2 MATERIALS

A. Adhesive. Use Armstrong 520 adhesive.

B. Finish (Indoor). Use Armaflex finish, white. Provide a minimum of two coats to entire surface, to provide satisfactory hiding qualities.

C. Finish (Outdoors). Apply glass fabric to all insulation, with Armstrong Insulcolor lagging adhesive. Then apply Armstrong Insulcolor primer, finished with white Armstrong Insulcolor. Finish can be applied by brush, roller or spray, as recommended by manufacturer.

PART 3 - EXECUTION

A. Construct a frame around the lower half of the chilled water pump, using angles made of .016-inch aluminum or galvanized sheet metal. If the chilled water pump is very large, add additional metal angles to rigidize the frame. The metal angles can be held together with galvanized nuts and bolts or pop rivets. Cut Armaflex sheets to fit each side and end of the metal angle frame. Each section of insulation should cover only the lower half of the top angle. The end insulation must be measured and cut out for the pipes or flanges. The side insulation must be cut out for protrusions at the drain at the bottom and at the shaft protrusion at the top. Then apply the insulation to the angle by use of the 520 adhesive.

B. Construct a frame around the upper half of the chilled water pump. Construct the upper half of the frame the same as specified for the lower half. The height of the frame is determined by the highest protrusion of the top section of the chilled water pump. A piece of .016-inch

galvanized steel or aluminum the dimension of the top of the frame shall be secured to the angles by use of galvanized nuts and bolts, or pop-rivets. This will provide a rigid top. Armaflex sheet shall then be cut to fit all sides of the cover. The height of the insulation for all sides is cut oversize to allow it to meet the body insulation plus 1/8 inch for a compression fit. The insulation is then adhered to the angles by use of the 520 adhesive. The extra 1/8 inch will be under compression from the weight of the top cover pushing down against the bottom cover insulation. Then cut another piece of insulation to fit the top cover and adhere it to the top by using the 520 adhesive. Assemble the cover.

C. Apply a finish to the cover as specified in paragraphs 2.2b and 2.2c.

D. Construct housing in accordance with manufacturer's recommendations.

END OF SECTION 23 07 16.02

SECTION 23 07 19.01 - LOW TEMPERATURE PIPING INSULATION

PART 1 - GENERAL

1.1 SCOPE

A. This section provides for installing and furnishing low temperature piping insulation of Fiberglass, Armaflex AP or Koolphen-K or as noted below. The insulation will be used for low temperature application including chilled water, refrigerant, domestic cold water, condensate drains, and horizontal portions of waste lines above grade that receive condensate from air handling units or evaporators.

1.2 RELATED WORK

A. Division 23, HVAC. Insulation - General.

PART 2 - PRODUCTS

2.1 PIPE INSULATION

A. Use one of the following as noted in the schedule below:

B. Fiberglass premolded pipe insulation, 4 PCF density, k-value 0.23 btu· in/hr· ft^2· °F at 75 °F, R-value = 4.3/inch, with factory-applied reinforced All Service Jacket having integral laminated aluminum vapor barrier.

C. Armaflex AP flexible closed cell elastomeric pipe insulation, 4 PCF density, k-value 0.27 btu· in/hr· ft^2· °F.

D. Premolded Phenolic Foam, closed cell pipe insulation, 2.5 PCF density, k-value 0.13 btu· in/hr· ft^2· °F at 75 °F, R-value = 7.6/inch, with factory-applied reinforced All Service Jacket having integral laminated aluminum vapor barrier. Koolphen-K, Insul-phen by Resol Co. or equal. Insulation shall be free of all CFC or HCFC. Material to comply with ASTM C1126 Type II and III grade 1, and comply with 25/50 flame smoke spread.

E. All above materials shall have Flame spread/Smoke developed rating less than 25/50 in accordance with ASTM E 84.

F. All materials to be installed and vapor sealed in accordance with the manufacturer's recommendations.

	Thickness (Inches)		
Insulated Unit	Fiberglass	Koolphen-K	Armaflex AP
Chilled Water Piping, 6" and smaller	1 1/2	1 1/2	—
Chilled Water Piping, 8" and larger	2	2	—
Condensate Drain Lines	—	—	1/2
Above Ground Sanitary Waste Piping receiving Condensate from HVAC Equipment	1/2	3/4	—
Domestic Cold Water Piping (All)	1	3/4	—
Refrigerant Suction Piping	—	—	1 (1)
(1) Pipe 1-1/2" and less - 1" insulation; larger than 1-1/2" - 1-1/2" insulation			

2.2 FLANGE, VALVE AND FITTING INSULATION

A. Provide molded or mitered covers for flanges, valves and fittings. Refer to paragraph 3.2 for method of fabrication.

2.3 INSULATION SHIELD

A. Field Fabricated. Use sections of high density Koolphen-K, fiberglass, or foamglass insulation that will support the bearing area at hangers and supports. Further support insulation at hangers and supports with a shield of galvanized metal extending not less than 4 inches on either side of the support bearing area, covering at least half of the pipe circumference, and conforming to the schedule below.

B. Adhere metal shield to insulation so that metal will not slide with respect to insulation.

Pipe Diameter	Insulated Section Length in Inches	Minimum U.S. Standard Gauge of Metal Shield
3" and smaller	12	18
4" to 6"	12	16

2.4 SEALANT, ADHESIVE AND FINISH

A. Sealant. Use Foster 95-44 or Childers CP-76 to be used at valve covers and vapor stops.

B. Adhesive. Furnish Foster 85-60 or Childers CP-127 to seal longitudinal laps of the vapor barrier jacket and to adhere butt joint covers. Self-sealing laps and butt strips are not allowed.

C. Finish. Use Foster 30-65 or Childers CP-34 with glass fabric reinforcement.

D. Finish Armaflex AP insulation installed outdoors with minimum two coats of Armstrong Finish per manufacturer's recommendations.

2.5 ALUMINUM JACKETING

A. Apply aluminum jacketing to all fiberglass and Phenolic insulated pipe located outdoors or as noted. For piping in crawl spaces, apply white PVC sealed jacketing.

B. Piping. Furnish for finishing insulated pipe, a self-fastening jacket of type 3003-H14 aluminum alloy, 0.016-inch thick.

C. Valves, Fittings and Flanges. For finishing all valves, fittings and flanges, and smaller installations, provide formed aluminum covers, 0.024-inches thick, Type 3003-H14 aluminum alloy.

D. Straps and seals. Provide aluminum strapping seals for jackets and covers according to manufacturer's recommendations.

E. Acceptable manufacturers. Jacketing as manufactured by Preformed Metal Products Company, Childers or Johns-Manville will be acceptable.

2.6 HEAT TRACING

A. Provide a parallel resistance heating cable with minimum 4.0 watts per lineal foot. Cable shall be UL listed and selected for 120 volt single phase service. Provide an adjustable thermostat with remote sensing bulb to energize cable when ambient temperature drops below 40□F, field adjustable, Thermon or approved equal. Heat trace all water piping located outdoors or exposed to outside temperatures.

B. Heat trace to be Thermon FLX self regulating cable, 5-FLX-1, 120/1/60, 5 watts per foot, with Thermon B4X-15140 adjustable ambient sensing thermostat, NEMA 4X. Thermon or approved equal. Heat trace all water piping and equipment components outdoors or in areas subject to freezing, whether shown or not.

PART 3 - EXECUTION

3.1 PIPE

A. Apply insulation to clean, dry pipes. Butt insulation joints firmly together. Seal longitudinal laps and butt strips with adhesive.

B. Where piping is interrupted by fittings, flanges, valves or hangers and at intervals not to exceed 25 feet on straight runs, an isolating seal (vapor stop) shall be formed between the vapor barrier jacket and the bare pipe by liberal application of the sealant to the exposed joint faces carried continuously down to and along 4 inches of pipe and up to and along 2 inches of the jacket. This shall be provided only for chilled water service. In areas with high ambient temperature and humidity conditions, seal all butt joints with vapor stop sealant in accordance with recommendations of the insulation manufacturer.

3.2 VALVES, FLANGES AND FITTINGS

A. Insulate all valves, flanges and fittings with factory molded or mitered fitting covers secured with wire. Thickness of insulation shall be equal to that of adjoining piping. Mitered covers for pipe 2" and smaller shall be minimum 3-piece to the side, and pipe 2-1/2" and larger shall be minimum 6 pieces to the side. The fitting shall then be rasped or otherwise formed to have a smooth appearance.

B. Finish with 1/4-inch layer of Foster 30-65 or Childers CP-34 reinforced with glass fabric.

3.3 CONTROL VALVE COVERS

A. Fabricate special covers, complete with troweled-on vapor seal, shaped to accommodate the valve stem. Insulation thickness shall be same thickness as adjoining pipe.

B. Seal covers to valve insulation proper with adhesive so that the seal may be broken with a knife blade without damage to either part. Arrange so that cover can be removed and replaced as necessary for operation of the valve. Finish valve cover with glass cloth and two coats of finish.

3.4 SHIELDS AND HANGERS

A. When the insulation is jacketed in aluminum, install a length of 40-pound roofing felt 1/2 inch longer than the insulation shield between shield and jacket.

END OF SECTION 23 07 19.01

SECTION 23 07 19.02 - HIGH TEMPERATURE PIPING INSULATION (FIBERGLASS)

PART 1 - GENERAL

1.1 SCOPE

A. This section provides for furnishing and installing high temperature piping insulation, including and hot water supply and return and domestic hot water piping. Emergency generator exhaust is not included.

1.2 RELATED WORK

A. Division 23, HVAC. Insulation - General.

PART 2 - PRODUCTS

2.1 INSULATION

A. Use premolded fiberglass pipe insulation, 4 PCF density, R-value = 4.3/inch with a factory-applied, all service reinforced jacket having integral laminated aluminum vapor barrier or phenolic foam rated for 210°F if listed for the service. Provide insulation thickness as listed.

Insulating Unit	Fiberglass Thickness (Inches)
Heating Water Piping, 5" and smaller	1-1/2
Heating Water Piping, 6" and larger	2
Domestic Hot Water Piping, 1-1/2" and smaller	1
Domestic Hot Water Piping, 2" and greater	1-1/2

2.2 INSULATION SHIELD

A. Field Fabricated. Use sections of high density fiberglass, calcium silicate, or foamglass insulation that will support the bearing area at hangers and supports. Further support insulation at hangers and supports with a shield of galvanized metal extending not less than 4 inches on either side of the support bearing area, covering at least half of the pipe circumference, and conforming to the schedule below. When pipe is guided at top and bottom, metal shields shall cover the whole pipe circumference. Adhere metal shield to insulation so that metal will not slide in respect to insulation.

Pipe Diameter	Insulated Section Length in Inches	Minimum U.S. Standard Gauge of Metal Shield
3" and smaller	12	18
4" to 6"	12	16

2.3 ADHESIVE, FINISH AND CEMENT

A. Adhesive. Furnish Foster 85-60 or Childers CP-127 to seal longitudinal laps of vapor barrier jacket and to adhere joint butt covers.

B. Finish. Use Foster 46-50 or Childers CP-10/11 with glass fabric reinforcement.

C. Cement. Furnish Johns-Manville No. 460 on insulated fittings, flanges and valves.

2.4 ALUMINUM JACKETING

A. Apply aluminum jacketing to all insulated pipe located outdoors or as noted.

B. Piping. Furnish for finishing insulated pipe, a self-fastening jacket of type 3003-H14 aluminum alloy, 0.016-inch thick.

C. Valves, Fittings and Flanges. For finishing all valves, fittings and flanges, and smaller installations, provide formed aluminum covers, 0.024-inches thick, type 3003-H14 aluminum alloy.

D. Straps and seals. Provide aluminum strapping seals for jackets and covers according to manufacturer's recommendations.

E. Acceptable manufacturers. Jacketing as manufactured by Preformed Metal Products Company, Childers or Johns-Mansfille will be acceptable.

PART 3 - EXECUTION

3.1 PIPE

A. Apply insulation to clean, dry pipes. Butt insulation joints firmly together. Seal longitudinal laps and butt strips with adhesive. Insulation using self sealing laps and butt strips is acceptable.

3.2 VALVES, FITTINGS AND FLANGES

A. Omit insulation at screwed unions and at valves smaller than 1-1/2 inches, except at VAV box heating coils and on steam and condensate piping, where insulation is required.

B. On concealed piping, insulate fittings and valves 2-1/2 inches IPS and larger, with factory molded or mitered fitting covers. Mitered covers for pipe 2" and smaller shall be minimum 3-piece to the side, and pipe 2-1/2" and larger shall be minimum 6-pieces to the side. The fitting

shall then be rasped or otherwise formed to have a smooth appearance. Thickness of insulation shall be equal to that of adjoining pipe. Finish with coating reinforced with white 10" by 10" glass fabric.

C. On concealed piping, insulate fittings and valves 2 inches IPS and smaller with mineral wool and insulating cement to a thickness equal to or greater than adjoining straight pipe. At Contractor's option, provide molded or mitered fittings, finished with coating reinforced with glass fabric. Mitered covers for pipe 2" and smaller shall be minimum 3-piece to the side, and pipe 2-1/2" and larger shall be minimum 6-pieces to the side. The fitting shall then be rasped or otherwise formed to have a smooth appearance.

D. In exposed areas, insulate all fittings, flanges and valves with factory molded or mitered fitting covers. Thickness of insulation shall be equal to that of adjoining pipe. Mitered covers for pipe 2" and smaller shall be minimum 3-piece to the side, and pipe 2-1/2" and larger shall be minimum 6-pieces to the side. The fitting shall then be rasped or otherwise formed to have a smooth appearance. Finish with coating reinforced with white glass fabric.

E. Finish with 1/4-inch layer of Foster 46-50 or Childers CP-10/11 reinforced with glass fabric.

3.3 SHIELDS AND HANGERS

A. When the insulation is jacketed in aluminum, install a length of 40-pound roofing felt 1/2 inch longer than the insulation shield between shield and jacket.

END OF SECTION 23 07 19.02

SECTION 23 08 00 - AIR AND WATER BALANCE

PART 1 - GENERAL

1.1 SCOPE

A. This section covers final air balance operations after construction of the air system.

B. Testing Agency. The contractor shall secure the services of an independent air balance and testing agency to perform complete balance, adjustment and testing of air moving equipment and air distribution systems, including terminal units. Agency shall have on its staff at least one certified member of NEBB or AABC, who has been a member in good standing for at least 3 years, and the balancing agency shall be NEBB or AABC certified for a period of at least three years. Approved firms to provide this work are PHI Service Agency, Texas Energy Planners, Engineered Air Balance, and TAB Technologies.

C. Equipment. Instruments used shall be accurately calibrated and maintained in good working condition. Equipment shall be as listed by the Associated Air Balance Council or NEBB for this type work.

D. The items requiring testing, adjusting and balancing include the following:

1. AIR SYSTEMS:

    a. Supply Fan AHU

    b. Exhaust Fans

    c. Zone branch and main ducts

    d. VAV systems

    e. Diffusers, Registers and Grilles

    f. Coils (Air Temperatures)

2. HYDRONIC SYSTEMS:

    a. Pumps

    b. System Mains and Branches

    c. Chillers

    d. Cooling Towers

    e. Boilers

    f. Heat Exchangers

g. Coils

E. The balancing contractor shall provide tests to demonstrate the specified capacities and operation of all equipment and materials comprising the systems. Such tests other than as described herein, which are deemed necessary by the Engineer to indicate the fulfillment of the contract, shall be made. The Balancing (HVAC) Contractor shall then make available to the Engineer such instruments and technicians as are required for spot checks of the system.

F. The drawings and specifications indicate valves, dampers, sheaves and miscellaneous adjustment devices for the purpose of adjustment to obtain optimum operating conditions, and it will be the responsibility of the Mechanical Subcontractor to install these devices in a manner that will leave them accessible and readily adjustable. The Balancing (HVAC) Contractor may be consulted if there is a questionable arrangement of a control or adjustable device.

G. The balancing contractor shall be responsible for inspecting, balancing, adjusting, testing and logging the data of the performance of fans, all dampers in the duct systems, all air distribution devices or heat exchangers and the flows of water through all coils. The General Contractor, the Mechanical Subcontractor and the suppliers of the equipment installed shall all cooperate with the Balancing (HVAC) Contractor to provide all necessary equipment cutsheets.

H. The Balancing (HVAC) Contractor shall provide the following services:

1. During construction, inspect the installation of heating and cooling pipe systems, sheet metal work, temperature controls and other component parts of the heating, air conditioning and ventilating systems. The inspection of the work will cover that part relating to proper arrangement and adequate provisions for the testing and balancing. The inspections shall be performed periodically as the work progresses. A minimum of three inspections are required as follows:

a. When 60% of the piping is installed.

b. When 60% of ductwork is installed.

c. When 90% of ductwork is installed.

I. Submit brief written report of each inspection to A/E, with copies to Contractor, Mechanical Engineer, Inspector, and Owner's Representative.

J. Upon completion of the installation and start-up of the mechanical equipment by the Mechanical Subcontractor, the Balancing (HVAC) Contractor will balance, test and adjust the systemic components to obtain optimum conditions in each conditioned space in the building. If construction deficiencies are encountered which preclude obtaining optimum conditions, and the deficiencies cannot be corrected by the Contractor within a reasonable period of time, cease TAB services and advise the Architect in writing with an information copy to the Owner's Representative. The Balancing (HVAC) Contractor is advised that deficiencies in HVAC construction are often encountered during final TAB services and he should include in his bid an amount he deems advisable to compensate for his time in identifying the deficiencies to the Mechanical Contractor and awaiting their correction.

K. Fourteen (14) days, or earlier, prior to the Owner's Final Inspection, as requested by the General Contractor, the TAB shall prepare seven (7) copies of the completed Balancing (HVAC) Test

and Balance Report. The Report shall be complete with logs, data, and records as required herein and all logs, data, and records shall be typed, produced on white bond paper, and bound with plastic spiral. The Reports shall be certified accurate and complete by a principal Engineer of the Balancing (HVAC) Contractor. Transmit one (1) copy direct to the Owner's Representative and the remaining six (6) copies to the Architect. The Architect will, in coordination with the Engineer, review the report. Upon approval, two (2) copies will be submitted to the Owner's Representative and two (2) copies transmitted to the Contractor.

L. The Report shall contain the following general data in a format selected by the TAB Agency for clarity and ease of reference.

1. Project No.
2. Contract No.
3. Project Title:
4. Project Location:
5. Project Mechanical Engineer: (Name)
6. TAB Field Test Engineer: (Name)
7. TAB Testing Diagnosis and Analysis by : (Name)
8. TAB Agency: (Firm name and address)
9. Mechanical Subcontractor: (Name and address)
10. General Contractor: (Name and address)
11. Inclusive dates tests were performed and date of Report
12. Test Certification Number:
13. Certification by principal engineer
14. The TAB Report shall normally contain the following sections:
15. Table of Contents
16. General data and certification
17. Brief Description of Tests and Test Procedures (including instruments used)
18. Summary of Test Results (note deficiencies, if any, and action taken for correction)
19. Logs, Data, and Records

1.2 REPORTS

A. Final TAB Report - The TAB agency shall submit the final TAB report for review by the engineer. All outlets, devices, HVAC equipment, etc., shall be identified, along with a numbering system corresponding to report unit identification. The TAB agency shall submit an AABC "National Project Performance Guaranty" assuring the project systems were tested, adjusted and balanced in accordance with the project specifications and AABC National Standards or NEBB procedures.

1.3 RELATED WORK

A. Division 23 - Mechanical.

1. Ductwork.

2. Fans.

3. Air Devices.

1.4 PROCEDURES

A. Operating Tests. After all mechanical systems have been completed, and prior to air balance, subject each system to an operating test under design conditions to ensure proper sequence of operation in all operating modes. Make adjustments as required to ensure proper functioning of all systems.

B. Certified Data. The contractor shall provide the balance and testing agency the certified data on fans, grilles, coils, filters and other equipment required for proper balancing of the system.

C. Adjustment. The balance and testing agency shall provide necessary adjustments to air flow dampers, fans, sheaves, extractors, splitters, and other controls as required to properly balance the system. TAB firm to include in his bid, all belts and sheaves, and labor to replace and adjust all sheaves to obtain scheduled air flow.

D. Balancing. The balance agency shall follow balancing and testing procedures published by the Associated Air Balance Council, or NEBB.

E. Reports. Compile the test data on report forms as listed in the AABC "National Standards for Total System Balance". Include data on air volume at supply and return grilles and diffusers. Include exhaust air volume. Contractor's forms are not acceptable unless all data included is in the latest "National Standards" by AABC.

F. The specified systems shall be reviewed and inspected for conformance to design documents. Testing, adjusting and balancing on each identified system shall be performed. The accuracy of measurements shall be in accordance with AABC National Standards. Adjustment tolerances shall be + or - 10% unless otherwise stated.

G. Equipment settings, including manual damper quadrant positions, manual valve indicators, fan speed control levels, and similar controls and devices shall be marked to show final settings.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 AIR AND WATER BALANCE (BY AIR BALANCE AGENCY)

A. General Requirements.

B. Do all work required for complete testing and adjusting of all HVAC systems.

C. Provide all instruments and equipment required to accomplish necessary testing, adjusting, and as required by the engineer to verify performance. All instruments shall be in accurate calibration and shall be calibrated in ranges that will be expected.

D. Prior to final observation, submit to the owner a letter certifying:

1. That all balancing is complete.

2. That all controls are calibrated and functioning properly.

3. That all parts of the various systems are complete and ready to be turned over to the owner for continuous operation. Submit with letter a report tabulating data requested by the Engineer.

E. Design Conditions. The HVAC systems have been designed to maintain the inside conditions indicated below when operating with the outside conditions stated. Install, test and adjust the systems so that they will produce the inside conditions for design; however, contractor must be prepared to provide a suitable test to prove that equipment is producing capacities scheduled.

1. Inside Conditions.

a. Summer: 75 F.D.B. 50% R.H.

b. Winter: 72 F.D.B.

2. Outside Conditions.

a. Summer: 98 F.D.B. 78 F.W.B.

b. Winter: 20 F.D.B.

F. Adjust all air system dampers and volume controllers to obtain proper air balance throughout the conditioned area. The air quantities shown on the drawings for individual outlets may be changed to obtain uniform temperature within each zone, but the total air quantity shown for each zone must be obtained. Maximum temperature variation within a zone to be 2°F.

G. Adjust all blower drives to obtain proper total amounts of air. Change drive if necessary to accomplish proper air flow. Costs for drive changes, including belts and sheaves will be borne by the TAB contractor.

H. Adjust all valves in the various water systems to obtain proper amount of water to each piece of equipment.

I. Calibrate, set and adjust all automatic temperature controls. Check proper amount of water to each piece of equipment.

3.2 AIR SYSTEMS

A. The TAB agency shall verify that all ductwork, dampers, grilles, registers, and diffusers have been installed per design and set in the full open position. The TAB agency shall perform the following TAB procedures in accordance with the AABC National Standards:

1. For supply fans:

   a. Fan speeds - test and adjust fan RPM to achieve maximum or design cfm.

   b. Current and voltage - test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.

   c. Pitot-Tube traverse - perform a Pitot-tube traverse of main supply and return ducts, as applicable to obtain total cfm.

   d. Outside air - test and adjust the outside air on applicable equipment using a pitot-traverse. If a traverse is not practical use the mixed air temperature method if the inside and outside temperature difference is at least 20 degrees Fahrenheit or use the difference between pitot-tube traverses of the supply and return air ducts.

   e. Static pressure - test and record system static profile of each supply fan.

2. For return fans:

   a. Fan speeds - test and adjust fan RPM to achieve maximum or design cfm.

   b. Current and voltage - test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.

   c. Pitot-tube traverse - perform a pitot-tube traverse of the main return ducts to obtain total cfm.

   d. Static pressure - test and record system static profile of each return fan.

3. For relief fans:

   a. Fan speeds - test and adjust fan RPM to achieve maximum or design cfm.

b. Current and voltage - test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.

c. Static pressure - test and record system static profile of each relief fan.

d. Pitot tube traverse - if possible, per system ductwork, perform a traverse to determine Relief Air cfm.

4. For exhaust fans:

a. Fan speeds - test and adjust fan RPM to achieve maximum or design cfm.

b. Current and voltage - test and record motor voltage and amperage, and compare data with the nameplate limits to ensure motor is not in or above the service factor.

c. Pitot-tube traverse - perform a pitot-tube traverse of main exhaust ducts to obtain total cfm.

d. Static pressure - test and record system static profile of each exhaust fan.

e. For zone, branch and main ducts:

f. Adjust ducts to within design cfm requirements. As applicable, at least one zone balancing damper shall be completely open. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.

5. For VAV systems:

a. Set volume regulators on all terminal boxes to meet design maximum and minimum cfm requirements.

b. Identification - identify the type, location, and size of each terminal box. This information shall be recorded on terminal box data sheets.

6. For diffusers, registers and grilles:

A. Tolerances - test, adjust and balance each diffuser, grille, and register to within 10% of design requirements. Minimize drafts.

B. Identification - identify the type, location and size of each grille, diffuser, and register. This information shall be recorded on air outlet data sheets.

C. For coils:

B. Air temperature - once air flows are set to acceptable limits, take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry bulb temperature shall be taken on the entering and leaving side of each heating coil.

3.3 HYDRONIC SYSTEMS. The TAB agency shall, as applicable, confirm that all hydronic equipment, piping, and coils have been filled and purged; that strainers have been cleaned; and that all balancing valves (except bypass valves) are set full open. The TAB agency shall perform the following testing and balancing functions in accordance with the AABC National Standards:

A. For pumps:

1. Test and adjust chilled water, hot water, and condenser water pumps to achieve maximum or design GPM. Check pumps for proper operation. Pumps shall be free of vibration and cavitation. Record appropriate gauge readings for final TDH and Block-Off/Dead head calculations.

B. Current and Voltage - test and record motor voltage and amperage, and compare data with the nameplate limits to ensure pump motor is not in or above the service factor.

C. For system mains and branches:

1. Adjust water flow in pipes to achieve maximum or design GPM.

D. For chillers:

1. Verify that chillers have been started by others and are in operation. Test and adjust chiller water flows to achieve maximum or design GPM.

E. Current and voltage - test and record motor voltage and amperage, and compare data with the nameplate limits to ensure compressor motor is not in or above the service factor.

F. Test and record temperature profiles of chillers.

G. For cooling towers:

1. Verify that cooling towers have been filled and started by others, and are in operation.

2. Test and adjust water flows to balance tower cells and flows between towers.

3. Test and record temperature profiles for water and air side operation.

H. For boilers:

1. Verify that boilers have been filled and started by others, and are in operation.

2. Current and voltage - as applicable, test and record motor voltage and amperage, and compare data with the nameplate limits to ensure motor is not in or above the service factor.

3. Test and adjust water flow through water boilers.

4. Test and record temperature and pressure profiles of water or steam boilers.

I. For heat exchangers:

1. Verify that heat exchangers have been filled and started by others, and are in operation.

2. Test and adjust water flow through heat exchangers.

3. Test and record temperature and pressure profiles of water or steam heat exchangers.

J. For coils:

1. Tolerances - test, adjust, and balance all chilled water and hot water coils within 10% of design requirements.

2. Verification - verify the type, location, final pressure drop and GPM of each coil. This information shall be recorded on coil data sheets.

3.4 SOUND TESTING. The TAB agency shall conduct sound testing in the following areas per AABC National Standards and to the criteria listed, using sound meter with octave band analyzer:

TEST AREA	NUMBER OF LOCATIONS	NC LEVEL ACCEPTABLE
General Offices	0	30-35
Executive Offices	0	25-30
Computer/Equipment Rooms	0	40-45

3.5 VIBRATION TESTING. The TAB agency shall conduct vibration testing on the following equipment per AABC National Standards. Test deflection in mils and velocity in inches per second shall be measured and the results compared to requirements in equipment specification sections.

3.6 EQUIPMENT

A. Fans over 3.0 horsepower

B. Pumps over 3.0 horsepower

3.7 INDOOR AIR QUALITY VERIFICATION

A. The TAB agency shall take measurements at design outside air. It shall measure temperature and humidity uniformity throughout the space, check filter installation for proper fit, seal, and operation, and verify condensate drain operation. The TAB agency shall note any water damage or obvious contamination sources from inside or outside.

B. The TAB agency shall conduct the following air sampling tests for every 2,500 square feet of space:

Chemical Name	Chemical Symbol	TLV-TWA (1) (PPM)	C-STEL (2) (PPM)	Dreager Tube Range (PPM)
Carbon Dioxide	CO^2	5000	-	100-3000
Carbon Monoxide	CO	25	-	2-300

[1] TWA - Time Weighted Average: Compound concentrations to be controlled during a continuous 8-hour period to within this TWA value, measured in parts per million (PPM).

[2] C-STEL - Ceiling-short Term Exposure Limit: Compound conc

C. The TAB agency shall prepare a report showing the results, location, time and date of each test. A summary of the HVAC operating conditions, and a listing of any discrepancies shall be provided.

D. All IAQ readings are applicable only to the date and time noted above.

3.8 DUCT LEAKAGE TESTING. The installing contractor shall isolate and seal sections of ductwork for testing. The test pressures required and the amount of duct to be tested shall be described by the engineer in the appropriate duct classification section. All testing shall be based on one test per section only unless otherwise noted.

3.9 VERIFICATION OF HVAC CONTROLS. The TAB agency shall be assisted by the building control systems contractor in verifying the operation and calibration of all HVAC and temperature control systems. The following tests shall be conducted:

A. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water resets, fire and freeze stats, and other safety devices.

B. Verify that all controlling instruments are calibrated and set for design operating conditions.

3.10 TEMPERATURE TESTING. To verify system control and operation, a series of three temperature tests shall be taken at approximately two-hour intervals in each separately controlled zone. The resulting temperatures shall not vary more than two degrees Fahrenheit form the thermostat or control setpoint during the tests. Outside temperature and humidity shall also be recorded during the testing periods.

3.11 TAB REPORT VERIFICATION. At the time of final inspection, the TAB agency may be required to recheck, in the presence of the Owner’s representative, specific or random selections of data recorded in the certified report. Points and areas for recheck shall be selected by the Owner’s representative. Measurements and test procedures shall be the same as approved for the initial work for the certified report. Selections for recheck, specific plus random, will not exceed 10% of the total number tabulated in the report.

A. The TAB agency shall test and adjust fume hood total air flow by duct pitot-tube traverse. If a pitot-tube traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet. Test and record face velocities under design operating conditions using a maximum of a one square foot grid pattern across the entire open face. The TAB agency shall set sash height on hoods to obtain face velocities within 20% of 100 feet per minute unless specified otherwise. It shall test and adjust VAV controllers to obtain design exhaust air flows and make-up air flows to maintain design room pressurization. The TAB agency shall test for turbulence and proper air flow patterns at the face and inside the hoods using a hand-held smoke puffer or other approved smoke-emitting device.

3.12 KITCHEN HOOD TESTING. The TAB agency shall test and adjust kitchen hood total air flow by duct pitot-tube traverse if applicable under local code. All sealing of test holes in the exhaust duct to be by others per local code requirements. The TAB agency shall test and record face velocities in accordance with design requirements. It shall test and adjust make-up air flow (if included) to meet design face velocities and pressurization and to maintain turbulence.

3.13 BUILDING/ZONE PRESSURIZATION**.** The TAB agency shall test and adjust building/zone pressurization by setting the design flows to meet the required flow direction and pressure differential. For positive pressure areas, it shall set the supply air to design flow, and gradually reduce the exhaust air rate to obtain the required flow or pressure difference. For negative pressure areas, it shall set the supply air to design flow, and gradually increase the exhaust air rate to obtain the required flow or pressure difference.

3.14 STAIRWELL PRESSURIZATION. The TAB agency shall test and adjust stairwell pressurization system to provide design air flow into the stairwell and set reliefs to maintain required pressurization. When required by the local authority, it shall check door pull force on all exit doors to specific requirements.

3.15 FIRE AND SMOKE TESTING. The TAB agency shall test fire/smoke dampers to assure operation. It shall verify that an access door has been installed for each fire and smoke damper. For fire dampers, the TAB agency shall open the access door, disconnect the fusible link, and allow the damper to close. Operation should be smooth and all dampers must close completely. The TAB agency shall then reset the damper. For the smoke damper, the TAB agency shall open the access door, activate the damper, and observe operation. The damper must close quickly and completely. The TAB agency shall then reset the damper and observe its complete opening.

3.16 SMOKE EVACUATION. The TAB agency shall test smoke evacuation by activating the system either manually, or at the direction of the Owner and local authority by the introduction of test smoke. As determined by design and test requirements, it shall observe and record system performance by time of smoke removal, pressurization readings or duct pitot-tube traverse.

3.17 LIFE SAFETY CONTROLS. The TAB agency shall test and record life safety control operation on the HVAC equipment. It shall verify the installation of required smoke detectors in air handling equipment (AHE), and shall verify operation of the smoke detector by activating the smoke detector and observing air handler shutdown. With the controls and alarm contractors, the TAB agency

shall verify the operation of interconnected systems such as the AHE smoke detector's activation of the fire alarm system and the alarm system's activation of the life safety control sequences.

A. After balancing is complete and before calling for final observation, record, and submit for record reports as noted herein and per recommendations of AABC or NEBB.

1. For each air unit:

a. Suction and discharge static pressure, and total static.

b. Fan rpm, measured by tachometer; verify rotation.

c. Motor nameplate F.L.A., actual amps, voltage.

d. Measured cfm for total supply, return and outside air.

e. Entering and leaving air temperature for each coil.

f. Entering and leaving water temperatures for each water coil.

g. Entering and leaving water pressures for each water coil.

2. For each pump:

a. Suction and discharge pressure readings at shutoff.

b. Suction and discharge pressure readings at final balance flow.

c. Motor nameplate F.L.A., actual amp at rated flow, voltage; verify rotation.

d. Copy of pump curve from manufacturer, with final balance point marked.

3. For each chilling unit:

a. Water temperature entering and leaving cooler.

b. Water pressure entering and leaving cooler.

c. Water temperature and pressure entering and leaving condenser.

d. Pressure drop-flow curves for cooler with flow points marked.

e. Motor nameplate F.L.A., actual amp, voltage.

f. Compressor suction and discharge pressures.

4. Each condenser unit:

a. Ambient air temperature, condenser discharge temperature.

b. Motor nameplate F.L.A., actual amp, voltage.

c. Suction and discharge pressures, temperature.

B. Other reports and forms to be completed and submitted. Provide instrument list, air moving test sheet, exhaust fan data sheet, static pressure profile, return air/outside air data, fan and motor pulley, duct traverse readings, duct traverse zone totals, air monitoring station data, air distribution test sheet, terminal units, pump data sheet, chillers, air cooled condensers, cooling coil data, heating coil data, flow measuring station, duct leak test. All forms shall be as listed in the latest "National Standards for Total System Balance", or shall be similar, but must note same information.

C. After Owner Occupancy. After owner has occupied and is using the building, make three additional inspections of the system (at 1 month intervals) to:

1. Correct any owner observed temperature imbalances.

a. Check correct operation of equipment and verify by letter to the engineer on each trip. List in the letter corrections made.

D. At Time of Job Completion.

1. Provide such tools, equipment and personnel as required to conduct tests and demonstrate the acceptability of the various systems.

E. Have the authorized representatives of the various manufacturers available if requested.

END OF SECTION 23 08 00

SECTION 23 09 00.01 - ADJUSTABLE FREQUENCY DRIVE

PART 1 - GENERAL

1.1 SUMMARY

A. This specification is to cover a complete Adjustable Frequency motor Drive (AFD) consisting of a pulse width modulated (PWM) inverter designed for use on a standard NEMA Design B induction motor.

1.2 REFERENCE STANDARDS

A. ANSI/NFPA 70 - National Electrical Code.

B. ICS 7.0 - Adjustable Speed Drives.

C. IEC 16800 Part 1 and 2.

D. IEEE - Institute of Electrical and Electronic Engineers.

E. IEEE 519 - Guide for Harmonic Content and Control.

F. IEC 447 - Man-Machine Interface Actuating Principles.

G. IEC 947 - Low Voltage Switchgear and Control gear Components.

H. IEC 255-8 Overload Relays.

I. IEC 801-2,-3,-4,-5 - Immunity Tests.

J. NEMA ICS 6 - Industrial Control and Systems Enclosures.

K. NEMA ICS, Part 4 - Overload Relays.

L. NEMA 250 - Enclosures for Electrical Equipment.

M. NEMA ICS 2-321 - Electrical Interlocks.

N. NEMA ICS7 - Industrial Control and Systems Adjustable Speed Drives.

O. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection Installation and Operation of Adjustable Speed Drives.

P. UL 50 - UL Standard for Safety Enclosures for Electrical Equipment.

Q. UL 98 - UL Standard for Disconnect Switches.

R. UL 507 - UL Standard for Safety Electric Fans.

S. UL 508 - UL Standard for Safety Industrial Control Equipment.

T. UL 508C - UL Standard for Safety Power Conversion Equipment.

U. UL 991 - UL Standard for Safety Tests for Safety Related Controls employing Solid-State Devices.

V. OSHA 1910.95 - AC Drive Controller Acoustical Noise.

W. UL 508 - Industrial Control Equipment.

1.3 APPLICABLE PROVISIONS

A. Refer to Section 26 00 00 - Electrical General Provisions.

B. Refer to Division 23.

1.4 SUBMITTALS

A. Submit manufacturers shop drawings and product data on adjustable frequency drive. Submittals shall include, but not be limited to the following.

1. Rated voltage, phase and frequency.
2. Drive horsepower and maximum current ratings.
3. Dimensions and weight.
4. Elementary control diagrams.
5. All control devices and accessories.

B. Compliance to IEEE 519-harmonic analysis for particular job site including total harmonic voltage distortion and total harmonic current distortion. The AFD manufacture shall provide calculations, specific to this installation, showing total harmonic voltage distortion is less than 5%. Input line filters shall be sized and provided as required by the AFD manufacturer to ensure compliance with IEEE standard 519. All AFD's shall include a minimum of 5% impedance reactors.

1.5 OPERATION AND MAINTENANCE DATA

A. Provide operation and maintenance data in accordance with Section 26 00 00.

1.6 WARRANTY

A. Warranty shall be 24 months from the date of certified start-up, not to exceed 30 months from the date of shipment. The warranty shall include all parts, labor, travel time and expenses. There shall be 365/24 support available via a toll free phone number.

1.7 QUALITY ASSURANCE

A. The drive and all necessary controls as herein specified shall be supplied by the drive manufacturer.

B. AFDs and options shall be UL listed as a complete assembly. AFD's that require the customer to supply external fuses for the AFD to be UL listed are not acceptable. The base VFD shall be UL listed for 100 KAIC without the need for input fuses.

C. The AFDs and all accessories shall be designed, constructed and tested in accordance with NEMA, NEC and IEC standards.

D. The manufacturer of the AFDs shall have been specialized in the design and manufacturing of AFDs for at least ten years.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the requirements, acceptable manufacturers shall be as follows:

1. ABB Automation, Inc.

2. Robicon.

3. Toshiba International Corporation.

4. Square D.

2.2 GENERAL

A. The AFD shall be completely assembled and tested by the manufacturer in an ISO9002 facility. The AFD shall operate from a line of +30% over nominal, and the undervoltage trip level shall be 35% under the nominal voltage as a minimum.

B. Environmental operating conditions: 0 to 40EC continuous at rated load and switching frequency. AFD's that are rated for 35E C average over a 24 hour period are not acceptable. Altitude 0 to 3300 feet above sea level, less than 95% humidity, non-condensing.

C. Enclosure shall be rated NEMA 12 and AFD shall be UL listed as plenum rated.

2.3 AFD FEATURES

A. All AFDs shall have the same user interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be used for local control, for setting all parameters, and for stepping through the displays and menus. The keypad shall be removable, capable of remote mounting, and shall have it's own non-volatile memory. The keypad shall allow for uploading and downloading parameter settings as an aid to start-up of multiple AFDs.

B. The Keypad shall include a back-lit LCD display. The display shall be in complete English words for programming and fault diagnostics.

C. The keypad shall include Hand-Off-Auto membrane selections. When in "Hand", the AFD will be started and the speed will be controlled from the up/down arrows. When in "Off", the AFD will be stopped. When in "Auto", the AFD will start via an external contact closure and the AFD speed will be controlled via an external speed reference. Manual pilot devices are not acceptable.

D. The AFD shall be capable of starting into a rotating load (forward or reverse) and accelerate or decelerate to set point without safety tripping or component damage (flying start). The AFD shall also be capable of DC injection braking at start to stop a reverse spinning motor prior to ramp.

E. The AFD shall be equipped with an automatic extended control power loss ride-through, which utilizes the inertia of the load to keep the drive powered. Typical control power loss ride-through for a fan load shall be 2 seconds minimum.

F. The overload rating of the drive shall be 110% of its normal duty current rating for one minute every 10 minutes. The minimum FLA rating shall meet or exceed the values in the NEC/UL table 430-150 as listed for 208-volt or 460-volt, three phase motors.

G. The VFD shall have 5% impedance reactors to reduce the harmonics to the power line and to add protection from AC line transients. The 5% impedance may be from dual (positive and negative DC bus) reactors, or 5% AC line reactors. VFD's with only one DC reactor shall add AC line reactors.

H. The AFD shall be capable of sensing a loss of load (broken belt / broken coupling) and signal the loss of load condition. The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communications bus. Relay output shall include programmable time delays that will allow for drive acceleration from zero speed without signaling a false under load condition.

I. The AFD shall be capable of both displaying on the AFD panel and communicating to the BMS the KWhrs used, MWhrs, Run Time, Input KWHrs, and Input KWHrs. Additionally, the AFD shall accept the dollars per KWHr for the facility ($/KWHrs) and use this to display and communicate the Dollars saved from running below full load.

J. The AFD shall be capable of displaying and communicating with BMS the Tons of CO2 saved by not running at full load.

K. The AFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and audible motor noise.

L. The AFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual VFD temperature that allows higher carrier frequency without derating the VFD or operating at high carrier frequency only at low speeds.

2.4 ADJUSTMENTS

A. Two (3) programmable critical frequency lockout ranges to prevent the AFD from operating the load continuously at an unstable speed.

B. Two (2) PID Set point controller shall be standard in the drive, allowing a pressure or flow signal to be connected to the AFD, using the microprocessor in the AFD for the closed loop control. The AFD shall have 250 ma of 24 VDC auxiliary power and be capable of loop powering a transmitter supplied by others. The PID set point shall be adjustable from the AFD keypad, analog inputs, or over the communications bus.

C. Two (2) programmable analog inputs shall accept a current or voltage signal.

D. Two (2) programmable analog output (0-20ma-or4-20ma). The outputs may be programmed to output proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, Active Reference, and other data.

E. Six (6) programmable digital inputs

F. Three (3) programmable digital Form-C relay outputs. The relays shall include programmable on and off delay times and adjustable hysteresis. The relays shall be rated for maximum switching current 8 amps at 24 VDC and 0.4 A at 250 VAC; Maximum voltage 300 VDC and 250 VAC; continuous current rating 2 amps RMS. Outputs shall be true form C type contacts; open collector outputs are not acceptable.

G. Seven (7) programmable preset speeds.

H. Two (2) independently adjustable accelerate and decelerate ramps with 1 – 1800 seconds adjustable time ramps.

I. Run permissive circuit - There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, time-clock control, or serial communications) the VFD shall provide a dry contact closure that will signal the damper to open (VFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a VFD digital input and allows motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop, and the damper shall be commanded to close.

J. The VFD shall include password protection against parameter changes.

K. EMI / RFI filters. All VFD’s shall include EMI/RFI filters. The VFD shall comply standard EN 61800-3 for the First Environment, restricted level with up to 100’ of motor cables. No Exceptions. Certified test lab test reports shall be provided with the submittals.

2.5 SERIAL COMMUNICATIONS

A. The AFD shall have an RS-485 port as standard. The standard protocol shall be BacNet, Modbus, Johnson Controls N2, and Siemens Building Technologies FLN. Optional protocols that must be available are: LonWorks, Profibus and DeviceNet (and must be compatible with

control system). All protocols shall be "certified" by the governing authority (ie BTL Listing for BacNet). Use of non-certified protocols is not allowed.

B. Serial communication capabilities shall include, but not be limited to, run-stop control; speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, and accelerate/decelerate time adjustments. The drive shall have the capability of allowing the DDC to monitor feedback. Available feedback information must include the following: Process variable feedback, output speed/frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), $ saved, Tons CO2 Saved, input KWhrs, operating hours (resettable), relay outputs, and diagnostic warning and fault information. AFD fault reset shall be possible through the DDC system. The DDC shall also be capable of monitoring the VFD relay output status, digital input status, and all analog input and analog output values. "Pass thru I/O" All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote VFD fault reset shall be possible.

C. The DDC system shall be able to determine if the motor is running in the AFD mode or bypass mode (if bypass is specified) over serial communications.

D. The AFD shall allow the DDC to control the drive's digital and analog outputs via the serial interface. The serial communications interface shall allow for DO (relay) control and AO (analog) control. This control shall be independent of any AFD function. The outputs can be used for modulating chilled water valves via the analog output, actuate a damper EP, etc. In addition, all drive digital and analog inputs shall be capable of being monitored by the DDC system.

2.6 ADDITIONAL FEATURES

A. All additional features shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label.

1. A complete factory wired and tested bypass system consisting of an output contactor and bypass contactor, service (isolation) switch and VFD input fuses are required. Bypass designs, which have no VFD only fuses, or that incorporate fuses common to both the VFD and the bypass will not be accepted.

2.7 BYPASS CONTROLLER

A. The following operators shall be provided:

1. Bypass Hand-Off-Auto

2. Drive mode selector and light

3. Bypass mode selector and light

4. Bypass fault reset

5. Bypass LDC display, 2 lines, for programming and status / fault / warning indications

B. Motor protection from single phase power conditions- The Bypass system must be able to detect a single phase input power condition while running in bypass, disengage the motor in a controlled fashion, and give a single phase input power indication. Bypass systems not incorporating single phase protection in Bypass mode are not acceptable.

C. The system (VFD and Bypass) tolerated voltage window shall allow the system to operate from a line of +30% , -35% nominal voltage as a minimum. The system shall incorporate circuitry that will allow the drive or bypass contactor to remain "sealed in" over this voltage tolerance at a minimum.

D. The Bypass system shall NOT depend on the VFD for bypass operation. The bypass shall be completely functional in both Hand and Automatic modes even if the VFD has been removed from the enclosure for repair / replacement.

E. Serial communications – the bypass and VFD shall be capable of being monitored and / or controlled via serial communications. Provide communications protocols for ModBus; Johnson Controls N2; Siemens Building Technologies FLN (P1) and BacNet.

F. BACnet Serial communication bypass capabilities shall include, but not be limited to; bypass run-stop control; the ability to force the unit to bypass; and the ability to lock and unlock the keypad. The bypass shall have the capability of allowing the DDC to monitor feedback such as, bypass current (in amps), bypass kilowatt hours (resettable), bypass operating hours (resettable), and bypass logic board temperature. The DDC shall also be capable of monitoring the bypass relays output status, and all digital input status. "Pass thru I/O" All bypass diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote bypass fault reset shall be possible. The following additional bypass status indications and settings shall be transmitted over the serial communications bus – keypad "Hand" or "Auto" selected, and bypass selected. The DDC system shall also be able to monitor if the motor is running under load in both VFD and bypass (proof of flow) in the VFD mode over serial communications or Form C relay output. A minimum of 40 field parameters shall be capable of being monitored in the bypass mode.

G. Run permissive circuit - There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, time-clock control, or serial communications) the VFD and bypass shall provide a dry contact closure that will signal the damper to open (VFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a VFD system input and allows motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop, and the damper shall be commanded to close.

H. The bypass control shall monitor the status of the VFD and bypass contactors and indicate when there is a welded contactor contact or open contactor coil. This failed contactor operation shall be indicated on the Bypass LCD display as well as over the serial communications protocol.

I. The bypass control shall include a programmable time delay for bypass start and keypad indication that this time delay is in process. This will allow VAV boxes to be driven open before the motor operates at full speed in the bypass mode. The time delay shall be field programmable from 0 – 120 seconds.

J. The bypass control shall be programmable for manual or automatic transfer to bypass. The user shall be able to select via keypad programming which drive faults will generate an automatic transfer to bypass and which faults require a manual transfer to bypass.

K. There shall be an adjustable motor current sensing circuit for the bypass and VFD mode to provide proof of flow indication. The condition shall be indicated on the keypad display, transmitted over the building automation protocol and on a relay output contact closure.

L. The bypass controller shall have six programmable digital inputs, and five programmable form C relay outputs.

M. The relay outputs from the bypass shall programmable for any of the following indications.

1. System started
2. System running
3. Bypass override enabled
4. Drive fault
5. Bypass fault
6. Bypass H-O-A position
7. Motor proof of flow (broken belt)
8. Overload
9. Bypass selected
10. Bypass run
11. System started (damper opening)
12. Bypass alarm
13. Over temperature

N. The digital inputs for the system shall accept 24VAC or 24VDC. The bypass shall incorporate internally sourced power supply and not require an external control power source. The bypass power board shall supply 250 ma of 24 VDC for use by others to power external devices.

O. Customer Interlock Terminal Strip – provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external safety interlocks shall remain fully functional whether the system is in VFD or Bypass mode. The remote start/stop contact shall operate in VFD and bypass modes. The terminal strip shall allow for independent connection of up to four (4) unique safety inputs.

P. The user shall be able to select the text to be displayed on the keypad when the safety opens. Example text display indications include “Firestat”, “Freezstat”, “Over pressure” and “Low

pressure". The user shall also be able to determine which of the four (4) safety contacts is open over the serial communications connection.

Q. Class 10, 20, or 30 (selectable) electronic motor overload protection shall be included.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Furnish and install all AFDs as indicated on the drawings. Individual units shall be mounted so that operating handle is approximately 54 inches above finished floor. Where individual AFDs are group mounted, align the top of the enclosure of all units.

B. Verify that the location is ready to receive work and the dimensions are as indicated.

C. Do not install AFDs until the building environment can be maintained within the service conditions required by the manufacturer.

D. Before and during the installation, the AFDs shall be protected from site contaminants.

E. Installation shall be in compliance with manufacturer's instructions, drawings and recommendations.

F. The AFD manufacturer shall provide a factory certified technical representative to supervise the contractor's installation, testing and start-up of the AC Drive(s) furnished under this specification for a maximum total of 2 days.

G. All individually mounted AFDs shall be mounted to structural walls or columns. Do not mount starters on equipment or fan housings.

3.2 FIELD ADJUSTMENTS

A. Adjust all AFD parameters as required to comply with the motor manufacturers recommendations and NEC requirements. Adjust all operating parameters as directed by the building energy management control contractor and the directions of the Engineer.

3.3 TRAINING

A. Instruct the owner's designated personnel in the operation and maintenance of AFDs. The training shall be performed by an authorized representative of the AFD manufacturer. Provide a minimum of 16 hours of training.

3.4 IDENTIFICATION

A. Provide unit nameplates as specified in Section 26 05 53[26 00 00].

B. Provide nameplates for all remote mounted control devices in accordance with Section 26 05 53[26 00 00]. The nameplate shall indicate the designation of the equipment controlled.

END OF SECTION 23 09 11.01

SECTION 23 09 23 - DIRECT DIGITAL CONTROL SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Control Equipment

B. Software

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION:

A. Hydronic Piping: Installation of control valves, flow switches, temperature sensor sockets, gauge taps, flow meters.

B. Ductwork Accessories: Installation of automatic dampers, smoke detectors. Connection of damper end switches.

1.3 REFERENCES

A. ASHRAE 85 - Automatic Control Terminology for Heating, Ventilating, Air Conditioning.

B. ASME MC85.1 - Terminology for Automatic Control.

C. NEMA EMCa - Energy Management Systems Definitions.

1.4 DEFINITIONS

A. Ensure terminology used in submittals conforms to ASHRAE 85.

1.5 SYSTEM DESCRIPTION

A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units.

B. Central and remote hardware, software, and interconnecting wire and conduit.

C. Terminal unit controls for coils, fan coils.

D. Damper Motors and Valve Operators: Electronic

1.6 SUBMITTALS

A. The submittals shall include a specification compliance analysis for review and approval before work shall begin. The compliance document shall address each paragraph of the specification by indicating COMPLY, EXCEED, or EXCEPTION. Do not indicate COMPLY unless the proposed system exactly meets the paragraph requirement. If EXCEED or EXCEPTION is indicated, then provide a clear and concise explanation of the variance from the specifications and the net effect this would have on the specified system performance.

B. Shop Drawings:

1. Trunk cable schematic showing programmable control unit locations, and trunk data conductors.

2. List of connected data points, including connected control unit and input device.

3. System graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.

4. System configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.

5. Descriptive data and sequence of operation of operating, user, and application software.

6. Flow diagram(s) showing all equipment and controls in the system.

7. Electric ladder diagram(s) and connection diagram(s), and electronic connection diagram(s), each as applicable.

8. Control sequence(s) designating each control device in the system, including DDC system control strategies.

9. Material lists(s) covering each device coded to match flow and connection diagrams. Field and panel located hardware shall be identified.

10. A DDC system points list and input/output summary.

11. Detailed resumes of all designers, programmers, installers, and service personnel assigned to the project. Once approved, these personnel shall be active in their respective capacities throughout the project, and work shall be performed strictly by only these individuals.

12. Material and equipment lists including manufacturer, model number, diagram device designation and a clearly identified product data sheet with applicable portions highlighted.

13. Upon completion of the work, The Controls Manufacturer/Contractor shall provide the Owner with “record” layouts of the system. Layouts shall indicate all equipment and the function of each item shall be indicated.

14. Operating instructions and as-built system flow diagrams and other complete controls drawings shall be prepared, bound, and mounted in a frame or cabinet in mechanical

equipment room. Each relay, transducer, switch, motor, controller, indicator (when inside panel) other control system device, and item of equipment, etc., shall be identified with a number or mark identical to one which shall be tagged on each item. Large items of equipment may be identified by a suitable symbol listed in a legend on the control diagram. Drawings/operating instructions shall be reduced to a 11" x 17" format for placement in the mechanical room, (or may be prepared in that format initially).

15. **Provide a minimum of four(4) copies of an owning, operating and service manual covering the entire system, as described below:**

    a. Each O & M manual shall be organized into systems and shall contain the manufacturer's complete, detailed operating and maintenance instructions with equipment data for each piece of installed material and equipment under this contract.

    b. Each manual shall be composed of 8-1/2" x 11" instruction sheets with full size (not less than 11" x 17") drawing sheets folded in and having a reinforced margin. Data shall clearly indicate information for specific material or equipment installed with extraneous material crossed out or removed.

    c. The O & M manual shall include, but not be limited to, the following information.

    d. As-built system layouts showing equipment, conduit routing, controls, test ports, terminals, sizes and locations. Indicate component piece or identify as tagged on layouts.

    e. As-built wiring and control diagrams to include schematics with data and narratives to explain the detailed operation and control of each component.

    f. Control schedules of all control components providing data for proper system operation and performance of maintenance.

    g. A control sequence describing start up, operation and shut down.

    h. A complete list (hard copy) of all controls programs and a flow chart of the entire controls program.

    i. Operating and maintenance instructions for each piece of equipment, including trouble shooting, check lists, repair and adjustment.

    j. Manufacturer's bulletins, data sheets, descriptive data and serial number, wiring diagrams and control schematics for equipment with self contained controls which are interfaced to the temperature control system (such as smoke detectors, fire alarm panels (circuits which may disable air handling unit fans) etc.)

    k. Parts lists and recommended spare parts with complete detailed ordering information correlated to tagged identification on system layouts.

    l. Safety instructions.

m. Product Data: Provide data for each system component and software module.

n. Manufacturer's Installation Instructions: Include for all manufactured components.

1.7 PROJECT RECORD DOCUMENTS:

A. Accurately record actual location of control components, including panels, thermostats, and sensors.

B. Revise shop drawings to reflect actual installation and operating sequences.

C. Include data specified in "Submittals" in final "Record Documents" form.

1.8 PROJECT RECORD DOCUMENTS:

A. Include interconnection wiring diagrams complete field installed system with identified and numbered, system components and devices.

B. Include keyboard illustrations and step-by-step procedures indexed for each operator function.

C. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

1.9 QUALIFICATIONS:

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

B. Installer: Company specializing in applying the work of this Section with minimum three years documented experience.

C. Design system software under direct supervision of a person experienced in design of this work.

1.10 COORDINATION:

A. Ensure installation of components is complementary to installation of similar components in other systems.

B. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

C. Ensure system is completed and commissioned.

D. It shall be the responsibility of the Controls Manufacturer/Contractor to verify, prior to bid, that sequences of operation and control approaches presented within the drawings and these

specifications are appropriate for the HVAC systems to be used, and that systems provided are complete.

E. The Controls Contractor or Subcontractor shall coordinate design and installation of the controls system with the fire alarm system.

F. The Controls Contractor or Subcontractor shall coordinate bidding and execution of the work with that of other trades, including mechanical (ducting), testing, adjusting, and balancing (reference also Part 3 below), and electrical (including fire alarm). Full cooperation and coordination with the other trades shall be required. The controls contractor/subcontractor shall be responsible for verifying proper installation (to be done by mechanical trades) of all wells, ports, etc. needed for installation of all control and instrumentation devices.

G. It shall be the joint responsibility of the Mechanical Contractor and the Controls Subcontractor to verify, prior to bid, that the applicable equipment manufacturer(s) approve the method of controls to be used with the particular equipment and system. Bring any questions to the Engineer's attention.

1.11 WARRANTY:

A. Warranty: Include coverage for field programmable micro-processor based units. The parts, service and labor will be warranted for 2 years from acceptance date. Acceptance date starts 45 days after project final acceptance, provided the controls have operated without failure during the 45-day period. If a controls failure occurs during the 45-day period (or successive one) the date for controls final acceptance resets to the date when the controls system is fully/properly operational. The reset process shall perpetuate until the system properly operates without failure for 45 consecutive days.

1.12 MAINTENANCE SERVICE:

A. Furnish service and maintenance of energy management and control system for one year.

B. Provide four complete inspections per year, one in each season, to inspect, calibrate, and adjust controls as required, and submit written reports.

1.13 EXTRA MATERIALS:

A. Provide one of each type of exposed sensor.

1.14 PROTECTION OF SOFTWARE RIGHTS:

A. Prior to delivery of software, the Owner and the party providing the software will enter into a software license agreement with provisions for the following:

1. Limiting use of software to equipment provided under these specifications.

2. Limiting copying

3. Preserving confidentiality.

4. Prohibiting transfer to a third party.

1.15 SCOPE

A. Furnish and install a complete working controls system of Direct Digital Controls (DDC), including any and all instrumentation necessary for a complete automatic control system as indicated by the drawings and as specified herein. System shall be designed and installed so as to obtain all functions and results necessary or appropriate for the system(s), and as hereinafter specified.

B. The automatic temperature control system shall be a microprocessor based, Direct Digital Control, System utilizing a combination of electric/electronic components, as indicated.

C. Provide control and interlock wiring necessary to accomplish sequences, automation and interlocks specified in this Section. This includes but is not limited to 120 volt and low voltage wiring. Materials and installation are specified in Division 26 requirements.

D. Work to be provided includes, but is not necessarily limited to:

1. Engineering/design

2. Submittals

3. DDC, electronic, and electric hardware

4. Controls panels

5. DDC data base/programming

6. Installation (including all related electrical wiring, ports, wells, etc.)

7. Start up and calibration

8. System commissioning/testing, including report certifying completed testing and commissioning and proper operation.

9. Spot checks for system operation, as directed by Engineer.

10. Owner instruction

11. Operating manuals.

12. Warranty replacement and service

E. All electrical work associated with this system shall be performed under this section of these specifications, (including any related 120V electrical work not indicated by drawings that may require connections at panelboard spares and/or spaces and related distribution to and for the controls system).

F. It shall be the responsibility of the Division 23 Contractor to ensure all controls work is properly coordinated.

G. Control systems to be provided include, but are not necessarily limited to, the following systems.

H. Building automation/energy management/temperature controls for unitary equipment.

I. Additional control systems and components as indicated by the drawings, as specified herein, or as necessary to accomplish the work described.

1.16 RELATED WORK:

A. Motor starters, switches, outlet boxes and other material and devices necessary to accomplish power wiring and not specified in the Section are specified in Division 26. requirements.

1.17 SUMMARY OF WORK:

A. Contractor shall achieve specified sequences by replacing the existing Trane controls system with the most up to date direct digital central processor available that will interface and be compatible with the existing peripheral devices. It shall be within the contractor's scope of work to reconnect the existing peripheral devices to the new central processor and ensure that each device functions correctly. The controls contractor shall verify the operation of those components of the existing system that will be incorporated into the new system and document all deficiencies. This shall be completed prior to beginning installation of the new DDC components. It shall be at the Owner's discretion as to when repairs are made and who makes them. Any deficiencies located after this report is submitted will be repaired/corrected by the DDC contractor at no cost to the Owner. Additional peripheral devices including but not limited to Local Control Units (LCU), input/output (I/O) devices, I/O interfaces, housings, interconnect cables, software and end devices (sensor, actuators, dampers, valves and relays) that are required to achieve the specified sequences for the added equipment/functions that are part of this contract shall be included.

B. **It is the DDC contractor's responsibility to provide the Owner with a completely functional total system, meaning the new components will function with the existing components and be completely compatible and provide the specified sequences. Any upgrades of the existing components that need to be made to achieve this compatibility and provide these functions are the control contractor's responsibility.**

C. The parts, service and labor will be warranted for 2 years from acceptance date. Acceptance date starts 45 days after project final acceptance, provided the controls have operated without failure during the 45-day period. If a controls failure occurs during the 45-day period (or successive one) the date for controls final acceptance resets to the date when the controls system is fully/properly operational. The reset process shall perpetuate until the system properly operates without failure for 45 consecutive days.

PART 2 – PRODUCTS

2.1 MANUFACTURERS:

A. Landis & Staefa, Johnson, CSI

2.2 TIME CONTROLS:

A. Time control for starting and stopping of air conditioning equipment, as described in control sequence, shall be by DDC control.

B. Status Indicators: Provide differential pressure switches to indicate status of all fans.

2.3 STAND ALONE DDC PANELS:

A. General: Stand alone DDC panels shall be microprocessor based, multi-tasking, multi-user, real-time digital control processors. Each stand alone DDC panel shall consist of modular hardware with plug-in enclosed processors, communication controllers, power supplies, and input/output modules. Sufficient number of controllers shall be supplied to fully meet the requirements of these Specifications and the attached point list.

B. Memory: Each DDC panel shall have sufficient memory to support its own operating system and databases including:

1. Control processes

2. Energy Management Applications

3. Alarm Management

4. Historical/Trend Data for all points

5. Maintenance Support Applications

6. Custom Processes

7. Operator I/O

8. Dial-Up Communications from at least one panel

9. Manual Override Monitoring

C. Point types: Each DDC panel shall support the following types of point inputs and outputs:

1. Digital Inputs for status/alarm contacts

2. Digital Outputs for on/off equipment control

3. Analog Inputs for temperature, pressure, humidity, flow, and position measurements

4. Analog Outputs for valve, damper or other actuator position control, and capacity control of primary equipment

5. Pulse Inputs for pulsed contact monitoring

6. Tristate outputs for equipment control

7. All analog inputs and outputs will be 0-10 VDC, or 4-20 mA

D. Expandability: System shall be modular in nature, and shall permit easy expansion through the addition of software applications, workstation hardware, field controllers, sensors, and actuators.

E. System architecture shall support 10% aggregate expansion capacity of all types of DDC panels, and all point types (i.e., include spare I/O modules to accommodate 10% expansion) included in the initial installation. 10% spare capacity shall be provided in each panel.

F. Serial Communication Ports: Stand alone DDC panels shall provide at least two RS-232C serial data communication ports for simultaneous operation of multiple operator I/O devices such as industry standard printers, laptop workstations, PC work stations, and panel mounted or portable DDC panel Operator's Terminals. Stand alone DDC panels shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, printer, or network terminals. Provide one (1) portable operators terminal.

G. Hardware Override Switches: Operator shall have the ability to manually override automatic or centrally executed commands at DDC panel via local, point discrete, onboard operator override switches for binary control points and gradual switches for analog control type points.

H. Override Monitoring: DDC panels shall monitor status or position of software and hardware overrides, and include this information in logs and summaries to inform operator that automatic control has been inhibited. DDC panels shall also have the capability to collect override activity information for daily and monthly reports.

I. Local Status Indicator Lamps: The DDC panel shall provide local status indication for each binary input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device.

J. Integrated On-Line Diagnostics: Each DDC panel shall continuously perform self-diagnostics, communication diagnosis and diagnosis of all subsidiary equipment. The DDC panel shall provide both local and remote annunciation of any detected component failures, or repeated failure to establish communication. Indication of the diagnostic results shall be provided at each DDC panel, and shall not require the connection of an operator I/O device. One DDC panel shall act as a master time keeper and a second panel shall act as a sub master.

K. Powerfail Restart: In the event of the loss of normal power, there shall be an orderly shutdown of all stand alone DDC panels to prevent the loss of database or operating system software. Non-Volatile memory shall be incorporated for all critical controller configuration data, and battery back-up shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours. Upon restoration of normal power, the DDC panel shall automatically resume full operation without manual intervention.

L. Should DDC panel memory be lost for any reason, the user shall have the capability of reloading the DDC panel via the local area network, via the local RS-232C port, or via telephone line dial-in.

2.4 SYSTEM SOFTWARE FEATURES:

A. General:

1. All necessary software to form a complete operating system as described in these Specifications shall be provided, installed, tested and demonstrated.

2. The software programs specified in this Section shall be provided, installed and tested as an integral part of the DDC panel and shall not be dependent upon any higher level computer for execution.

3. Control Software Description:

4. Pre-Tested Control Algorithms: DDC panels shall have the ability to perform the following control algorithms:

a. Two Position Control

b. Proportional Control

c. Proportional plus Integral Control

d. Proportional, Integral, plus Derivative Control

e. Automatic Control Loop Tuning is desirable, but shall be easily disengaged

B. Equipment Cycling Protection: Control software shall include a passive provision for limiting the number of times each piece of equipment may be cycled within any one-hour period.

C. Heavy Equipment Delays: System shall provide protection against excessive demand situations during start-up periods by automatically introducing time delays between successive start commands to heavy electrical loads.

D. Set Points: All set points shall be variable set points.

E. Powerfail Motor Restart: Upon resumption of normal power, DDC panel shall analyze the status of all controlled equipment, compare it with normal occupancy scheduling, and turn equipment on or off as necessary to resume normal operation.

2.5 APPLICATION SPECIFIC CONTROLLERS - HVAC APPLICATIONS:

A. Each Stand Alone DDC Controller shall be able to extend its performance and capacity through the use of remote Application Specific Controllers (ASCs).

B. Each ASC shall operate as a stand alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.

C. Each ASC shall have sufficient memory to support is own operating system and data bases including:

1. Control Processes

2. Energy Management Applications

D. The operator interface to any ASC point data or programs shall be through a portable operator's terminal connected to any DDC panel in the network.

E. Powerfail Protection: All system setpoints, proportional bands, control algorithms, and their programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the controller.

F. Operator Commands: The operator interface shall allow the operator to perform commands including, but not limited to, the following:

1. Start-up or shutdown selected equipment

2. Adjust setpoints

3. Add/Modify/Delete time programming

4. Enable/Disable process execution

5. Lock/Unlock alarm reporting for each point

6. Enable/Disable Totalization for each point

7. Enable/Disable Trending for each point

8. Override PID Loop setpoints

9. Enter temporary override schedules

10. Define Holiday Schedules

11. Change time/date

12. Enter/Modify analog alarm limits

13. Enter/Modify analog warning limits

14. View limits

15. Enable/Disable Demand Limiting for each meter

16. Enable/Disable Duty Cycle for each load

17. Add/Modify/Delete any input or output point

2.6 CENTRAL PANEL:

A. Provide a central panel where shown on the Drawings housing all of the above controls and with a display and control device to display all of the system analog and status and start/stop points and to provide a centralized point of start/stop and adjustment. Provide space in the panel for future Owner furnished chiller, condensers, and pumps.

2.7 INTERLOCKS (Hardwired):

A. General: Provide switches, relays, PE switches, wire, conduit and other necessary devices (except motor starters and starter auxiliaries specified in Division 26 requirements and shown on E-series Drawings) necessary to accomplish interlocks specified, shown on Drawings, indicated in schedules, specified in other control sequences or required for proper functioning of various systems. Show such devices in the composite wiring diagram.

B. Air Handling Units and Exhaust Fans: Provide interlocks as indicated on Drawings, in schedules or specified in other sequences.

2.8 VALVES:

A. All automatic valves shall be sized by the control subcontractor. Equip valves with plugs to produce an equal percentage or modified equal percentage characteristics on water and steam service. Provide a valve operator of sufficient size to give tight shutoff at the differential pressures that will be encountered.

B. Provide valves 2-inches and smaller with bronze or cast iron brass screwed bodies at 150 psig minimum; provide valves 2-1/2 inches and over with iron flanged bodies rated at 125 psig minimum with brass trim.

C. Size valves to pass required capacity at a pressure drop not to exceed 5 psig for water valves.

2.9 AUTOMATIC CONTROL DAMPERS:

A. Provide parallel blade dampers for 2-position control; opposed blade dampers for 3-position or modulating control. Construct frames of 13-gauge galvanized sheet metal with provisions for duct mounting. Provide damper blades not exceeding 8-inches in width, of corrugated-type construction, fabricated from two sheets of 22-gauge galvanized sheet metal spot welded together or a single 16-gauge sheet. Make bearings of oil-impregnated, sintered bronze. Make shafts of ½-inch zinc-plated steel. Provide blades suitable for high velocity performance. Construct damper so that leakage does not exceed 1/2% based on 2000 fpm and 4-inch static pressure. Provide replaceable resilient seals along top, bottom and sides of frame and along blade edge. Submit leakage and flow characteristic data with shop drawings.

2.10 PROGRAMMING APPLICATION FEATURES:

A. Trend Point:

1. Sample up to six points, real or computed, with each point capable of collecting six samples at intervals specified in minutes, hours, days or month.

2. Output trend logs as line graphs or bar graphs. Output graphic on terminal, with each point for line and bar graphs designated with a unique color, vertical scale either actual values or percent of range, and horizontal scale time base. Print trend logs up to 12 columns of one point/column.

B. Alarm Messages:

1. Allow definition of minimum of six messages, each having minimum length of twelve characters for each individual message.

2. Assign alarm messages to system messages including point's alarm condition, point's off-normal condition, totalized point's warning limit, hardware elements advisories.

3. Output assigned alarm with "message requiring acknowledgment".

4. Operator commands include define, modify, or delete; output summary listing current alarms and assignments; output summary defining assigned points.

5. Weekly Scheduling:

6. Automatically initiate equipment or system commands, based on preselected time schedule for points specified.

7. Provide program times for each day of week, per point, with one minute resolution.

8. Automatically generate alarm output for points not responding to command.

9. Provide for holidays, minimum of 366 consecutive holidays.

10. Operator commands:

a. System logs and summaries

b. Start or stop point

c. Lock or unlock control or alarm input

d. Add, delete, or modify analog limits and differentials

e. Adjust point operating position

f. Change point operational mode

g. Open or close point

h. Enable/disable/ lock/unlock, or execute interlock sequence or computation profile

i. Begin or end point totalization. Modify totalization values and limits

j. Access or secure point

k. Begin or end HVAC or load control system.

l. Modify load parameter.

m. Modify demand limiting and duty cycle targets

11. Output summary: Listing of programmed function points, associated program times, and respective day of week programmed points by software groups or time of day.

C. Interlocking:

1. Permit events to occur, based on changing condition of one or more associated master points.

2. Binary contact, high/low limit of analog point or computed point shall be capable of being utilized as master. Same master may monitor or command multiple slaves.

3. Operator commands:

a. Define single master/multiple master interlock process.

b. Define logic interlock process.

c. Lock/unlock program.

d. Enable/disable interlock process.

e. Execute terminate interlock process

f. Request interlock type summary.

2.11 ADDITIONAL FEATURES:

A. Provide hardware for minimum 20 assignable/programmable points.

2.12 ELECTRICAL

A. General: All electrical wire, cable, fittings, connectors, conduit, 120V connections and distribution to panelboards, associated circuit breakers, and control devices, etc., associated with the systems under this Section of the specifications, including interlock wiring, shall be furnished and installed complete under this section of the specifications.

B. Separate Ground: DDC system/components shall employ and maintain a separate, "clean earth" grounding protection. "Mixing" of grounding systems shall be prohibited. (Isolate DDC controls conduits/metal boxes from other raceway systems using isolation bushings and other measures as necessary.)

C. Conduit: Except as noted below, **all** wire/cable (in walls, chases, mechanical rooms, above ceilings, etc.) Shall be run in conduit. Conduit types shall match those in Division 26 with regard to types (e.g. RGS, IMC, EMT) in particular spaces.

D. Exception: Control wire/cable may be run outside conduit if all the following conditions prevail: located above accessible ceilings; plenum rated cable is used; less than 12 VAC or 12 VDC (nominal) is used; where allowed by all applicable administrative authorities; where labeled "controls" at not less than ten feet intervals; and where properly supported from structure, piping, or conduit - not from ceiling systems - at frequent intervals not exceeding five feet. Not to be used in detention facilities, higher education facilities, laboratories, health care facilities.

E. Color Codes and Labels: Control wires and cables shall be of consistent color codes and polarity throughout the project. Coordinate with Division 26 to provide unique color codes different than 208/120V, communications, etc., systems wherever possible.

F. All controls wire/cable and all conduit housing controls wire/cable shall be permanently labeled "CONTROLS" to distinguish it from power, lighting, data, communication, etc., system. Such labeling shall occur on not less than 10 foot intervals, and at least once in every room area and at all junction or pull boxes.

G. Provide all wiring to electric (120V, 24V) and electronic control devices.

H. Materials and installation shall be in accordance with the requirements of NFPA, the National electrical Code, and the electrical division (Division 26) of this specification. All electrical work included under this section shall be complete with labor, materials and installations.

I. Run all wiring and conduit concealed.

J. Where required for proper operation with electronic controls interfacing, provide relays and other devices with low impedance gold contacts.

K. Where required to maintain proper relay operation, increase minimum control wire gauges specified herein. Coordinate relay and voltage drop characteristics to ensure proper operation.

L. Minimum Wire Sizes: "Bus" wiring/cable - minimum 18 gauge shielded/twisted with protective jacket meeting 25/50 plenum requirements; 24V control "power" wiring to actuators and controllers - properly fused 16 gauge solid or stranded with THHN insulation; 120V wiring - 12 gauge solid with THHN insulation properly fused or protected by circuit breakers. Increase these minimum requirements if/as needed for the particular application.

M. Exceptions: Where manufacturer recommends in writing smaller size (higher gauge) cabling for the particular system/application, including considerations/provisions for all future system expansion/installation.

2.13 ELECTRIC ACTUATORS: DAMPERS, VALVES, AND TERMINAL BOXES

A. Damper operators shall be provided for each automatic damper and shall be of sufficient capacity to operate the damper under all conditions (including "drag" conditions for dampers).

B. Each operator shall be two-position type as required, indicated or specified, and shall be provided with spring-return for normally closed or normally open position for fire, freeze or moisture protection on power interruption as indicated.

C. Operators shall be suitable for installation in any orientation.

D. Actuators shall be designed for mounting directly to the damper shaft without the need for connecting linkages.

E. All actuators having more than 100 lb.-in. torque output shall have a self-centering damper shaft clamp that guarantees concentric alignment of the actuator's output coupling with the damper shaft. The self-centering clamp shall have a pair of opposed "V" shaped toothed cradles; each having two rows of teeth to maximize holding strength. A single clamping bolt shall simultaneously drive both cradles into contact with the damper shaft.

F. All actuators having more than a 100 lb.-in. torque output shall accept a 1" diameter shaft directly, without the need for auxiliary adapters.

G. All actuators having more than 100 lb.-in. torque output shall have an all metal housing made from die-cast aluminum.

H. All actuators must provide overload protection throughout the full range of rotation, enabling the actuator to detect a blockage in the damper and withstand as continuous stall condition without premature failure, or degradation in performance.

I. All spring return actuators shall be capable of both clockwise or counterclockwise spring return fail-safe operation.

J. All spring return actuators shall use a continuously engaged mechanical return spring that returns the actuator to a fail-safe position within 15 seconds, under rated temperature and load, in response to a loss of power. Other fail-safe mechanisms that are either engaged only in response to a loss of power, or that are non-mechanical are not acceptable.

K. All actuators shall provide a means of manually positioning the output coupling in the absence of power.

L. Dual independently adjustable auxiliary switches must be integral to the actuator, thus maintaining a low total installed costs. The addition of this feature as an accessory kit is not acceptable.

M. All actuators having more than 100 lb.-in. torque shall provide a factory mounted electrical cable (3 feet) and conduit fitting, thus maintaining a low total installed cost.

N. All actuators shall not require more than 10 VA.

O. Proportional actuators shall accept a 0-10 VDC or 4-20mA control signal, and provide a 0-10 VDC feedback signal.

P. All actuators shall provide an easily readable high contract yellow on black position indicator.

Q. All actuators shall be designed for a minimum of 50,000 full stroke cycles at the actuator's rated torque and temperatures, and manufactured using ISO9002 and ISO14000 registered procedures, and shall be UL873 and CSA22.2 listed. Actuators shall be as manufactured by SIEMENS.

2.14 TEMPERATURE SENSORS AND THERMOSTATS

A. Electronic Temperature Sensors/Transmitters

1. The electronic temperature sensors/transmitters shall be designed for wall service. Sensors shall be thermister type (consistent throughout system) and shall be supplied to match the related electronic controller.

2. Temperature sensors/transmitters shall, at a minimum, have the most stringent of the following characteristics: have an accuracy of not less than 0.4 degrees F over a range of 32 to 158 F. Sensor lead wire error shall not exceed 0.4 Degrees F. **Submit tables showing the temperature ranges, accuracy, and the manufacturer's recommended lead wire length and gauge**. Unless otherwise specified or needed by the application, single point sensors are to be used.

3. Sensors/transmitters shall provide a 4-20 ma, 0-10V, or 1-18V (nominal) proportional output, direct and/or reverse acting as required, and shall have the smallest degrees span appropriate for the particular application. Select 4-20, 0-10, or 1-18 to yield the least possible interference from other electric and inductive sources that the sensor or wiring/cabling may be near.

4. Provide a "divisioned" accessible dial at each space sensor which shall allow the zone occupant to adjust set point manually.. Provide dial with remote duct mounted sensor where indicated on drawings. Setpoints and allowable adjustments to be DDC System adjustable.

5. Provide a momentary override pushbutton (12 hour programmed override) at each space sensor. This override button shall provide a digital signal to the sensor's respective controller which may be used to provide after-hours (outside of time schedules) use of the controlled facility.

2.15 AIR SWITCHES AND TRANSMITTERS

A. Differential Pressure Air Flow Switches shall be mounted on the side of duct or equipment in a vertical position and have an adjustable differential pressure set point range of 0.05" + 0.02" to 12.0" + 0.1" W.C. (Contact shall be snap action type SPDT where for 120 vac.)

2.16 OTHER DEVICES/EQUIPMENT

A. Provide all other devices/equipment required to make the system function properly.

2.17 LOCAL CONTROL CABINET(S)

A. All electric/electronic peripherals and support devices (relays, controllers, transformer(s), power supply(ies), terminal blocks/strips, switches, alarms, etc.), shall be mounted in a control cabinet in the mechanical room. Cabinets shall be aluminum and graphite or all steel construction with full-fronted, hinged doors with locks.

2.18 LABELING

A. All instrumentation and controls shall be labeled with engraved laminate tags as to their identification with respect to the control record drawings and the equipment served. Set points after testing, adjusting, and balancing shall also be labeled as per Part 4 of this section. All control wiring/cabling shall be labeled/tagged with numbered and descriptive ("text") adhesive bands prepared for that purpose. Refer also to Electrical Wiring above for labeling of controls conduits, junction pull boxes, and field wiring/cabling.

2.19 CO_2 / VOC SENSORS

A. CO_2 / VOC sensors to be Siemens QPA63 Series, operating on 24 Vac and provide 0-10 Vdc signal on CO_2 only or two 0-10 Vdc inputs (CO_2 and VOC) to the Ventilation Demand Calculator (AQP63.2), which will then combine the two signals to one output signal. Each signal can be adjusted in the field from the factory 50/50 setting. The AQP63.2 will also provide continuous calibration of the VOC signal. Permissable line lengths and wire sizes must be strictly adhered to. Provide sensors with LEDs, duct mounting kits, ventilation demand calculator.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install in accordance with manufacturer's instructions.

B. Install electrical work in accordance with Division 26 Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

C. Provide with 120v AC, 15 amp dedicated power circuit to each programmable control unit.

3.2 MANUFACTURER'S FIELD SERVICES:

A. Prepare and start systems, commissioning, demonstration, instruction to the Owner (minimum 24 hours) by authorized factory-trained field engineer.

3.3 GENERAL

A. Install system and materials in accordance with manufacturer's instructions and rough-in drawings, and details on the drawings. Calibrate all components. Submit calibration reports.

B. Install electrical work and use electrical products complying with the requirements of the applicable Division 26 sections of these specifications. Mount controllers at convenient locations and heights.

C. All wiring, including motor control and interlock wiring associated with main control panel or local controls, and all conduit in connection with automatic temperature control system, shall be provided under this Section of the work.

D. Do not install conduit/wiring "beneath" insulation applied externally to ductwork and other surfaces.

E. Wiring shall be terminated by connecting to temperature control devices of numbered terminal strips as indicted on the drawings to be furnished by the temperature control manufacturer. All wiring shall be color coded and shall be tagged (numbered and text labeled) for future identification. (Tag describing wire/control purpose function, circuit/channel/terminal shall be provided. Numbered labels alone shall not be acceptable.)

F. Identify all transducers, switches, panels, controllers, sensors, actuators/dampers, etc., by means of engraved phenolic nameplates or other clear and permanent labeling acceptable to Engineer; embossed or punched plastic tape will not be acceptable.

G. Locate system control panel and all TCM's controllers, sensors, etc., where they can be calibrated and maintained from floor without use of a ladder. Avoid installation on any surface subject to vibration or condensation. Where installed on warm or cold surfaces (e.g. duct), install with specified insulation between the device and the surface to protect against condensation and temperature swings. Locate and install control dampers, etc., where they can be easily removed.

H. Install above-ceiling controllers, sensors, etc., where they are readily accessible without obstructions from other above-ceiling systems. Where needed, relocate such devices and provide necessary wiring/tubing extensions so that controller, device, etc., is readily accessible.

I. The Mechanical Contractor shall provide all openings (including duct access doors in ducts and equipment) required for thermostat bulbs and sensing elements in ductwork or mechanical equipment. Coordinate bidding and execution.

3.4 PROGRAMMING

A. Prior to completion of the controls installation, schedule time with Owner's designated representative(s) to evaluate and select programming options and requirements. Contractor shall provide designer/engineer for such meetings and consultations on an as-needed basis. Actual "in conference" time shall not exceed 4 hours. Preparation time for the conference shall be in addition to the "in conference" time, and shall be provided on an as-needed basis at the Contractor's cost.

B. At a MINIMUM, the following functions/features shall be programmed.

1. Sequences of operation

2. Automatic time scheduling

3. Self-adapting optimal start/stop, on an AHU by AHU basis

4. Night set-back/set-up, on zone by zone (and central plant) basis

5. Morning warm-up

6. Night cool down

7. Scanning and alarming (smoke/fire alarm shutdown, low temperatures, dirty filters, total run times, etc.)

8. Fine tuning and trend logging

9. All other programming required to meet control sequences and provide proper and satisfactory operation of the system.

3.5 COMPLETION AND TESTING

A. **Contractor's Field Test:** When installation of system is complete, calibrate equipment and verify transmission media operation before the system is placed on-line. All testing, calibrating, adjusting and final field tests shall be completed by the Contractor.

1. Provide a detailed cross check of each sensor within the system by making a comparison between the reading and the sensor and a standard traceable to the National Bureau of Standards.

2. Provide a cross check of each control point within the system by making a comparison between the control command and the field controlled device.

3. Verify that all systems are operable from local controls in the specified failure mode upon system failure or loss of power.

4. Submit the results of functional and diagnostic tests and calibrations as a part of the request for substantial completion review.

B. Performance Test Report and Performance Certification

1. Verify and test program loading/unloading capability to the Owner's satisfaction.

2. After completion of the installation, adjust all thermostats, transmitters, sensors, motors, damper linkages and other equipment provided under this Contract. Place such items in complete operating condition and demonstrate that the controls are working satisfactorily.

3. Attend all test and balance functions (including Engineer's spot checks) and make adjustments, refinements, corrections, etc., in cooperation with the test and balance

subcontractor. After testing and balancing, each control component shall have its setpoint clearly labeled on or adjacent to the component. (Neatly lettered pressure adhesive labels acceptable for this labeling only.)

4. This testing and certification shall be provided prior to the Engineer's substantial completion review and punch list. Upon delivery of the report and certification, contractor shall schedule substantial completion review with Engineer. Coordinate also with Section 23 05 93 - Testing, Adjusting, and Balancing, for similar requirements regarding substantial completion.

5. Upon completion and thorough testing of the installed system, test reports shall be submitted in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria. Each test report shall indicate the final position of the controls. Test report shall include contractor's signed statement certifying all testing indicated was performed and all systems are properly functioning.

6. **Acceptance Testing:** After complete installation, programming, and field testing, and **submittal of described reports and certifications,** contractor shall schedule substantial completion acceptance testing with the Engineer. Such testing shall be coordinated with Division 23 substantial completion "punch out" and air balance acceptance testing required by the contract documents. Verify and coordinate with other applicable Division 23 trades, as required.

7. Acceptance testing shall consist of various checks and spot checks for system calibration and functioning. Contractor shall provide all calibration equipment and other instrumentation necessary to conduct the tests, and shall provide system operator(s) and technician(s) to "exercise" and demonstrate various system features.

8. Should spot tests show system to be incomplete or operation/performance otherwise unsatisfactory, as determined by the Engineer, contractor shall perform remedial measures as required. Performance must be acceptable and as specified and programmed prior to certifying substantial completion.

9. Contractor shall provide compensation to Engineer based on standard hourly rates and reimbursable expenses for all time spent allotted to site visits/spot checks repeated after the first set (provided "repeat visits/tests" are due to contractor installation, incompleteness of or incorrect operation of system, equipment, substitutions, or other shortfalls in performance). Said compensation shall be deducted from contractor's payments due.

10. At completion of job, submit record drawings, including any changes made during construction. Place record drawings in suitable plastic sheet protector installed at system controller/control panel.

3.6 TRAINING

A. General: Provide combination of written and oral, classroom and field instruction to Owner's selected five personnel. Training shall be approximately 30 percent classroom and 70 percent field or hands-on.

B. Provide the services of competent instructors who will give full instruction to designated personnel in the operation, maintenance and programming of the system. Orient the training specifically to the system installed rather than a general training course. The instructors shall be thoroughly familiar with the subject matter they are to teach and the specific system(s) applications.

C. Provide a minimum of 20 hours of training as scheduled with the Owner. Provide a training manual for each student which describes in detail the data included in each training program. Provide equipment and material required for classroom training. Provide an additional 8 hours of training at the "next season change" or as otherwise requested by Owner.

D. Training on the functional operation of the specific system and controls shall include:

1. Operation of equipment

2. Programming

3. Diagnostics

4. Failure recovery procedures

5. Alarm formats (where applicable)

6. Maintenance and calibration

E. All training described above shall occur after the systems are fully operational so that hands-on training occurs specific to the Owner's particular systems. All training shall be complete and acceptable to the Engineer and Owner as a condition of final acceptance.

END OF SECTION 23 09 23

SECTION 23 13 13.01 - STEEL TANKS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section specifies furnishing and installation of tanks not specified elsewhere. Provide tanks of minimum size and type, as shown.

1.2 RELATED WORK

A. Division 09 - Finishes. Painting.

B. Division 23 - HVAC. Equipment Supports.

1.3 DESIGN CRITERIA

A. Capacity.

B. Fluid.

C. Operating Pressure.

D. Operating Temperature.

E. Maximum/Minimum Pressure.

F. Maximum/Minimum Temperature.

G. Hydrostatic Test Pressure.

1.4 SHOP DRAWINGS

A. Submit shop drawings in accordance with Division 01 - General Requirements. Include certification of qualified ASME welders.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR TANK

A. Fabricate tanks of welded, mild, open-hearth steel plate.

B. Construct pressure tanks in accordance with the latest ASME code for Unfired Pressure Vessels and furnish the ASME code stamp.

C. Provide each tank with the proper number and size of openings and nozzles as shown or as otherwise required. Reinforce openings as required.

D. Furnish loose steel saddles for horizontally mounted tanks. Provide integral support base on vertical pressure tanks. Design vertical tank support so as to permit inspection and painting of the bottom surface. Do not use skirt-type support.

E. Provide closed tanks 36 inches in diameter and less with a 4" x 6" handhole. Furnish larger tanks with an 11" x 16" manhole.

F. Paint tanks and saddles with a minimum of one shop coat of rust inhibitive inorganic zinc primer inside and outside. Hot-dip galvanize inside and out when noted on drawings. Finish paint in accordance with Division 09 - Finishes, Painting.

2.2 EXPANSION TANKS

A. Equip with angle stop valves and a sight glass.

B. Provide with a Bell & Gossett Airtrol tank fitting, Bell & Gossett air charger and tank drain valve.

2.3 EXPANSION TANKS

A. Provide full acceptance volume captive air expansion tank with a replaceable bladder, flanged connection to replace bladder, steel skirt for vertical mounting, and certified to ASME Section VIII. Provide gate valve and pressure at remote air connection coupling to register air pressure inside bladder chamber.

PART 3 - EXECUTION

A. Install tanks in locations shown. Connect and test as specified.

END OF SECTION 23 13 13.01

SECTION 23 21 00 - PIPE AND PIPE FITTINGS - GENERAL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section specifies pipe and pipe fittings for all piping systems. The section applies to all sections of Division 23 - HVAC that employ pipe and pipe fittings.

1.2 RELATED WORK

A. Division 23 - HVAC.

1. Earthwork.
2. Valves, Strainers, and Vents.
3. Vibration Isolation.
4. Painting.
5. Insulation.

1.3 WELDERS CERTIFICATION

A. Employ welders qualified to perform welding operations required either by certifications or by submitting to required tests.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. The particular type of pipe and fittings for each system is specified in the section on that system. All pipe and pipe fittings shall be domestically manufactured (foreign pipe will not be acceptable).

2.2 JOINTS

A. Screwed. Make screwed joints using machine cut USASI taper pipe threads. Apply a suitable joint compound to the male threads only. Ream the pipe to full inside diameter after cutting. All-thread nipples are not permitted.

B. Dissimilar Metals. Make joints between copper and steel pipe and equipment using insulating unions such as Crane Company No. 1259; EPCO as manufactured by EPCO Sales, Inc.; or an approved equal.

C. Solder Joints.

1. Prior to making joints, cut pipe square and ream to full diameter. Clean exterior of pipe and socket. Apply a thin coat of suitable fluxing compound to both pipe and socket, and fit parts together immediately.

2. Heat assembled joint only as required to cause the solder to flow. Run the joint full, slightly on the outside, and wipe to remove excess solder.

3. Use silver brazing alloy or Sil-Fos on refrigerant piping. Use 95.5 solder on all other copper piping, except domestic water piping.

4. For domestic water piping, use Harris "Stay-Safe-Bridgit", lead free, UPC and NSF approved, silver bearing solder with Harris "Stay-Clean" liquid solder flux. Apply per manufacturer's recommendations.

D. Welded. Make welded joints as recommended by the standards of the American Welding Society. Ensure complete penetration of deposited metal with base metal. Provide filler metal suitable for use with base metal. Keep inside of fittings free from globules of weld metal. Do not use mitered joints.

E. Flanged.

1. Prior to installation of bolts, accurately center and aline flanged joints to prevent mechanical prestressing of flanges, pipe and equipment. Aline bolt holes to straddle the vertical, horizontal or north-south centerline. Do not exceed 3/64 inch per foot inclination of the flange face from true alignment.

2. Use flat-face companion flanges only with flat-faced fittings, valves or equipment. Otherwise, used raised-face flanges.

3. Install proper gaskets, suitable for intended service and factory cut to proper dimensions. Secure with a suitable gasket cement.

4. Use ANSI nuts and bolts, galvanized or black to match flange material. Use ANSI 316 stainless steel nuts and bolts underground. Tighten bolts progressively to prevent unbalanced stress. Draw bolts tight to ensure proper seating of gaskets.

5. Use carbon steel flanges conforming to ANSI B16.5 with materials conforming to ASTM A 105 Grade II or ASTM A 108 Grade II. Use slip-on type flanges on pipe only. Use welding neck type flanges on all fittings. Weld slip-on flanges inside and outside.

6. Keep flange covers on equipment and shop-fabricated piping until ready to install in system.

7. No Hub. Install according to manufacturer's recommendations, using recommended tools.

8. Mechanical Joints. Provide a stuffing box type mechanical joint adapted to use gasket, cast iron gland and bolts. Coat bolts with bitumastic enamel. Use joint parts similar in design to one of the following:

9. Doublex Simplex Joint manufactured by the American Cast Iron Pipe Company, Birmingham, Alabama.

10. U.S. Joints manufactured by the United States Pipe and Foundry Company, Burlington, New Jersey.

11. Boltite Joint manufactured by the McWane Cast Iron Pipe Company, Birmingham, Alabama.

12. Flexklamp manufactured by the National Cast Iron Pipe Company, Birmingham, Alabama.

F. Victaulic Joints. Make joint with Victaulic Style 77, 300 PSI, coupling fitted with Grade E molded synthetic rubber gasket. Before assembling couplings, lightly coat pipe ends and outside of gaskets with cup grease or liquid vegetable soap to facilitate installation. Groove pipe to manufacturer's specifications. Victaulic joints are allowed only if specified in a specific piping section.

G. Ball Joints. Where shown, provide flexible ball joints, made of carbon steel. Ball joints must have 15° of angular flexibility. Use welded or flanged ends, as required. Furnish with 1 inch gaskets.

2.3 UNIONS

A. Use Class-150 standard (300-pound WOG) malleable iron, ground joint unions with bronze seat. Provide flanged union joints on piping larger than 2-1/2 inches.

2.4 BRANCH CONNECTIONS

A. For Pipe 2-1/2 Inches and Smaller. For threaded piping, use straight size of reducing tee. When branch is smaller than header, a nipple and reducing coupling or swaged nipple may be used.

B. For 3 Inches and larger. For welding piping, when branch size is the same as header size, use welding tee. Use Weldolet when branch is smaller than header. For threaded branch connections, use 3000-pound full coupling welded to header.

2.5 GASKETS

A. High Temperature Piping. Provide 1/16-inch-thick ring gaskets of graphite-impregnated asbestos such as Garlock No. 7022.

B. Other Piping. Provide ring rubber gaskets, Garlock No. 10. Use 1/8-inch-thick cloth reinforced rubber gaskets. For pipe smaller than 6 inches, use 1/16-inch-thick gasket.

PART 3 - EXECUTION

3.1 PIPE FABRICATION AND INSTALLATION

A. Make piping layout and installation in the most advantageous manner possible with respect to headroom, valve access, opening and equipment clearance, and clearance for other work.

B. Give particular attention to piping in the vicinity of equipment. Preserve the maximum access to various equipment parts for maintenance.

C. Do not cut or weaken any structural member.

D. Cut all pipes accurately to measurement determined at the site. After cutting pipe, ream it to remove burrs.

E. Install piping neatly, free from unnecessary traps and pockets. Work into place without springing or forcing. Use fittings to make all changes in direction. Field bending and mitering are prohibited. Make all connections to equipment using flanged joints or unions. Make reducing connections with reducing fittings only.

3.2 WELDING

A. Weld and fabricate piping in accordance with ASME Standard B31.1, latest edition, Code for Power Piping, which is for all steam piping and all piping with internal pressures higher than 160 psig. For chilled and heating water piping, weld and fabricate in accordance with ASME B31.9. Machine beveling in shop is preferred. Field beveling may be done by flame cutting to recognized standards.

B. Align piping and equipment so that no part is offset more than 1/16 inch. Set all fittings and joints square and true, and preserve alinement during welding operation. Use of alinement rods inside pipe is prohibited.

C. Do not permit any weld to project within the pipe so as to restrict it. Tack welds, if used, must be of the same material and made by the same procedure as the completed weld. Otherwise, remove tack welds during welding operation.

D. Do not split, bend, flatten or otherwise damage piping before, during or after installation.

E. Remove dirt, scale and other foreign matter from inside piping before tying in sections, fittings, valves or equipment.

3.3 OFFSETS AND FITTINGS

A. Because of the small scale of drawings, the indication of all offsets and fittings is not possible. Carefully investigate the structural and finish conditions affecting the work and take such steps as may be required to meet such conditions.

B. Install all piping close to walls, ceilings and columns so piping will occupy the minimum space. Provide proper space for covering and removal of pipe, special clearances, and for offsets and fittings.

3.4 SECURING AND SUPPORTING

A. Support piping adequately to maintain line and grade, with due provision for expansion and contraction. Use approved, clevis-type, split-ring or trapeze-type hangers properly connected to structural members of the building. On insulated pipe, provide hangers that are large enough in diameter to accommodate the insulation (Do not use line size hangers). Do not support piping from other piping.

B. Use copper hangers with copper pipe.

C. Support vertical risers with steel strap pipe clamps of approved design and size, properly supported at every floor. Support piping assemblies in chases adequately enough to be rigid and self-supporting before the chase is closed. Provide adequate structural support for piping penetrating chase walls to fixtures. Ensure that flush valve will not pull away from wall.

D. Where insulation occurs, design hangers to protect insulation from damage. Pipe saddles and insulation shields, where required, are specified in the appropriate insulation section.

E. Perforated bar hangers, straps, wires or chains are not permitted. Plastic support brackets as manufactured by P & M Company may be used in accordance with the manufacturer's recommendations.

F. Roof supports. Roof supports to be level, sloped curbs as required, compatible with roofing system installed (metal material to be modified if required), similar to Thycurb TEMS with roller assemblies with stainless steel rod, channel, nuts; 18" height (unless noted otherwise or required for proper installation). All seams and joints to be welded and hot dip galvanized. No shop fabricated products allowed.

G. Pipe roof penetrations to utilize 12" high curb assembly, compatible with the roof system installed (metal material to be modified if required) and level, similar to Thycurb Model TC with TP piping covers (sizes and number determined by Contractor), installed per manufacturer recommendation. All joints and seams to be welded and hot dip galvanized. No shop fabricated products allowed.

3.5 UNISTRUT PIPE SUPPORTS

A. Provide standard Unistrut metal framing members and appurtenances for pipe support where shown. Mult-A-Frame and Power-Strut pipe support systems also are acceptable. Hot-dip galvanize all such members and appurtenances.

3.6 ANCHORS

A. Provide anchors as indicated or required. Use pipe anchors consisting of heavy steel collars with lugs and bolts for clamping to pipe and attaching anchor braces. Install anchor braces in the most effective manner to secure desired results. Do not install supports, anchors or similar devices where they will damage construction during installation or because of the weight or the expansion of the pipe.

3.7 PIPE GUIDES

A. Provide ADSCO, FRS or FRC pipe alinement guides as indicated or required. Use ADSCO 178 for cold lines.

B. Guide expansion joints with two guides on the side opposite the anchor.

C. Guide pipe installed and supported by Unistrut supports using a duplicate set of pipe rolls on the top of the pipe.

D. Guide piping in vertical chases at a maximum guide spacing of 15 feet.

3.8 PIPE SLEEVES AND FIRESTOPPING

A. Reference the specification on Mechanical General Provisions, Section 23 00 00.

3.9 ISOLATION VALVES

A. Provide piping systems with line size shutoff valves located at the risers, at main branch connections to mains for all equipment, and at other locations as indicated and required.

3.10 DRAIN VALVES

A. Install drain valves at all low points of water piping systems so that these systems can be entirely drained. Install a 2-inch drain for 2-inch pipes and larger. Install a line size drain valve for pipes smaller than 2 inches.

3.11 CLEANING AND FLUSHING OF WATER SYSTEMS

A. Water circulating Systems shall be thoroughly cleaned before placing in operation to rid systems of rust, dirt, piping compound, mill scale, oil, grease, silt, any and all other material foreign to water being circulated.

B. Extreme care shall be exercised during construction to prevent dirt and other foreign matter from entering the pipe or other parts of systems. Pipe stored on the project shall have open ends capped and equipment shall have openings fully protected. Before erection, each piece of pipe, fitting, or valve shall be visually examined and dirt removed.

C. At pipe end locations a temporary bypass will be installed. Bypass shall be *same* size as the supply and return pipe. Prior to flushing the distribution system, the Contractor shall install the temporary bypass and a temporary line size strainer between the supply and return pipes. Contractor shall verify that the isolation valves are open.

D. Install temporary strainers in front of pumps, tanks, solenoid valves, control valves, and other equipment where permanent strainers are not indicated. Keep these strainers in service until the equipment has been tested, then remove either entire strainer or straining element only. Fit strainers with a line size blowoff valve.

E. After the temporary bypasses are installed, the Contractor shall provide and operate one pump which will cause a velocity of 7 feet per second in the main piping. This pump will be provided with a shot chemical feeder and a strainer assembly. Pump shall be connected to system at the point where the new piping connects to the existing piping. The pump can be either electric driven or engine driven. The Contractor shall provide all temporary electrical disconnects, wiring, fuses, and other electrical devices that are required for safe operation. All cleaning shall be performed in the presence of the owner's representative.

F. Circulation will be started using the temporary pump. A nonhazardous cleaning compound (Entec 324 or approved equal) shall be added using the shot feeder until the concentration level of 20 parts per million is reached. Once this 20 parts per million concentration is reached, circulation will be maintained for 48 hours. After this period of time, the cleaning water shall be dumped to the sanitary sewer.

G. The distribution system will then be refilled with city water and circulated with continual bleed and make-up until the water is certified clean by the water treatment consultant, and accepted by the Owner. At the completion of this step an inhibitor shall be introduced. All waste water shall be dumped into the sanitary sewer system.

H. After the system is certified as clean, the Contractor shall close the valves. The bypass piping shall be removed as final connections to the building are accomplished.

I. During the flushing procedure, strainers shall be cleaned as often as necessary to remove debris and, in any event, all strainers shall be cleaned by physically removing the strainer screen from the body of the strainer at the end of flushing. Replace strainer basket and gasket. Contractor shall not flush through control valves, coils, etc. Contractor shall provide temporary bypasses at coils and spool pieces at control valves. Flush the coils individually wasting water to sanitary sewer. Connect coils and install control valves after flushing.

J. Test samples shall be taken at all bypass locations and all tests shall indicate that the entire system has reached a PH, conductivity, and chemical concentration level as approved by the Owner to match present systems. Contractor shall purchase needed chemicals from Owner’s chemical treatment supplier.

K. Contractor shall provide a smaller assembly to clean and flush any miscellaneous piping that cannot be included in the initial system flush. All other criteria shall remain the same.

L. Contractor shall add Betz Entec 338, (or approved equal) nitride borate with MBP inhibitor, at 350 ppm, to the chilled and heating water systems.

M. Once the system is approved as cleaned and treated, by the owners representative, there shall not be any delay in connecting the new system to the existing system, (if any). This is to prevent any corrosion after the new pipe is clean.

N. Special requirements, if any, are specified in the sections on each type of piping.

3.12 PIPE MARKERS

A. Identify all exposed piping and piping in accessible chases or plenums with Brady Perma-Code Pipe Markers, System 2, consisting of pipe marker, arrows, and 1-1/2-inch wide banding tape.

Use Brady B-350 material, 35 ounces per inch, for all indoor applications and Brady B-946G, 35 ounces per inch, for all outdoor applications. Background colors of markers, arrows and tape shall be the same.

B. Use a pipe marker at every point of pipe entry or exit through a wall, roof or floor. Apply markers at intervals not exceeding 50 feet. Apply marker where view is unobstructed.

C. Pipe Marker Listing. Use pipe markers conforming to ANSI "Scheme for Identification of Piping Systems."

END OF SECTION 23 21 00

SECTION 23 21 13.02 - PIPING AND PIPING APPURTENANCES FOR COLD WATER MAKEUP AND EQUIPMENT DRAINS

PART 1 - GENERAL

1.1 SCOPE

A. This section provides for furnishing and installing piping and piping appurtenances to drain air handlers, pumps, boilers and other equipment requiring drains, and for cold water makeup piping.

1.2 RELATED WORK

A. Division 23 - HVAC.

1. Valves, Strainers and Vents.

2. Pipe and Pipe Fittings.

3. Insulation.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Provide Schedule 40, galvanized steel pipe conforming to ASTM A 120, and galvanized class-150 malleable iron fittings.

2.2 PIPE AND FITTINGS

A. Provide seamless, hard-drawn, Type L, copper water tube conforming to ASTM B 88, and wrought copper fittings.

2.3 VALVES AND STRAINERS

A. For pressure-reducing and relief valves, provide Bell & Gossett dual unit No. D-250.

2.4 TRAPS

A. On each air handling unit condensate drain, provide a trap deep enough to overcome pressure of the unit.

2.5 BACKFLOW PREVENTER

A. Provide a Watts Number U-909-S-HW-QT Reduced Pressure Principle backflow preventer on the city water header providing makeup water to all equipment, e.g., chillers, boilers, expansion tanks and any other items serving mechanical requiring cross connection protection. Equip complete with bronze strainer, stainless steel check modules, quarter turn ball valves and integral body unions.

1. At the contractor's option, a backflow preventer may be installed at each piece of equipment.

2. For each backflow preventer valve provide a Zurn Z-1025 Fixed Air Gap Fitting and full size drain line from air gap fitting to floor drain or hub drain.

PART 3 - EXECUTION

A. Install according to manufacturer's recommendations.

END OF SECTION 23 21 13.02

SECTION 23 21 13.03 - HOT WATER AND CHILLED WATER PIPING, VALVES AND APPURTENANCES

PART 1 - GENERAL

1.1 SCOPE

A. This section provides for furnishing and installing heating water and chilled water piping, valves and appurtenances, including fittings, expansion joints and strainers. Domestic hot water piping is specified in the section on Domestic Water Piping and Appurtenances.

1.2 RELATED WORK

A. Division 09, Finishes. Painting.

B. Division 23, HVAC.

1. Pipe and Pipe Fittings - General
2. Valves, Strainers and Vents
3. Vibration Isolation
4. Insulation

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Above Ground.

1. For pipe 2-1/2-inches and less in diameter, provide pipe conforming to ASTM A 53, Grade A or B, standard weight seamless, or electric-resistance welded black steel pipe. Furnish 150-pound screwed malleable iron fittings conforming with ANSI B 16.4 for hot water. At contractor's option, provide ASTM B 88 hard drawn, Type L copper water tube with wrought copper fittings.

2. For pipe 3-inches in diameter and larger, provide pipe meeting the requirements of ASTM A 53, Grade A or B, standard weight seamless, or electric-resistance welded black steel pipe with standard weight seamless steel welded fittings, satisfying ASTM A 234, Grade WPA or WPB, ANSI B 16.9.

B. Underground (Option #1: + 35°F to 210°F).

1. All underground chilled water and/or hot water distribution piping shall be factory pre-insulated as manufactured by INSUL-PIPE SYSTEMS, INC.

2. Carrier pipe shall be Schedule 40, black steel, A-53 or A-120 ERW. Fittings and straight runs for all piping sizes shall be joined by fusion welding. Insulation shall be foamed-in-place polyurethane with a density of not less than 2.5 lbs. per cubic foot to a thickness of

not less than 1.25 inches. Insulation shall be completely encased within a seamless PVC jacket of not less than .060 inches thick.

3. Insulation at each end of each length of pipe shall be protected with an end seal bonded both to the carrier pipe and the outer jacket. Piping cuts made in the field must be provided with end seals equal to factory type.

4. Fittings and joints on straight runs shall be field insulated with pre-cut polyurethane half-sections of the same thickness as the adjacent pipe, wired in place with all voids being eliminated. Vapor barrier jacketing material for fittings and joints shall be of the same material and thickness as the pipe jacketing. Installation shall be as per manufacturer's instructions.

5. For additional corrosion protection for the carrier pipe and fittings a heavy coat of asphalt mastic is to be applied directly to the exposed portions of all steel pipe and fittings after specified leak testing has been performed and before field insulation kits are installed.

6. Pipe schedule to be as noted below:

   a. BELOW GROUND INSTALLATIONS

      (1) For additional corrosion protection on steel carrier pipe only, apply a heavy coat of mastic directly to the carrier pipe before installing insulation sections.

      (2) Seal exposed ends of insulation with mastic provided by manufacturer.

      (3) Insulation materials for ells, tees, and joints to be field cut to the exact length required for each individual fitting or joint.

      (4) After insulation half-sections have been cut to length, install sections on the fitting and/or core pipe with tape provided by manufacturer, eliminating voids at ends and seams.

      (5) Insulate all fittings and couplings.

   b. BACKFILLING UNDERGROUND PIPING

      (1) Fill material within six inches all around the pipe should be sand or sandy loam, free of rock. Fill should be hand tamped around the pipe to ensure an even, uniform support. Final backfill should be free of large rocks and should be installed in one (1) foot layers, watered and tamped to 95% of original compaction.

C. Underground (Option #2: - 300°F to 250°F)

1. All outdoor and underground chilled water and/or hot water distribution piping shall be factory pre-insulated as manufactured by INSUL-PIPE SYSTEMS, INC. AUSTIN, TEXAS.

2. Carrier pipe shall be type L, hard drawn copper of domestic manufacture. Fittings and couplings for all piping sizes shall be joined by 95/5 lead solder. Insulation shall be foamed-in-place polyurethane with a density of not less than 2.5 lbs. per cubic foot to a thickness of not less than 1.25 inches. Insulation shall be completely encased within a seamless PVC jacket of not less than .060 inches thick.

3. Insulation at each end of each length of pipe shall be protected with an end seal bonded both too the carrier pipe and the outer jacket. Piping cuts made in the field must be provided with end seals equal to factory type.

4. Fittings and joints on straight runs shall be field insulated with pre-cut polyurethane half-sections of the same thickness as the adjacent pipe, wired in place with all voids being eliminated. Vapor barrier jacketing material for fittings and joints shall be of the same material and thickness as the pipe jacketing. Installation shall be as manufacturer's instructions.

5. Pipe schedules to be as noted below:

   a. BELOW GROUND INSTALLATIONS

      (1) For additional corrosion protection on steel carrier pipe only, apply a heavy coat of mastic directly to the carrier pipe before installing insulation sections.

      (2) Seal exposed ends of insulation with mastic provided by manufacturer.

      (3) Insulation materials for ells, tees, and joints to be field cut to the exact length required for each individual fitting or joint.

      (4) After insulation half-sections have been cut to length, install sections on the fitting and/or core pipe with tape provided by manufacturer, eliminating voids at ends and seams.

      (5) Insulate all fittings and couplings.

   b. BACKFILLING UNDERGROUND PIPING

      (1) Fill material within six inches all around the pipe should be sand or sandy loam, free of rock. Fill should be hand tamped around the pipe to ensure an even, uniform support. Final backfill should be free of large rocks and should be installed in one (1) foot layers, watered and tamped to 95% of original compaction.

2.2 PRE-ASSEMBLED EXPANSION LOOPS

A. Provide flexible expansion loops, factory assembled, of size and type as noted on drawings.

B. Loop must consist of two flexible sections of stainless steel hose and braid, two stainless steel 90 degree elbows, and a 180 degree return.

C. Provide pipe guide quantity and spacing as recommended by manufacturers.

D. Mount with nested loop hanging down on horizontal runs, unless noted otherwise, support the 180° return if other configuration is used.

2.3 CHECK VALVES

A. For pipe 2-1/2-inches in diameter and smaller, furnish 300-pound screwed, "Y" pattern, swing check valve, all bronze, with screwed cap, such as one of the following or approved equal:

Crane 76E	Powell 563-Y
Stockham B-375	Nibco T-473-B

B. For pipe 3-inches in diameter and larger, provide 150-pound, raised-face, wafer check valve, cast iron or ductile iron body and plate, Buna-N seal, and 316 stainless steel spring, such as one of the following or approved equal:

Mission Duo-Check 15 HMP	Stockham WG-970
Marlin HZNSF	WECO 15-AHATT-R
	Nibco W-920-W

2.4 GATE VALVES

A. For pipe 2-1/2-inches in diameter and smaller, use 150-pound screwed, inside screw, rising stem gate valve, all bronze, with union bonnet and solid wedge disc, such as one of the following, or approved equal:

Crane 431UB	Powell 2714	Nibco T-134
Stockham B-120	Walworth 11	

B. For pipe 3-inches in diameter and larger, provide 150-pound flanged OS&Y wedge gate valve with 13 chrome alloy steel trim, with stilette seat rings, such as one of the following or approved equal:

Crane 47U	Powell 1503FE
Kitz K-150 SCL	Stockham 15-OF-US

C. For underground applications, furnish mechanical joint or tyton, double disc, or resilient wedge with parallel seats, nonrising stem, with 2-inch square operating nut and AWWA iron gate valve. Include for valves 10 inches and smaller a 2-piece screw type extension valve box. Include for valves larger than 10 inches a 3-piece, screw-type extension valve box. Provide each valve box with a cover marked "Water." Coat all parts of the valve box with bituminous varnish, such as one of the following or approved equal:

	Mech. Joint	tyton end
Kennedy	571X or 1571X	901X or 1901X
Clow	F-5065 or F6100	F-6112
Stockham	G-743-0 or G-701	G-749 or G-703
Nibco	M-609-RW	

2.5 PLUG VALVES

A. For pipe 2-1/2-inches in diameter and smaller, use 150-pound screwed, eccentric plug valve with a carbon steel or semisteel body. Hycar or Buna N faced plug, lever operated, or lubricated, short pattern plug valve, such as one of the following, or approved equal:

DeZurik 128 S 1 RS26
Nordstrom 1924
Homestead 1112

B. For pipe 3-inches in diameter and larger, furnish 150-pound flanged eccentric plug valve, with carbon steel or semisteel body, Hycar or Buna-N faced plug, lever operated through 6-inch size, and manually operated above 6-inch size, or lubricated, short pattern plug valve, such as one of the following, or approved equal:

Homestead 1122, 1132, or 1132-EWG
DeZurik 128 F 1 RS26
Nordstrom 1925 and 1989
Walworth 1749F and 1757F

2.6 GLOBE VALVES

A. For pipe 2-1/2-inches in diameter and smaller, provide 150-pound screwed, rising stem, globe valve with bronze body, Teflon disc, union or bolted bonnet, such as one of the following or approved equal:

Crane 7TF
Walworth 3095
Powell 150
Nibco T-235-Y
Stockham B-22T

B. For pipe 3-inches through 8-inches in diameter, provide 150-pound flanged OS&Y globe valve, with carbon steel body and 13 chrome alloy steel trim, such as one of the following or approved equal.

Crane 143X
Stockham 15-GPF-US
Walworth 5275-F-AA
Powell 1531FE
Lunkenheimer 1532W
Kitz K-150SCJ

2.7 BUTTERFLY VALVES

A. For pipe 3 inches and larger in diameter, furnish 150-pound flanged or tapped full lug type butterfly valve with ductile iron body, stainless steel stem, aluminum-bronze disc conforming to ASTM B-148 Alloy 9-C, seat rated for 210□F. Provide lever-operated valves 6 inches and smaller. Furnish valves 8-inches and larger with totally enclosed worm gear operators. Furnish valves with air cylinder operators with manual override, or enclosed worm gear operators with chain wheel and chain as shown in drawings. Use valves designed for drip-tight shutoff in dead end service against 200 psi with downstream flange removed in either direction. Do not use butterfly valves in a hot water system. Provide one of the following or approved equal:

DeZurik 660-L-RS82-3-PLG-1	Keystone Fig. 129 or 105
Demco Series NE-175-5214351	Nibco LD 2000

C. For 14-inch diameter pipe and larger, employ 150-pound, full-flanged butterfly valve with iron body, stainless steel stem, cast iron with stainless steel seating edge or Ni-Resist disc and synthetic rubber seat. Provide totally enclosed worm gear operators for all valves. Provide valves with air cylinder operators with manual override, or enclosed worm gear operators with chain wheel and chain as indicated on drawings. Provide valves designed for drip tight shutoff in dead end service against 150 psi, such as one of the following or approved equal:

1. Allis-Chalmers 7-7-XX-1-6-3
2. Pratt 2F-11 or XR-70
3. Rockwell-Edward 952

2.8 STRAINERS

A. Furnish semisteel, 150-pound strainers conforming with ASTM A 126, Class B, screwed, 20-mesh screen opening through 2 inches. Provide flanged 0.045 perforations through 3 inches, 0.125 perforations through 16 inches and 0.250 perforations above 16 inches.

2.9 BALL VALVES (TWO-PIECE)

A. Nibco T-585-70-66 series ball valves, 2 1/2" and smaller, screwed ends, stainless steel ball and stem, with balancing stop, 2 1/4" non-metallic stem extension, 600 lb. WOG and full port.

2.10 BALL VALVES (THREE-PIECE)

A. Nibco T-595-Y-66 series ball valves, 2 1/2" and smaller, screwed ends, full port, stainless steel ball and stem, balancing stop, 2 1/4" non-metallic stem extension 600 lb. WOG.

2.11 CIRCUIT SETTERS (1/2" to 4")

A. Circuit setter equal to Bell & Gossett ULTRASET flow limiting valve, pressure independent, externally field adjustable automatic valve. Circuit setters to include memory stop, drain connection, pre-insulated molded insulation kit for easy removal, valved read-out ports, one portable differential pressure flow meter (with case, hoses, calculators, over range protection) to be turned over to Owner at end of project.

2.12 SUCTION DIFFUSERS (2" to 10")

A. Diffusers to be equal to Bell & Gossett with integral strainer (bronze mesh), stainless steel inlet vanes and orifice cylinder, pressure drop to be less than one psi; provide with adjustable floor support foot.

PART 3 - EXECUTION

3.1 TESTING

A. Apply a hydraulic pressure 1-1/2 times the operating pressure, 150 psig minimum, and carefully check for leaks. Repair all leaks and retest the system until proved airtight.

END OF SECTION 23 21 13.03

SECTION 23 21 23 - PUMPS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section provides general characteristics for pumps specified in Division 23 - HVAC.

1.2 RELATED WORK

A. Requirements for particular pumps are specified in other sections of Division 23 - HVAC, including the following:

1. Division 23 - HVAC.

2. Domestic Water Piping and Appurtenances. Domestic Water Booster Pumps.

3. Fire Protection System. Fire Pumps.

4. Condensate and Feedwater Piping and Valves.

1.3 PUMP SELECTION

A. Select pumps conservatively for scheduled conditions. Furnish pumps which have reasonably high efficiencies, with peak of efficiency at or near rated conditions. Select pumps that will operate stably at 15-foot suction lift despite substantial reduction in head or substantial increase in delivery.

B. If the pumps proposed are not considered suitable, submit manufacturer's data on other pumps for review.

1.4 PUMP SIZE AND TYPE

A. Provide motor driven pumps of the type and speed scheduled. Select pumps that are not overloaded throughout the entire range of pump operation. Provide pump connection sizes as drawn.

1.5 CERTIFIED TEST DATA

A. Submit certified pump curves showing actual performance of the actual pump to be shipped and installed at the site. The test shall be performed prior to shipment of the pump and signed by witnesses at the factory. Also, submit to test and balance contractor for use in balancing operations, and inclusion in the Balance report.

1.6 TRIMMING PUMP IMPELLER

A. This applies to constant flow pumps without VFDs only. After TAB firm has provided balance, TAB firm will advise Mechanical Contractor of amount of trim required to the impeller (with 15% safety on pump head). Mechanical Contractor to remove impeller, have impeller trimmed, reinstall impeller; after this procedure is completed, pump can then be insulated.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL PUMPS

A. Casing. Provide a cast iron, volute type, centrifugal pump with screwed or Class 125 ANSI flanged connection and tapped openings for vent and drain, equipped with petcocks. Casing for pumps 3" x 4" and larger must accommodate an impeller 15% greater in diameter than the impeller actually selected to meet specified performance. Design casings to provide for complete removal of bearing, seals and impeller without disturbing connection piping.

B. Impeller. Furnish an enclosed, cast bronze impeller, keyed and locked to the shaft, statically and hydraulically balanced.

C. Wearing Rings. Provide bronze, renewable wearing rings on all pumps 1-1/2 inches and larger.

D. Shaft. Furnish a stainless steel shaft, turned and ground to accurate dimension, of ample size to prevent deflection and key slotted as required.

E. Bearing. Provide antifriction type bearings, grease lubricated.

F. Stuffing Box and Shaft Sleeves. Furnish a deep, integral stuffing box, packed with suitable die-formed ring packing. Provide a leakage-water-cooled, bronze gland with stainless steel studs and nuts. Furnish one-piece, machined-bronze shaft sleeves, keyed and locked to the shaft, extending from the impeller hub through the stuffing box, with a compression seal to prevent leakage between shaft and sleeve. Provide bronze, water-deflection ring on the outboard end of the sleeve, and a galvanized metal cover over stuffing box. Provide seal cage and seal piping on pumps operating at 5 feet of water pressure or less. Design pump so that mechanical seals may be installed in lieu of packing at a later date.

G. Mechanical Seals. Equip pumps with mechanical seals selected for intended service, taking into account temperature and quality of water pumped, with special water lubrication provisions, if necessary.

H. Support Bracket. Furnish a cast iron, pump support bracket for close-coupled pumps. Machine the bracket for rabbet jointing to pump casing and motor-end bracket to maintain rigid assembly and accurate alinement between pump and motor.

I. Pedestals. Furnish a cast iron pump and bearing pedestal for pedestal-mounted pumps. Machine the pump bracket for rabbet jointing to pump casing. Precision bore the bearing support to provide accurate alinement between bearings and pump.

J. Motor Extension Shaft. For close-coupled pumps, provide a motor with an extension shaft and a special end bracket. Machine the end bracket to receive the pump support bracket for rigid bolted assembly to ensure permanent, accurate alinement of pump and motor.

K. Couplings. Provide a flexible mechanical coupling rated for the full rated horsepower of the driving motor at motor speed. Provide coupling guard that complies with ANSI B15.11, Section 8 and OSHA 1910.219, slotted viewing holes and change-out kits.

L. Base Plates. Mount the pump assembly and the motor on a common rigid steel or cast iron base fabricated and arranged to ensure rigid and true alinement of pump and motor shafts.

M. Provide a cast iron base where pump is located outdoors.

N. Furnish base plate with drip pan having tapped drain opening.

O. Use chilled water pumps with extended steel base big enough to receive all drip from suction and discharge flanges.

P. Motors. Motors shall be 1800 rpm, ODP (for indoor application), Reliance Electric Model XE or approved equal. For outdoor application, provide TEFC motor, but efficiencies shall be as stated below.

Motor HP	Full Load Nominal Efficiency	3/4 Load	2/4 Load
3	88.5	88.8	87.5
5	89.5	89.	89.2
7-1/2	1.0	91.0	90.8
10	91.0	91.0	90.8
15	91.7	91.7	91.4

2.2 MOTORS CONTROLLED BY VFD

A. General Requirements - Shaft Grounding:

1. All motors operated on variable frequency drives shall be equipped with a maintenance free, conductive micro fiber, shaft grounding ring with a minimum of two rows of circumferential micro fibers to discharge damaging shaft voltages away from the bearings to ground, AEGIS Bearing Protection Ring.

2. Application Note: Motors up to 100HP shall be provided with one shaft grounding ring installed either on the drive end or non-drive end. Motors over 100HP shall be provided with an insulated bearing on the non-drive end and a shaft grounding ring on the drive end of the motor. Grounding rings shall be provided and installed by the motor manufacturer or contractor and shall be installed in accordance with the manufacturer's recommendations.

B. General Requirements - High Frequency Bonding:

1. All motors operated on variable frequency drives shall be bonded from the motor foot to system ground with a high frequency ground strap made of flat braided, tinned copper with terminations to accommodate motor foot and system ground connection.

2. Application Note: Proper grounding of motor frame for all inverter-driven induction motors.

C. References: ABB Technical Guide No. 5

1. Allen Bradley Publication 1770-4.1 Application Data, Industrial Automation Wiring and Grounding Guidelines

2.3 CIRCULATORS

A. Furnish an all bronze centrifugal circulator designed for inline mounting, with a resiliently mounted motor, a centrifugal impeller, an alloy-steel shaft with thrust collar, a bronze sleeve bearing, a mechanical seal, a spring-type flexible coupling. and a wick-type oil circulating system.

2.4 SUBMERSIBLE SEWAGE EJECTORS AND SUMP PUMPS

A. Description. Use duplex, submersible, nonclog, screenless, sewage pumps complete with pumps, motors, accessories and controls for completely automatic operation.

B. Construction. Furnish pumps of cast iron with substantial tripod supports integral with the pump casing. Key the impeller to the motor shaft and secure it in place by means of a lock nut. Design the pump to permit removal of the motor-shaft-impeller assembly without need to disconnect discharge piping or remove pump casing from basin.

C. Motors. Use a totally enclosed motor of immersible design, manufactured as a complete unit by a reputable motor manufacturer. Acceptable manufacturers: Baldor, Marathon, Reliance, Century. Furnish a motor of ball bearing type, equipped with a stainless steel shaft. Supply the motor with not less than 15 feet of immersible utilized cable.

D. Level Control. Furnish a mercury float switch liquid level controller with float switches located as shown on drawings.

E. Control Panel. Provide a control panel in a NEMA IV enclosure, complete with fused disconnect switches, magnetic starters with overload and low voltage protection, Hand-On-Automatic selector switches, electric alternator, reset buttons, running lights and alarm bell with alarm silencing switch.

F. High Water Alarm. Provide a switch, a transformer and a bell as parts of a compression type high water alarm switch.

END OF SECTION 23 21 23

SECTION 23 25 13 - CLOSED LOOP WATER TREATMENT SYSTEMS

PART 1 - GENERAL

1.1 OVERVIEW

A. Provide chemicals and equipment to clean, flush, and passivate a closed recirculating loop prior to start-up.

1.2 WORK INCLUDED

A. Provide chemical feeder.

B. Provide chemicals, services, and recommendations for the pre-operation cleaning and passivation for a closed loop.

C. Provide comprehensive service to manage the water treatment program. On-site service visits will be provided weekly for the first month. Thereafter services completed will be from the agreed upon service plan established and contracted by the Owner.

D. Provide the necessary test equipment , reagents, and glassware required to test and control the water treatment program.

E. All of the control equipment will be installed by the mechanical subcontractor. This subcontractor will follow the specific written installation instructions provided by the selected water treatment supplier. Provide a one year warranty of all the equipment provided under this bid.

1.3 QUALITY ASSURANCE

A. The pre-flush and passivation step shall be supervised by the selected water treatment system installer. The water treatment system installer shall report to the Owner throughout the this phase of the operation.

B. All chemicals shall be compatible with system materials or construction and shall comply with all applicable EPA and regulatory agency standards.

C. The water treatment vendor must hold an ISO9000 certification for their chemical production plant.

D. Water treatment representative experience must conform to either one of the following conditions.

1. Have over 6 years of water treatment experience with his current employer.

E. Water treatment service representative must reside within 2 hrs of the project.

F. The supplier will monitor corrosion rates of the closed loop. Afterward the coupon will be analyzed for corrosion rate and type. The water treatment provider will provide the coupons and analysis. Acceptable corrosion rates for the closed loop shall not exceed 0.1 mpy for copper and < 1.0 mpy for mild steel.

G. The water treatment system installer shall provide comprehensive training to the Owner in the proper administration and control of the water treatment program.

H. The water treatment supplier shall provide a troubleshooting manual that contains the necessary program parameters, MSDS's, testing procedures, and emergency numbers.

1.4 SUBMITTALS

A. Please compile the information in the following:

1. Specification sheets on all equipment provided.

2. Detailed procedures for Pre-flush and Passivation.

3. Copy of ISO9000 Certification.

4. Description of suppliers representative. Include education background, work experience, and home address.

5. Trouble-shooting manual for program.

6. Proof of workman's compensation insurance.

PART 2 - PRODUCT AND EQUIPMENT

2.1 MANUFACTURERS

A. The only acceptable manufacturers are:

1. Nalco Chemical Company.

2. Diversey.

3. Betz.

2.2 FEEDING AND TESTING EQUIPMENT

A. Shot Feeder.

1. Shot Feeder shall be constructed for 200 PSIG operating pressure. Feeder will have a chemical resistant prime coat. Feeder shall be provided with 3 1/2" screw-type cover,

with replaceable gasket. The feeder shall have a capacity of 5 gallons and shall include a drain, outlet, and inlet valves.

2. Testing Equipment.

3. Provide all test reagents, glassware to perform nitrite or molybdate testing on-site.

2.3 TREATMENT REQUIREMENTS

A. Closed Loop.

1. Pre-flush and passivation.

a. Please provide a detailed procedure for cleaning and passivating the closed loop system. The following basic chemical formulations, concentrations, and procedures must be used in the proposed procedure.

b. An Alkaline cleaner must be used to remove oil, mill scale, and other foreign deposits from the system piping. The cleaner must contain penetrants, emulsifiers, peptizers, dispersants, wetting agents, and a corrosion inhibitor. The cleaner's concentration must be clearly stated. The cleaning solution must recirculate for at least 12 hours prior to flush.

c. After the system has been flushed and filled with fresh water the system will need to be sterilized with and EPA approved non-oxidizing biocide. Slug feed at least 38 ppm of Glutaraldehyde into the closed loop. Please note the dosage is as Glutaraldehyde and not as product. Indicate the percent actives in the proposed biocide.

d. The long term corrosion inhibitor will be the product used to passivate the system metallurgy. The product will contain molybdate , nitrate, and tolytriazole. Nitrite levels must be raised to 500 to 600 ppm and recirculated for 48 hours. Molybdate should be approximately 120 to 140 ppm during this phase (if this is a hot-loop the nitrite level should be 600 to 800 ppm and the 150 to 250 ppm of molybdate). Indicate percent actives for the proposed product.

2. Continuous Treatment.

a. The closed loop will be continuously treated with a multi-functional product containing molybdate, nitrite, and tolytriazole. The control limits for the Nitrite will be 500 to 600 ppm and 120 to 140 for molybdate. (If this is a hot-loop the nitrite level should be 600 to 800 ppm and the 150 to 250 ppm of molibdate.) This will be the same product as used in the passivation step. For calculation purposes assume 10% annual make-up to the closed loop system.

PART 3 - EXECUTION

A. Install all equipment per manufacturer recommendations.

END OF SECTION 23 25 13

SECTION 23 30 00 - DUCTWORK (REVISED)

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section provides for furnishing and installing low , medium and high pressure ductwork and includes duct construction and accessories.

1.2 RELATED WORK

A. Division 23 - HVAC.

1. Air Devices
2. Air Balance
3. Fans
4. Insulation
5. Emergency Generator Exhaust Piping, if required, is specified in drawing detail.

1.3 GUARANTEE

A. Guarantee all ductwork for two (2) years from the date of final acceptance. The guarantee will cover workmanship. noise, chatter, whistling, or vibration. Ductwork must be free from pulsation under all conditions of operation.

1.4 CONTRACTOR COORDINATION

A. Erect all ducts in the general locations shown, but conform to all structural and finish conditions of the building. Before fabricating any ductwork, check the physical conditions at the job site and make all necessary changes in cross sections, offsets, and similar items, whether they are specifically indicated or not.

1.5 STANDARD AND CODES

A. Except as otherwise indicated, sheet metal ductwork material and installation shall comply with the latest edition of the SMACNA HVAC Duct Construction Standards. Fiberglass ductwork material and installation shall comply with the latest edition of SMACNA Fibrous Glass Duct Construction Standards and NFPA Bulletin 90A. All air distribution devices (such as dampers) included in this specification shall comply with the latest applicable SMACNA manual and NFPA 90A.

PART 2 - PRODUCTS

2.1 DUCT MATERIAL

A. Except for the special ducts specified elsewhere, use prime galvanized steel sheets or coils up to 60 inches wide. Stencil each sheet with proper gauge and manufacturer's name. Stencil coils of sheet steel throughout on 10-foot centers with gauge and manufacturer's name. Contractor shall be cautioned that Engineer may random check duct and strap gauges with a micrometer to verify compliance with the specifications.

2.2 SEALING OF SEAMS AND JOINTS (LOW VOC)

A. The entire duct system shall be sealed. The seams and joints shall be sealed by use of low VOC Hardcast DT tape with FTA-20 (indoor) adhesive or low VOC RTA-50 adhesive for outdoor applications. Duct shall be thoroughly cleaned prior to application.

B. Provide Seal Class A to all transverse and longitudinal joints and all openings for all locations. Joints includes additional sealing of TDF, duct-mate or other mechanical/gasketed joints. Spiral lock seams in round and flat oval duct need not be sealed.

2.3 LOW PRESSURE DUCTWORK (LESS THAN 2 INCHES STATIC PRESSURE)

A. Low pressure ductwork is defined as all exhaust ductwork downstream of fans and supply ductwork downstream of terminal units and fan-coil units.

B. Rectangular. Provide rectangular, low-pressure duct construction, gauges and reinforcing in accordance with the latest edition of the SMACNA HVAC Duct Construction Standards for 2" w.g. static pressure class (positive or negative), however, the gauges listed below are the minimum gauges to be used. Internal rod reinforcement will not be allowed for any ductwork with a largest dimension of less than 54".

Largest Dimension	U.S. Gauge
12" and less	No. 26
13" to 30"	No. 24
31" to 54"	No. 22

C. Round. Furnish round, low-pressure ducts which are spiral wound, such as manufactured by United McGill Sheet Metal Company, or shop fabricated round ducts with Pittsburgh lock longitudinal seams. Use the following minimum gauges for shop fabricated spiral wound ducts under positive pressure, however, the gauges listed below are the minimum gauges to be used. Internal rod reinforcement will not be allowed for any ductwork with a largest dimension of less than 50".

Diameter	U.S. Gauge
26 " and less	No. 26

27 " to 36 "	No. 24
37 " to 50 "	No. 22

D. Use the following minimum gauges for shop fabricated spiral wound ducts under negative pressure, however, the gauges listed below are the minimum gauges to be used. Internal rod reinforcement will not be allowed for any ductwork with a largest dimension of less than 60".

Diameter	U.S. Gauge
17" and less	No. 26
18" to 23"	No. 24
24" to 30"	No. 22
31" to 48"	No. 20
49" to 60"	No. 18

E. Use the following minimum gauges for shop fabricated ducts with Pittsburgh lock longitudinal seams under positive pressure, however, the gauges listed below are the minimum gauges to be used. Internal rod reinforcement will not be allowed for any ductwork with a largest dimension of less than 50".

Diameter	U.S. Gauge
14" and less	No. 26
15" to 26"	No. 24
27" to 36"	No. 22
37" to 50"	No. 20

F. Use the following minimum gauges for shop fabricated ducts with Pittsburgh lock longitudinal seams under negative pressure, however, the gauges listed below are the minimum gauges to be used. Internal rod reinforcement will not be allowed for any ductwork with a largest dimension of less than 48".

Diameter	U.S. Gauge
13" and less	No. 26
14" to 17"	No. 24
18" to 20"	No. 22
21" to 26"	No. 20
27" to 34"	No. 18

35" to 42"	No. 16
43" to 48"	No. 18 A6*

* A6 indicates that 1"x1"x1/8" reinforcement angles shall be used at minimum 6'-0 intervals and installed per latest edition of SMACNA HVAC Duct Construction Standards.

** B4 indicates that 1-1/4"x1-1/4"x3/16" reinforcement angles shall be used at minimum 4'-0 intervals and installed per latest edition of SMACNA HVAC Duct Construction Standards.

G. Flexible Ducts. Low pressure insulated flexible duct may be used where shown on the drawings. Duct shall be made with factory preinsulated duct, covered with a minimum of 2" thick, R6 fiberglass blanket sheathed in a vapor barrier of fiberglass reinforced aluminized polyester laminate. The insulation shall have a minimum "K" factor of 0.29 at 60 degrees F mean and a vapor barrier permeability rating of 0.05 per ASTM method E96-66, Procedure A. The C factor shall be 0.24 to meet HUD requirements. The duct shall be rated for a positive working pressure of 6" w.g. and a temperature of up to 250 degrees F. The duct must comply with the latest NFPA Bulletin 90A and be listed and labeled by Underwriters™ Laboratories, Inc., as Class I Air Duct, Standard 181, and meet GSA, FHA and other U.S. Government standards; flame spread, not over 25; smoke developed, not over 50. Provide Flexmaster 1M, 8M or PeppertreeAir Solutions Type HM only (no substitutions) for flex duct at air devices, and Flexmaster Type TLM or PeppertreeAir Solutions Type TFT-M for medium and high pressure applications i.e., connection to VAV boxes.

H. Low Pressure Acoustic Performance:

1. The straight duct insertion loss (db) of a 10 foot length of duct when tested in accordance with ASTM E 477 at a velocity of 2500 feet per minute shall be at least:

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
8" dia.	12	29	36	35	38	22
12" dia	21	28	29	33	26	12

2. The radiated noise reduction (db) of a 10 foot length of duct when tested in accordance with ASTM E 477 at a velocity of 2500 feet per minute shall be at least:

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
8" dia.	10	7	7	8	10	13
12" dia	9	6	6	5	9	13

3. The terminal ends of the duct core shall be secured by stainless steel worm gear type clamp equal to Ideal Series 56 Snaplock. The fittings on air mixing devices and on sheet metal duct shall be coated with the sealant specified for low pressure ductwork, then flexible duct core slipped over duct and coupling or clamp tightened, then connection sealed with more sealant. Insulation of flexible duct shall be slipped over connection to point where insulation abuts mixing box or insulation on duct. These insulation connections shall be sealed by imbedding fiberglass tape in the sealant specified for

medium pressure ductwork and coating with more sealant to provide a vapor barrier. (This applies to all flex connections to diffusers, grilles, etc., when allowed on the drawings.)

4. Medium and High Pressure Insulated Flexible Duct shall be the same construction as the Low Pressure Duct, factory applied insulation of 2" minimum thickness, R6 with a permeability rating of 0.30. The duct shall be supported by a corrosion resistant metal spiral, or a coated spring steel helix and solid inner liner mechanically interlocked or permanently bonded to the helix wire. Ratings shall be as described for Low Pressure Duct above. Flexible ducts shall be not more than 3' - 0" in length, used for alignment or sound/vibration purposes only, and may only be installed in straight runs. Flexible duct shall NOT be used for changes of direction of air flow. Installation, clamps and sealing shall be the same as specified for rigid duct and Flexmaster Type TLM or PeppertreeAir Solutions Type TFT-M for medium and high pressure applications i.e., connection to VAV boxes.

5. Support flexible ductwork such that there is no more than 1/2" per foot deflection of duct between support points.

2.4 MEDIUM PRESSURE DUCTWORK (2 INCHES THROUGH 6 INCHES STATIC PRESSURE)

A. Medium pressure ductwork is defined as all ductwork downstream of all air handlers, up to and including terminal units, plus all return air ductwork, and all exhaust ductwork from the exhaust outlet to fans.

B. Rectangular. Provide rectangular, medium-pressure duct construction, gauges and reinforcing in accordance with the latest edition of the SMACNA HVAC Duct Construction Standards for 6" w.g. static pressure class (positive or negative), however, the gauges listed below are the minimum gauges to be used. Internal rod reinforcement will not be allowed for any ductwork with a largest dimension of less than 72".

Largest Dimension	U.S. Gauge
18" and less	No. 24
19" through 48"	No. 22
49" through 72"	No. 20

C. Round. Use spiral-wound ducts up to 84 inches in diameter, equal to those of United McGill Sheet Metal Company, however, the gauges listed below are the minimum gauges to be used. Internal rod reinforcement will not be allowed for any ductwork with a largest dimension of less than 50". Also provide fittings equal to those of United McGill Sheet Metal Company. Use the following minimum gauges for shop fabricated spiral wound ducts under positive pressure:

Diameter	U.S. Gauge
14" and less	No. 26

15" through 26"	No. 24
27" through 36"	No. 22
37" through 50"	No. 20

D. Use the following minimum gauges for shop fabricated spiral wound ducts under negative pressure, however, the gauges listed below are the minimum gauges to be used. Internal rod reinforcement will not be allowed for any ductwork with a largest dimension of less than 60".

Diameter	U.S. Gauge
11" and less	No. 26
12" to 14"	No. 24
15" to 22"	No. 22
23" to 26"	No. 20
27" to 36"	No. 18
37" to 42"	No. 18 F12*
43" to 60"	No. 18 F6**

* F12 indicates that 2"x2"x1/4" reinforcement angles shall be used at minimum 12'-0 intervals and installed per latest edition of SMACNA HVAC Duct Construction Standards.

** F6 indicates that 2"x2"x1/4" reinforcement angles shall be used at minimum 6'-0 intervals and installed per latest edition of SMACNA HVAC Duct Construction Standards.

*** F4 indicates that 2"x2"x1/4" reinforcement angles shall be used at minimum 4'-0 intervals and installed per latest edition of SMACNA HVAC Duct Construction Standards.

E. Oval. Furnish oval, medium-pressure ducts that are spiral; flat oval, or welded flat oval equal to those of United McGill Sheet Metal Company with gauges and reinforcing as recommended by the manufacturer for medium-pressure. Use fittings equal to those of the United McGill Sheet Metal Company. The ducts may be shop fabricated of completely welded construction of the following minimum gauges with no reinforcing:

Minor Axis Dimension	U.S. Gauge
18" and less	No. 24
19" through 48"	No. 22
49" through 70 "	No. 20

F. Medium Pressure Insulated Flexible Supply Duct. Provide factory-fabricated flexible ducts for connection between high velocity ducts and air terminal boxes consisting of an inner liner, insulation, and outer jacket. Construct the inner liner of coated steel helix and neoprene

impregnated fiberglass fabric substantially bonded together to prevent the duct from collapsing or kinking in short radius bends. Provide fiberglass insulation of 2-inch minimum thickness and R6 rated around inner liner. Sheath the entire assembly in a heavy, outer vapor barrier jacket consisting of 3-ply laminate of Kraft paper, fiberglass reinforcement and aluminum foil, or closely woven fiberglass cloth impregnated with rubber or vinyl. Maximum length of flexible duct is 6 feet. Use duct rated at minimum working pressure of 10 inches of water. Provide duct listed and labeled by UL at flame spread of not more than 25 and smoke developed rate of not more than 50, and complying with NFPA Standard 90A, paragraph 113a. Acceptable products include PeppertreeAir Solutions, Thermaflex.

2.5 HIGH PRESSURE DUCTWORK (6 INCHES THROUGH 10 INCHES STATIC PRESSURE)

A. Rectangular. Provide rectangular, high-pressure duct construction, and reinforcing in accordance with the latest edition of the SMACNA HVAC Duct Construction Standards for 10" w.g. static pressure class (positive or negative). Use the following minimum sheet metal gauges:

Largest Dimension	U.S. Gauge of Metal
48" and less	No. 22
49" through 60"	No. 20
61" through 72"	No. 18

B. Round. For round, high-pressure duct construction, use the same material as for round medium pressure duct.

C. Oval. For oval, high-pressure duct construction, use the same material as for oval medium pressure duct.

2.6 HIGH VELOCITY LINED DUCTWORK

A. Provide double-walled, internally insulated ductwork equal to United Sheet Metal Acousti-K-27. Provide duct and fittings with solid spiral, galvanized steel, outer pressure shell, 1-inch-thick fiberglass insulation and perforated, spiral, galvanized-steel inner liner. Construct the outer pressure shell in accordance with specifications for round ductwork. Provide an assembly with effective thermal conductivity of 0.27 BTU/hr./sq.ft degree F at 75ºF mean temperature.

2.7 FIRE AND SMOKE DAMPERS

A. Quality Standards. Furnish and Install fire and smoke dampers according to NFPA Standards and SMACNA Duct Manual. Dampers must bear UL label. Use blade dampers when blade width exceeds 12 inches. Provide access doors in attached ductwork for inspection. Stencil each door "FIRE DAMPER ACCESS."

B. Fire Dampers. Use fire dampers that are 95% minimum free area, as manufactured by Greenheck, or approved equal. Dampers to be similar to Ruskin DIBD2, Styles C, CR, CO, dynamic dampers, listed per latest edition of UL 555, listed for two-way airflow and vertical or horizontal mounting. Closure springs to be 301 stainless steel. Dampers shall be activated by a fusible link designed to react at 165ºF or as required by code. Code (UBC) requires 165ºF, but minimum 50ºF above maximum operating conditions. Links for smoke control may be up to 365ºF per code official. Coordinate requirements with the code official.

C. Combination Fire and Smoke Dampers. Provide parallel blade UL listed dynamic damper and assembly with 120 volt motor, and sleeve assembly, similar to Ruskin FSD 60 with Class I leakage per UBC. Rate dampers for 4000 FPM and pressure level of 4000 FPM. Temperature rating to be as recommended by the manufacturer for the application. Dampers to be rated for airflow in both directions. Accessories to be provided are:

1. Heat activated release devices, which are automatically resettable after test, smoke detection or power failure conditions.

2. E/P switch on pneumatically controlled dampers.

3. TS150 fire stat to provide remote override of fire-induced closure when F/SD is used in smoke management system for hi-rise buildings or buildings with atriums. When this feature is used, provide with switch package to remotely indicate damper blade position.

D. Coordinate the location of motor actuators to provide adequate maintenance access.

E. For three-hour applications, provide same as above except FSD60-3, three-hour rated fire/smoke damper.

F. Provide with blade position indicator and blade position indicator switch.

G. All motors for F/SD in stairwells an vestibules for stairwell pressurization shall have motors which are UL listed for modulating service, but can be used for open/closed positions also.

2.8 WALL LOUVERS

A. Louvers are provided under other sections of these specifications.

2.9 WALL LOUVERS

A. Provide louvers constructed of 16-gauge, galvanized sheet steel or 0.080 inch minimum thickness, clear anodized, extruded aluminum of storm-proof design. Make offset in louver blades to prevent water carry-over. Provide 1/4" x 1/4" galvanized hardware cloth, 1/4" x 1/4" aluminum screen, 18-16 mesh galvanized screen or 18-16 mesh aluminum screen behind the louver.

2.10 TEST OPENINGS:

A. Furnish and install in the return air duct and in the discharge duct of each fan unit Ventlok No. 699 instrument test holes. The test holes shall be installed in locations as required to measure

pressure drops across each item in the system, e.g., O.A. louvers, filters, fans, coils, intermediate points in duct runs, etc.

2.11 DRYER EXHAUST

A. Dryer exhaust duct materials and installation shall comply with the current IMC and UMC. Ductwork shall be sheetmetal (minimum 0.016 inch thick), smooth interior finish, minimum 4" diameter (sized per manufacturers listing). Ducts shall not be joined with screws or similar fasteners that protrude into the inside of the duct. Maximum allowable length shall be 35 ft from the connection at the dryer to the termination with deductions for fittings per IMC and UMC. Provide protection shields in wall to protect duct from penetration by screws or nails. Terminate with a listed dryer vent with backdraft damper. Vertical risers shall be provided with a means for cleanout per IMC, UMC.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Construction Standards. Use construction methods which follow the requirements outlined in paragraph 1.5, as well as SMACNA Balancing and Adjusting publications, unless otherwise indicated in these specifications or accompanying drawings.

B. Reinforcement. Reinforce ducts having one side equal to 25 inches or more in accordance with recommended construction practice of SMACNA.

C. Plenum Construction. Construct Plenum chambers of not less than No. 20 U.S. gauge metal reinforced with galvanized structural angles.

D. Cross Breaking or Beading. Cross break or bead sheet metal for rigidity, except ducts which are 12 inches or less in the longest dimension.

E. Wall Penetrations. Where ducts pass through walls in exposed areas, Install suitable escutcheons made of sheet metal angles as closers. At all locations where ductwork passes through floors, provide watertight sleeves projecting 3 inches above finished floor and flush with bottom of floor slab. Fabricate sleeves of 1/8-inch thick steel, galvanized after fabrication. Anchor into adjacent floor slab as required. Sleeves are required inside as well as outside chases. Support ducts where passing through floors with steel structural angles of adequate bearing surface, galvanized after fabrication and resting on top of the sleeve.

F. Interior Painting. Interior painting of metal ductwork exposed to view through grilles, registers, and other openings is specified in the section on painting. Do not Install grilles, registers, or similar items until painting is complete.

3.2 LOW PRESSURE DUCTWORK

A. Construction. Construct rectangular ducts in accordance with the SMACNA Duct Manual.

B. Splitters. Provide adjustable, galvanized splitter-dampers pivoted at the downstream end with appropriate control device at each supply duct split, in accordance with SMACNA Duct Manual. Provide a splitter for each duct branch to two or more outlets.

C. Extractors. Provide Titus AG225 or equal extractors with an appropriate control device at each rectangular zone or branch supply duct connection in accordance with SMACNA Duct Manual.

D. Volume Dampers. Provide opposed-blade volume dampers with an appropriate control device in each return air, outside air and exhaust branch duct, in exhaust connections to hoods or equipment, in each zone at multizone unit discharge, and where otherwise indicated, in accordance with SMACNA Duct Manual. Manual balancing damper to be similar to Greenheck Model MBD-15, multi-blade, 6" maximum blade height, 16-gauge galvanized steel reinforced blades, 20-gauge frame, manual hand quadrant with standoff for externally insulated ductwork, synthetic sleeve. Dampers suitable for service to 4" w.c. for 12" width, 3" w.c. for 24" width, 2" w.c. for 36" width, 2" w.c. for 48" width and rated for 2000 fpm. Dampers larger than 96" x 96" to be similar to Greenheck Model VCD-20 series.

E. Manual low-leakage volume dampers shall be similar to Greenheck Model VCD-33, ultra lowl-leakage damper, rated for 6 cfm per s.f. at 4" w.c. and rated for up to 4000 fpm and up to 8" w.c. Frame to be 16-gauge galvanized, blades to be 14-gauge airfoil. Seals to be silicone-rubber for blades and flexible metal compression jamb seals. Bearings to be synthetic type. Maximum blade height is 6". Provide with manual hand quadrant with 1 ½" standoff. All volume dampers used for stairwell and vestibule pressurization shall be low leakage with blade and jamb seals.

F. Elbows.

1. Rectangular. Where square elbows are shown, or are required for good air flow, provide and Install Barber-Colman or equal double-wall air foil turning vanes. Job-fabricated turning vanes, if used, must be double thickness vanes of galvanized steel sheets of the same gauge metal as the duct in which they are installed. Furnish vanes fabricated for the same angle as the duct offset. Use radius elbows with a center line radius of not less than 1-1/2 times the duct width. Radius elbows may be provided in lieu of vaned elbows where space and air flow requirements permit.

2. Round and Oval Duct. Provide elbows with a centerline radius of 1-1/2 times the duct diameter or duct width. For round ducts, furnish smooth elbows or 5-piece, 90º elbows and 3-piece, 45º elbows.

G. Controls. For control devices concealed by ceilings, furring, or in other inaccessible locations, furnish extension rods and appropriate recessed-type Young regulators, mounted on the surface of the ceiling or the furring, unless specified, or shown otherwise. For ducts which are not concealed, or ducts which are above lay-in ceiling but accessible, provide heavy-duty, quadrant-type, adjustable regulators having wing nuts for locking in position. Saw-mark the ends of all operating rods for dampers and air control devices to indicate damper position.

H. Obstruction. Install streamline deflectors at any point where dividing a sheet metal duct around piping or where other such obstruction is permitted. Where such obstructions occur in insulated ducts, fill space inside streamliner and around obstructions with glass fiber insulation.

I. Remote Operated Dampers. Provide factory-fabricated volume dampers for remote, manual volume control. Use opposed-blade, balanced type, pivoted in bronze bearings and mounted in a channel frame. Operate damper through a flexible-drive cable from a wall-mounted operating knob. Remote operated dampers to be ultra low-leakage dampers similar to Greenheck VCD-33.

J. Low Pressure Insulated Flexible Duct. Do not exceed 6 feet in length with any flexible duct. Support duct independently of lights, ceiling and piping.

K. Low Pressure Duct Supports.

1. Horizontal Ducts Up To 40 Inch. Support horizontal ducts up to and including 40 inches in their greater dimension by means of No. 22 U.S. gauge band iron hangers attached to the ducts by means of screws, rivets or clamps, and fastened to inserts with toggle bolts, beamclamps or other approved means. Place supports on at least 8'-0" centers. Use clamps to fasten hangers to reinforcing on sealed ducts.

2. Horizontal Ducts Larger Than 40 Inch. Support horizontal ducts larger than 40 inches in their greatest dimension by means of hanger rods bolted to angle iron trapeze hangers. Place supports on at least 8'-0" centers according to the following:

Angle Length	Angle	Rod Diameter
4'-0"	1-1/2" x 1-1/2" x 1/8"	1/4"
6'-0"	1-1/2" x 1-1/2" X 1/8"	1/4"
8'-0"	2" X 2" X 1/8"	5/16"
10'-0"	3" X 3" X 1/8"	3/8"

L. Vertical Ducts. Support vertical ducts where they pass through the floor lines with 1-1/2" x 1-1/2" x 1/4" angles for ducts up to 60 inches. Above 60 inches the angles must be increased in strength and sized on and individual basis considering space requirements.

3.3 MEDIUM PRESSURE DUCTWORK

A. Rectangular. Construct rectangular ducts as noted in paragraph 1.5. Provide reinforcing method as shown without tie rods through 60-inch-size. For rods 61 inches and over, use tie rods to keep reinforcing angles to 2-inch maximum. Use sealant (3M EC-800) or equal and 4-inch-wide Glasfab at all of the joints on rectangular ducts ins hop and field fabrication to provide positive seal. Provide sufficient sealant to completely embed the cloth.

B. Round Provide round, medium-pressure duct construction as noted in paragraph 1.5. Seal joints with 3M EC-800, lapped a minimum of 3 inches, secured with sheet metal screws and covered with sealant, over which is applied a 4-inch-wide Glasfab cloth. Apply additional sealant until the cloth is completely embedded, or welded. Make 90º branch take-offs with conical tees. Weld take-off fittings to fittings or to the main duct. Clean and coat all welds with rust-inhibiting paint. Stamp elbows as smooth-type, or 5-or 3- piece gore type, with either type having a centerline radius of 1-1/2 times the duct diameter.

C. Oval. Provide construction, taps, sealing, and other features similar to that specified for round, medium-pressure ductwork.

D. Elbows.

1. Rectangular. Construct radius and vaned elbows in accordance with paragraph 1.5.

2. Round and Oval. Provide elbows having a centerline radius 1-1/2 times the duct diameter or width. For round ducts, smooth elbows, or 5-piece, 90º elbows and 3-piece, 45º elbows are permitted.

E. Medium Pressure Insulated Flexible Duct. Do not exceed 6 feet in length nor make any bend greater than 90º with flexible ducts. Seal flexible duct connections with 3M 900 mastic end tape or equal. Support duct independently of lights, ceiling and piping.

F. Medium Pressure Duct Supports. Provide hangers and supports in accordance with paragraph 1.5.

3.4 HIGH PRESSURE DUCTWORK

A. Rectangular. Construct rectangular ducts in accordance with paragraph 1.5.

B. Round and Oval. Construct round and oval high pressure ducts the same as medium pressure ducts.

C. Supports. Provide the same supports for high pressure ducts as for medium pressure ducts.

3.5 KITCHEN, DISHWASHER, AND SHOWER ROOM EXHAUST DUCTWORK

A. Provide kitchen, dishwasher and shower room exhaust ductwork as specified for sheet metal ductwork. In addition, make all joints in the bottom of horizontal runs watertight. Slope horizontal runs to exhaust outlet. Use unlined duct in all such installations.

3.6 FLEXIBLE CONNECTIONS

A. Where ducts connect to fans or air handling units, make flexible airtight connections using "Ventglas" fabric. The fabric must be fire-resistant, waterproof and mildew resistant with a weight of approximately 30 ounces per square yard. Provide a minimum of 1/2-inch slack in the connections, and a minimum of 2-1/2-inches distance between the edges of the ducts. Also provide a minimum of 1-inch slack for each inch of static pressure on the fan system. Securely fasten fabric to apparatus and to adjacent ductwork by means of galvanized flats or draw bands. Where rectangular connections are made in outdoor locations, seal fabric to metal with mastic. For connections to belted vent sets outdoors, provide Duall fan connector, Koroseal, black with UV inhibitors. Secure with stainless steel bands.

3.7 ACCESS DOORS

A. Install ductwork access doors in structural angle frames and provide with sash locks and hinges arranged for convenient access. Construct doors which occur in insulated ducts with an insulation filler.

3.8 FLASHING

A. Where ducts pass through roofs or exterior walls, provide suitable flashing to prevent rain or air currents from entering the building. Provide flashing not less than No. 26 gauge stainless steel or 16-ounce copper.

3.9 DUCT LINING (If shown on drawings)

A. Install glass fiber acoustical lining in all rectangular low velocity supply and return ductwork as shown on drawings. Provide 1/2-inch thick, 1-1/2 pound density, flexible lining coated on the air stream side to reduce attrition. Liner to also have an anti-microbial coating. Secure to duct surfaces with low VOC adhesive and sheet metal fasteners on 12-inch centers. Omit lining as necessary to permit satisfactory operation of air control devices. Coat all exposed edges and leading edges of cross joints with adhesive. Use liner such as Johns-Manville Lina-Coustic, or equal which meets requirements of NFPA 90-A.

3.10 DUCT LEAKAGE TESTS

A. Unless noted otherwise in paragraph below, all ductwork operating less than 2'in. w.c., to be less than 5% leakage, per SMACNA Duct Leakage Test Manual 1985. Document all tests, and forward to Engineer.

B. For ductwork operating in excess of 2-in. w.c., and all ductwork from air units/fans to VAV boxes, and from exhaust air valves to exhaust fans, it shall be tested at 1 1/2 times operating pressure, minimum 3" w.c. and shall be leak tested per sections 5 and 6, SMACNA HVAC Air Duct Leakage Test Manual, 1985. Tests must be performed only for representative sections of ductwork, minimum 33% of the installed ductwork areas for the tested pressure class. Document all tests, and forward to Engineer. Maximum leakage to be Lmax per below:

1. $Lmax = C_L P^{0.65}$

2. Where Lmax = maximum permitted leakage in CFM per 100 s.f. duct surface area.

3. Where CL = 6 for rectangular sheet metal or fireglass duct and round flex ducts.

4. Where CL = 3 for round/flat oval sheetmetal ducts.

5. Where P = test pressure (design class pressure rating in in. w.c., min. 3").

C. Mains. Test mains after risers and branches are tied in and all equipment set. Close runout connections and place fan in operation. Provide pressure in mains above design pressure. Visually inspect joints. Repair leaks detected by sound or touch. Release mains for completion after joints are tight.

END OF SECTION 23 30 00

SECTION 23 33 00 - AIR DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section provides for the furnishing and installation of air distribution devices, including grilles, diffusers, registers, dampers, extractors, and sound attenuators.

1.2 RELATED WORK

A. Division 23 - HVAC.

1. Ductwork.

2. Air Balance.

1.3 COOPERATION WITH OTHER TRADES

A. Coordinate this work with work under Division 26 Electrical, to ensure that intended functions of lighting and air systems are achieved.

1.4 SUBMITTALS

A. Submit product data for outlets, grilles, registers, control devices, sound attenuators, and similar equipment for review prior to placement of purchase order.

1.5 FINISHES

A. Paint devices with factory standard white enamel finish.

PART 2 - PRODUCTS

2.1 DIFFUSERS

A. Louvered. Provide louvered, fixed-pattern, multiple cone diffusers with removable center cone, frames and white factory finish.

B. Select faces and necks that are circular, rectangular or square, of the size and configuration indicated.

1. Construct diffusers and frames of aluminum.

2. Use a frame compatible with the type of ceiling in which the diffuser is installed.

C. Perforated. Provide adjustable-pattern, aluminum diffusers and frames with white factory finish. Frame the diffuser face with a mitered and welded frame fitted with controllers of adjustable pattern.

D. Dampers. Furnish an opposed-blade damper easily adjustable through the outlet for all diffusers. Provide operating rod extensions as required for damper adjustment.

2.2 GRILLES

A. Supply. Use double-deflection supply grilles made of aluminum.

1. Install vertical face blades and horizontal rear blades. Provide solid, extruded aluminum blades which are individually adjustable. Space at not more than 3/4-inch centers for rear blades and 1/2-inch centers for face blades and not less than 5/8-inch deep.

2. Employ grille frames of extruded aluminum with welded and mitered corners and mounting gaskets.

B. Return.

1. For ceiling return, provide aluminum egg-crate or louvered type as scheduled, with white factory finish. Use construction and frame styles as specified for ceiling diffusers. Use neck sizes as shown.

2. For wall return, provide a fixed-blade, aluminum grille, essentially sightproof, having curved or angular break, inclined blades. Space the blades at 1/2-inch centers to achieve sightproof feature. Furnish hemmed or fully rounded leading edges. Provide extruded aluminum grille frames with welded and mitered corners. Include mounting gaskets.

C. Door Grilles. Furnish sightproof door grilles of aluminum construction for core only. Finish with prime coat suitable for field painting.

2.3 REGISTERS

A. Supply. Provide double-deflection supply registers with aluminum, vertical face blades and horizontal rear blades. Use an integral, key-operated, opposed blade damper.

B. Furnish solid, extruded aluminum blades which are individually adjustable. Space not more than 3/4-inch centers for rear blades and 1/2-inch centers for face blades and not less than 5/8-inch deep.

C. Employ grille frames of extruded aluminum with welded and mitered corners and mounting gaskets.

D. Return and Exhaust. Furnish return and exhaust registers identical to return grilles except for the addition of an integral key-operated, opposed-blade damper.

2.4 PLENUM SLOT DIFFUSER

A. Plenum slot diffusers shall be insulated. Plenum slot diffuser shall be of the sizes shown on the plans and schedule. Diffusers shall have 3/4" slot width and shall be available in multiple four parallel slots. Discharge deflectors shall be fixed in 1-way or 2-way blow directions. Provide with adjustable center slot. Provide with adjustable center slot. The diffuser face shall be constructed of extruded aluminum with a white finish on the exposed surfaces. The overall diffuser height must be no greater than 10 inches. The plenum must be detachable from the diffuser face to allow the inlet direction to be changed in the field. Fibre-Free internal insulation (3/8") shall be provided. Fiberglass type insulation is not acceptable. Factory furnished plaster frames to be provided for all air devices in sheetrock, plaster type ceilings (non lay-in). The finish shall be black unless noted otherwise.

B. Support slots from structure above. The manufacturer shall provide published data for the plenum slot diffuser. The diffuser shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

2.5 ACCESSORIES

A. Mounting Frames. Provide each grille or register not equipped with a removable core with a companion, all-purpose mounting frame constructed like a grille frame to facilitate installation and removal of the grille or register without marring adjacent mounting surfaces.

1. Furnish frames with 1/2-inch-thick sponge rubber gasket to prevent air leakage.

2. Provide a frame that neatly fits the grille. Mounting frames will not be required for grilles or registers mounted directly on exposed ductwork.

2.6 SUPPLY AIR SOUND ATTENUATORS

A. Construct casings of not less than 22-gauge galvanized steel for diameters up to 36- inches, and 18-gauge for diameters up to 48-inches. Furnish perforated face sheets over acoustical material of not less than 5.0 pounds per cubic foot of compressed density glass fiber or mineral wool.

B. Provide acoustical liners of the same density around the outside perimeter and in the center baffle of the silencer. Use attenuators with capacity to handle air quantities scheduled at no more than 0.50-inch of water pressure drop with acoustic performance as tabulated below:

Octave Pass Bands (Hz)		63	125	250	500	1000	2000	4000	8000
Attenuation (dB)	4	8	13	25	28	25	20	17	

2.7 RETURN AIR SOUND ATTENUATORS

A. Construct casings of not less than 22-gauge galvanized steel. Provide perforated face sheets over the acoustical material of not less than 24-gauge galvanized steel. Use mineral fiber or organic glass acoustical material. Apply fiberglass cloth between filler material and face sheets.

B. Coat solid surfaces with vibration-dampening material to assure that equal attenuation will be provided not only in the direction of air flow, but also through duct silencer walls. Provide attenuators to handle air quantities as scheduled at no more than 0.25-inch of water pressure drop with acoustic performance as tabulated below.

Octave Pass Bands (Hz)			125	250	500	1000	2000	4000	8000
Attenuation (dB):	3' long:	11	16	23	36	42	34	28	
	5' long:	16	25	37	45	44	38	22	

PART 3 - EXECUTION

3.1 INSTALLATION

A. Diffusers. Attach the frame assembly by a concealed hinge assembly to an outer frame compatible with the type of ceiling on which the diffuser is installed.

END OF SECTION 23 33 00

SECTION 23 33 33 - ACCESS DOORS

PART 1 - GENERAL

1.1 SCOPE

A. This section provides for furnishing and installing access doors in all wall or ceiling locations as required or shown for access to valves, controls, regulating devices, water hammer arrestors, trap primers, fire dampers, air distribution boxes and other equipment requiring maintenance, adjustment or operation. Provide access doors to provide access to all mechanical items requiring service or maintenance, whether shown on drawings or not.

1.2 WORK NOT INCLUDED

A. Doors or panels required in acoustical ceilings are provided for under Division 09. However doors required in plaster, gypboard, masonry, or other solid wall or ceiling are included under this section.

PART 2 - PRODUCTS

2.1 NON-FIRE-RATED ACCESS DOORS

A. Furnish INRYCO/MILCOR approved equal with 16- frames, 14- panels, and 22- casing bead. Provide continuous concealed hinges and flush screwdriver cam lock. Use Style K access doors for plastered surfaces, Style M for masonry or gypboard surfaces, and Style AP for acoustical plaster ceilings, with 18- panel and all galvanized construction.

2.2 FIRE-RATED ACCESS DOORS (1-1/2 HOUR LABEL DOORS)

A. Furnish INRYCO/MILCOR or approved equal UL-listed 1-1/2 HR Label "B". Access doors with 16- steel frames, and 20- insulated sandwich type door panel. Provide door with an automatic closing and latching mechanism. Fire-rated access doors are required.

PART 3 - EXECUTION

A. Doors furnished by this contractor will be installed by this contractor. Not all required access doors are shown. The contractor will be responsible for proper coordination in locating access doors for ease of operation and maintenance of concealed equipment.

END OF SECTION 23 33 33

SECTION 23 34 00 - FANS

PART 1 - GENERAL

A. This section provides for furnishing and installing fans, including centrifugal and propeller types, with all supplemental equipment.

1.2 RELATED WORK

a. Division 23 - HVAC.

1. Ductwork.

2. Vibration Isolation.

3. Air Balance.

1.3 PERFORMANCE

A. Provide fan type, arrangement, rotation, capacity, size, motor horsepower, and motor voltage as shown. Fan capacities and characteristics are scheduled on the drawings.

B. Rate fans according to appropriate Air Moving and Conditioning Association, Inc. (AMCA), approved test codes and procedures. Supply fans with sound ratings below the maximums permitted by AMCA standards. All fans provided must be licensed to bear the Certified Ratings Seal.

C. Statically and dynamically balance all fans.

PART 2 - PRODUCTS

2.1 PROTECTIVE COATINGS

A. Manufacturer's Standard. Apply to all fans, motors and accessories, the manufacturer's standard prime coat and finish, except on aluminum surfaces or where special coatings are required.

B. Galvanizing. After fabrication of the parts, hot-dip all surfaces which require galvanizing. Where galvanizing is specified, a zinc coating may be used. After fabrication, apply the zinc coating and air-dry the coating to 95% pure zinc. Acceptable zinc coatings include Zincilate, Sealube, Amercoat, Diametcoat, or an approved equal.

C. Vinyl Plastic. Coat surfaces, where required, with vinyl plastic, air-dried Heresite, or an approved equal. Have the product factory-applied to fan wheels and interior surfaces of casings. apply a minimum of three coats.

2.2 SUPPLEMENTAL EQUIPMENT

A. Motor Covers. Provide weatherproof motor covers for installation out of doors. Apply the same finish as used on the fan.

B. Belt Drives.

1. Unless otherwise specified for belt-driven fans, equip the fan motors with variable pitch sheaves. Select the sheave size for the approximate midpoint of adjustment and to provide not less than 20% speed variation from full open to full closed size drives for 150% of rated horsepower.

2. Provide belt guards and apply the same finish as used for the fan.

C. Safety Disconnect Switch. Provide a factory-wired, safety disconnect switch on each unit equipped with a 115/1/60 motor.

D. Relief Vents and Air Inlets. Provide vents and inlets with aluminum frames and ½-inch mesh, galvanized bird screens. Include with dampers.

E. Prefabricated Roof Curbs. Furnish prefabricated roof curbs with built in cant strips and lined with glass fiber insulation. Curbs may be made of No. 18 U.S. standard gauge galvanized steel or 0.063-inch aluminum. The minimum height is 8-inch. Include on each roof curb a resilient pad for equipment mounting on the top flange. Curbs to be compatible with roofing system.

F. Sound Attenuating Bases. Construct sound attenuating bases of No. 18 U.S. standard gauge galvanized steel or 0.063-inch aluminum. Include a built-in cant strip for curb mounting and a resilient pad for equipment mounting on the top flange. Line the base with two inches of glass fiber insulation and fit internally with glass fiber acoustical baffles.

2.3 ROOF-MOUNTED GENERAL EXHAUST FANS

A. Furnish centrifugal fans with backward curved aluminum fan wheels. Fans shall be belt driven. Place motors on resilient mounts outside the air-stream. The selected motor must have enclosed, prelubricated bearings. Make provisions for forced air cooling of the motor. Construct unit hoods, housing and bases of aluminum. Provide 1/2-inch mesh, galvanized bird screen over openings, where required. Supply a disconnect switch and have the switch and motor factory wired to the junction box. Provide automatic dampers with curb flanges.

2.4 WALL-MOUNTED SUPPLY FANS (BELT DRIVEN)

A. Furnish belt-drive, propeller-type fans designed for mounting to the wall. Mount the fan wheel and motor on a square, flanged panel made of steel and formed with a venturi orifice. Finish the panel in baked enamel. Provide fans with a drive-side, galvanized wire guard and standard-duty shutter.

2.5 VERTICAL DISCHARGE, SMOKE MAKE-UP AIR AND SMOKE EXHAUST FANS

A. Wheel and Inlet. Backward inclined centrifugal wheel in steel or aluminum construction with blades welded to inlet and backplate; cast steel hub bolted to backplate and keyed to shaft with set screws.

B. Housing.

1. Minimum 20 gauge galvanized steel, adequately braced, designed to minimize turbulence with spun inlet bell and shaped cut-off.

2. Factory finish before assembly with enamel paint system. Coating on aluminum parts is not required.

3. Provide fans with welded, flanged base to mount on roof curb.

C. Belt Driven Fan, Shaft and Bearings.

1. Shafts: Hot rolled steel, ground and polished, with keyway, coated with lubricating oil.

2. Bearings: Heavy duty pillow block type, self-aligning, permanently sealed ball bearings, or pillow block type, self-aligning, grease-lubricated ball or roller bearings. Extend lubrication fittings to outside of housing.

D. Make-up Air Fans. Provide complete with properly sized intake air hood, weatherproof motor cover and prefabricated 14-inch high roof curb.

E. Smoke Exhaust Fans. Provide complete with upblast, high velocity discharge section, gravity discharge dampers, weatherproof motor cover and prefabricated 14-inch high roof curb.

2.6 BELTED VENT SETS

A. Provide belt-driven, squirrel-cage, utility set units. Furnish with antifriction, grease lubricated bearings and alemite fittings. Mount the fan on antivibration devices as specified in the section on Vibration Isolation. Include inlet or outlet screens where no duct is connected. Drill a 1/4-inch drain hole in the lowest part of the scroll on any fan installed outside.

2.7 CABINET-ENCLOSED FAN

A. Fan Section.

1. Casing. Fabricate a casing from galvanized steel sheets reinforced as required with structural members. Provide access panels to permit inspection and maintenance.

2. Fan. Supply double-inlet, squirrel-cage, centrifugal fans with die-formed impeller blades. Use rigid galvanized steel or aluminum fan wheels which are statically and dynamically balanced. Mount the wheels on a common shaft and fasten the wheels mechanically to the shaft. Provide galvanized steel fan scrolls in a secured casing to prevent vibration. Design fans for quiet, slow speed operation at specified rating conditions.

3. Shaft. Provide a shaft with adequate stiffness to prevent deflection and vibration. Rate the shaft at maximum rpm 10% below the first critical speed. Make a tachometer groove in the drive end of the shaft.

4. Bearings. Install antifriction ball bearings, selected for 200,000 hours minimum average life under actual load and speed conditions. Locate the bearing to be adjustable for accurate alignment of fan wheels in scrolls. Provide remote grease fittings on the accessible side of the unit for ease of lubrication.

B. Motors. Furnish motors in accordance with the section on Motors and Motor Starters. Motors must have grease lubricated ball bearings with alemite fittings. Mount the fan drive motor on a vibration isolating adjustable base, arranged for positive adjustment of drive alinement and belt tension. Select fan motors to be nonoverloading at design rpm and at static pressure 15% under design.

C. Belt Guard. Provide a substantial, removable belt guard for drives on the unit exterior. Leave a hole over the tachometer groove.

D. Filter Section.

1. Slide Racks. Provide and arrange suitable galvanized filter slide racks to permit easy removal of filters from the accessible side of unit.

2. Glass Fiber Filter. Furnish a replaceable, high-velocity filter of glass fiber with gradient density, 2-inches thick.

3. Make frames of channel construction, rigid and square with a nominal 2-inch thickness.

4. Design filtering element for low pressure drop and high efficiency at net face velocity of 500 feet per minute. The element must also have a high dust load capacity.

5. Fabricate filters using dimensions to suit the arrangement and size of filter slides or racks in which filters are installed.

6. Low Velocity Glass Media Filter. Furnish filters 2-inches thick. Design the filtering element for a low pressure drop and high efficiency at net face velocity of 300 feet per minute. The filter must have a high dust load capacity. Fabricate filters using dimensions to suit the arrangement of the filter slides or rack in which they are installed.

E. Permanent, Cleanable. High-Velocity Filters. Provide filters 2-inches thick. Construct the filter throughout of galvanized or other equivalent corrosion-resistant materials and parts.

1. Make frames of channel construction, rigid and square.

2. Design the filtering element for low pressure drop and high efficiency at net face velocity of 500 feet per minute. The element must have a high dust load capacity. Fabricate filters using dimensions to suit the arrangement and size of the filter slides or racks in which they are to be installed.

F. High Efficiency Particulate Air Type. Provide a filter with a steel holding frame, separators to support and hold the filter open, a sealer frame, and a disposable, glass fiber filter cartridge.

Select a cartridge with an average efficiency of 95% by Discoloration Test (NBS type) and with 500 feet per minute face velocity. Supply a high velocity prefilter of 2-inch replaceable media. House the filter assembly in a filter box constructed of heavy galvanized steel. Use hinged access doors at each end, extruded aluminum filter tracks, and woven pile gasketed on track.

G. Replacement Filters. Furnish one spare set of all air conditioning system filters or filter media. Cut media to required size.

2.8 IN-LINE CENTRIFUGAL FANS

A. Provide tubular, in-line centrifugal fans with airfoil-type wheels. Select a fan model with 1-piece inlet cone, heavy gauge welded steel casing, v-belt drive, stationary discharge conversion vanes, steel shaft, internal and external belt guards and adjustable motor mounts.

B. Inlet and outlet connections for fan casings to ductwork and equipment casings may be of the slip fit or flanged type. Air will flow axially. Make streamlined inlets and conversion vanes which eliminates turbulence and provide a smooth discharge air flow.

C. Enclose fan bearings and drive shaft to isolate them from the air stream. Provide lubricating tubes extending from the shaft bearings to the housing.

2.9 IN-LINE CENTRIFUGAL FANS

A. Provide in-line fans with backward inclined wheels. Select a fan model with 1-piece inlet cone, heavy gauge welded steel casing, internal and external belt guards, and adjustable motor mounts. Air will flow axially. Enclose fan bearings and drive shaft to isolate them from the air stream. Provide lubrication tubes extending from the shaft bearings to the housing or otherwise make the bearings accessible for lubrication.

2.10 AXIAL FANS

A. Casing. Fabricate cylindrical fan casings of welded steel construction and make flanged inlets and outlets. Have guide vanes and motor supports welded in place. Provide access panels to permit inspection and maintenance.

B. Fan Wheel. Design the fan wheel for high efficiency and low noise level. Use airfoil blades and guide vanes. The minimum diameter of the fan hub must be equal to the diameter of the motor frame. Use adjustable wheel blades on direct driven fans to allow adjustment of the performance over a range of volume and pressure. Index the hub to facilitate setting the blade angle uniformly and accurately. Include stops to prevent overloading the motor with excessive fan blade angles. On the fan nameplate include the factory blade setting and the maximum setting compatible with the motor furnished.

C. Bearings. Enclose fan bearings and drive shaft to isolate them from the air stream. Provide lubricating tubes extending from the shaft bearings to the housing.

D. Motors. Vane-axial fans may be direct-connected with adjustable blade wheel or v-belt driven. When direct-connected, provide a totally enclosed, air-over motor with flanged or end

mounting. For belt-driven fans, use internal and external belt guards and adjustable motor mounts. Select motor horsepower to be not less than the brake horsepower required for blades set at maximum pitch and air delivery equal to 50% free delivery (zero pressure). Use motors with permanently grease-lubricated ball bearings. Provide auxiliary lubrication and relief fittings to the outside of the casing. Install the grease line to minimize the pressure on the bearing seals.

E. Submittals. Submit performance curves for at least five blade angles, including maximum and minimum settings. Include curves showing brake horsepower, mechanical efficiency and both static pressure and total pressure plotted against air delivery.

2.11 POWER ROOF VENTILATORS

A. Provide power roof ventilators with belt-driven, nonoverloading propeller wheels. Construct ventilator heads and stacks of aluminum or steel sheets which are galvanized or zinc coated. Brace heads and stacks internally. Design fan stacks for curb mounting. Screen the hood opening with ½-inch mesh, galvanized bird screen. Equip ventilators with standard duty dampers.

2.12 WALL-MOUNTED SUPPLY OR EXHAUST FAN (BELT DRIVEN)

A. Furnish belt-drive, propeller-type fans designed for mounting to the wall. Mount the fan wheel and motor on a square, flanged panel made of steel and formed with a venturi orifice. Finish the panel in baked enamel. Provide fans with a drive-side, galvanized wire guard and standard-duty shutter.

2.13 WALL-MOUNTED SUPPLY OR EXHAUST FAN (DIRECT DRIVEN)

A. Furnish direct-driven, propeller-type fans designed for mounting in the wall. Mount the fans wheel and motor on a square, flanged panel made of steel and formed with a venturi orifice. Finish the panel in baked enamel. Provide fans with a drive-side, galvanized wire-guard and a standard-duty, automatic shutter.

2.14 ACCEPTABLE MOTOR MANUFACTURERS

A. Baldor

B. Marathon

C. Reliance

D. Century

PART 3 - EXECUTION

A. Install fans according to the manufacturer's instructions and in the locations shown on the drawings.

END OF SECTION 23 34 00

SECTION 23 64 23.01 - AIR-COOLED PACKAGED ROTARY SCREW CHILLER (REVISED) (70 - 500 TONS)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This section specifies the installation of the package air cooled liquid chillers of the rotary/screw type.

B. The Contractor is responsible to perform all work required to complete installation as indicated by the Contract Documents and to furnish all supplementary and/or miscellaneous items necessary for the proper acceptance and installation of the equipment. Contractor shall be responsible for chiller procurement, for delivery, off-loading, on-site handling, storage and protecting chillers.

1.2 MANUFACTURER'S WARRANTY

A. Provide a full parts, labor and refrigerant warranty of two (2) years from final acceptance.

B. Provide a five (5) year warranty for compressors.

1.3 MANUFACTURER'S FIELD SERVICES

A. Provide a factory trained representative for a minimum period of two (2) days to supervise testing, start-up and instruction on operation and maintenance to Owner.

B. Start-up logs shall be submitted to the Engineer for record.

1.4 QUALITY ASSURANCE

A. Unit shall be rated in accordance with ARI Standard 590-92, latest edition (USA).

B. Unit construction shall be designed to conform to ASHRAE 15 latest revision safety standard, NEC (USA) and ASME (USA) applicable codes.

C. Factory Assembled, Air Cooled Liquid Chiller. Contained within the unit cabinets shall be all factory wiring, piping, controls, refrigerant charge, and special features required prior to field start-up.

D. Unit operation shall be fully tested at the factory.

E. Unit shall meet efficiencies of ASHRAE 90.1.

1.5 RELATED WORK

A. Division 23 - Mechanical.

1. Chilled Water Piping.

2. Insulation.

3. Controls.

4. Vibration Isolation.

1.6 PERFORMANCE

A. Provide performance as scheduled on drawings, with head pressure control to enable unit to operate at ambient temperatures as low as 20°F.

PART 2 - PRODUCTS

2.1 ROTARY/SCREW LIQUID CHILLERS

A. General Description. The units shall be factory assembled and tested outdoor air cooled liquid chillers consisting of rotary/screw semi-hermetic direct drive compressors, condenser, evaporator, electronic expansion valves, refrigeration accessories, starters and control panel. Unit shall be dehydrated and charged with refrigerant and oil at the factory. Construction and ratings shall be in accordance with ANSI/ARI standards 550 and 590.

2.2 COMPRESSORS

A. Construct helical screw compressors with heat treated forged steel or ductile iron shafts, discharge valves and sealing surface immersed in oil. Rotors shall be of high grade steel or cast iron alloy.

B. Statically and dynamically balance rotating parts. Provide oil lubrication system with oil charging valve and oil filter to ensure adequate lubrication during starting, stopping and normal operation.

C. Provide compressor with automatic capacity reduction equipment consisting of capacity control slide valve.

D. Provide constant speed compressor motor, suction gas cooled with solid state sensors and electronic winding overheating protection.

E. Provide crankcase heater to evaporate refrigerant returning to crankcase during shut down. Energize heater when compressor is not operating.

2.3 EVAPORATOR

A. Provide shell and tube evaporator, seamless or welded steel construction with cast iron or fabricated steel heads, seamless internally finned copper tubes roller expanded into tube sheets. Furnish minimum tube wall thickness of .025".

B. Design, test and stamp refrigerant side for 300 psig working pressure and water side for 215 psig working pressure, in accordance with ANSI/ASME SEC. 8.

C. Insulate with 0.75 inch (20 mm) minimum thick flexible elastometric rubber closed cell insulation with maximum K value of 0.26. Provide heat tape to protect evaporator to -20 degrees F (-29 degrees C).

D. Provide water drain connection, vent connection and fittings for factory installed leaving water temperature control and low temperature cutout sensors.

E. Water connections shall be victaulic. Evaporator shall have one (1) entering and one (1) leaving connection.

2.4 CONDENSER AND FANS

A. Construct condenser coils of aluminum fins mechanically bonded to seamless copper tubing. Provide sub-cooling circuits and oil cooling for the compressor bearing and injection oil. Air test under water to 506 psig. Provide painted louvers for condenser coil. Minimum fin thickness shall be .055" aluminum. Fin thickness less than .055 shall be coated with .8 mils backed epoxy coating.

B. Provide vertical discharge direct driven propeller type condenser fans with fan guard on discharge. Entire fan assembly shall be statically and dynamically balanced and fan assembly shall be either painted or zinc coated steel. Fan guard shall be either PVC, chrome or zinc coated.

C. Provide three (3) phase condenser fan motors with permanently lubricated ball bearings and built-in thermal overload protection.

2.5 ENCLOSURE

A. House components in 12 gauge galvanized steel frame and mount on welded structural steel base. Hot-dip galvanized steel frame coating shall be Underwriters Laboratories, Inc. (UL) recognized as G90-U, UL guide number DTHW2.

B. Unit panels and control panels shall be finished with a baked or powder paint. Control panel doors shall have door stays. Paint system shall meet the requirements for outdoor equipment of Federal Government Agencies.

C. Casings fabricated from steel that do not have a zinc coating conforming to ASTM A 123 or ASTM A 525 shall be treated for the prevention of corrosion with factory coating or paint system. The coating or paint system shall withstand 500 hours in a salt-spray fog test in accordance with ASTM B117.

2.6 REFRIGERANT CIRCUIT

A. All units shall have a minimum of two (2) independent refrigeration circuits designed for independent operation. Each circuit may contain one (1) to four (4) compressors.

B. Provide for each refrigerant circuit:

1. Liquid line shut-off valve.
2. Removable core filter dryer.
3. Liquid line sight glass with moisture indicator.
4. Electronic or thermal expansion valve sized for maximum operating pressure.
5. Charging valve.
6. Discharge and oil line check valves.
7. Compressor suction and discharge service valves.
8. High side pressure relief valve.
9. Full operating charge of R-22 or R-134A and oil.
10. Unit factory leak tested at 200 psig.

C. Capacity Modulation. Provide capacity control modulation by using a slide valve. Unit shall be capable of operation down to 15% capacity.

2.7 CHILLER CONTROLS AND POWER CONNECTION

A. On chiller, mount weather-proof control panel, containing starters, micro-processor, power and control wiring, factory wired with terminal block power connection. Provide single point power connection on units. Heat tape shall be powered by separate 115-volt electrical circuits. Provide unit mounted central power transformer.

2.8 MICRO-PROCESSOR

A. The micro-processor shall provide the following safety controls with diagnostic readouts in clear English language.

1. Loss of chilled water temperature protection.
2. High refrigerant pressure.
3. Low oil flow protection.
4. Loss of chilled water flow.

5. Contact for remote emergency shut-down.

6. Loss of refrigerant charge protection.

7. Motor current overload.

8. Phase reversal/unbalance/single phasing.

9. Over/under voltage.

10. Failure of water temperature sensor used for control.

11. Compressor on-off status.

12. Alarm contact to EMCS.

B. The micro-processor shall provide the following operating controls:

1. Leaving chilled water temperature ± 1 degrees F.

2. Two five-minute solid state anti-recycle timers to prevent compressors from short cycling. If a greater than five-minute solid state anti-recycle timer is provided, hot gas bypass shall be provided to insure accurate temperature control for light load applications.

3. Load limit thermostat to limit compressor loading on high return water temperature to prevent nuisance trip-outs.

4. Low ambient controls for operation down to 20 degrees F.

5. High condensing pressure control that starts condenser fans and unloads compressors to keep head pressure under control and help prevent high pressure nuisance trip-outs.

6. Compressor current sensors that unload compressors to prevent current overload nuisance trip-outs.

7. Automatic lead-lag that equalizes running hours and compressor starts. If manufacturer cannot provide this function, a cycle counter and hour meter shall be provided for each compressor and Owner can be instructed by the manufacturer on how to manually change lead-lag on compressors to equalize compressor starts and running hours.

8. Low ambient lockout control with adjustable set point.

9. Condenser fan sequencing which automatically cycles fans in response to ambient, condensing pressure and expansion valve pressure differential thereby optimizing unit efficiency.

10. Low suction pressure control to unload compressors and throttle expansion valve to prevent low pressure nuisance trip-outs.

11. Chilled water reset from EMCS.

2.9 GAUGE BOARD

A. Provide a pre-piped gauge board with pressure gauges for suction and discharge refrigerant pressures or digital display of pressures.

2.10 AMMETERS

A. Provide ammeters for each compressor or digital display of % RLA.

2.11 BUILDING MANAGEMENT SYSTEM INTERFACES

A. Chiller controls shall:

1. Must be BacNet control signal from building automation system for supply and return water temperature and demand limiting set point adjustment.

2. Alarm for abnormal operation and safety shutdown.

3. Start-stop unit.

4. Have run indication.

5. Have outside air temperature indication.

6. Have chiller status indication.

2.12 ISOLATORS

A. Provide rubber in shear isolators.

2.13 OPERATING CHARACTERISTICS

A. Unit shall be capable of starting and running fully loaded at outdoor ambient temperatures from 20°F to 125°F.

B. Unit shall be capable of starting up with 95°F entering fluid temperature to the cooler.

C. Two refrigerant circuits shall be provided in each unit to protect against loss of total capacity.

D. Unit shall operate without special controls down to an ambient temperature of 20°F.

E. Unit shall have automatic lead-lag feature to automatically alternate the lead circuit to ensure even compressor wear.

2.14 MOTOR STARTERS

A. Furnish with across-line starter for 460 volt and reduced inrush starters for 208/230 (if specified). For each starter provide a current transformer to signal the control center for current limiting control. Place an ammeter in the door of the starter panel. Use three-leg overload protection and other features required by the control system. Provide across-the-line oil pump starters, where required. Provide all current transformers required to operate auxiliaries.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All work shall be performed in accordance with the manufacturer's published diagrams, recommendations, and equipment warranty requirements.

B. Necessary supports shall be provided for all equipment, appurtenances, and pipe as required, including frames or supports for compressors and similar items. Equipment shall be set on not less than a 6 inch concrete pad.

C. Equipment shall be properly leveled, aligned, and secured in place in accordance with manufacturer's instructions.

D. Mount and wire flow switches.

E. Install double boilers rubber pipe flex connectors, Pete’s plug, and shut-off balance valves.

F. Wire heat tape at chiller and all exposed connecting piping, make-up water piping, or any other assemblies containing water exposed to the outdoors.

3.2 START-UP

A. A factory-trained engineer is required for two working days. The engineer will adjust and start the chillers and instruct designated personnel on operation and maintenance.

END OF SECTION 23 64 23.01

SECTION 23 73 00 - AIR HANDLING UNITS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section specifies furnishing and installing factory standard air handling units and includes casing, fans, coils, filters and special items.

1.2 PERFORMANCE

A. Unit capacities and characteristics are as scheduled on the drawings. Units must be UL or ETL listed and display the appropriate label as a complete assembly. Units must be certified in accordance with ARI Standard 430-66.

1.3 SUBMITTALS

A. Shop Drawings: Show assembly, unit dimensions, weight loading, required clearances, construction details, and field connection details. [Air handling unit dimensional drawings shall be prepared on AutoCAD compatible CAD system, specific to each tag number. CAD disk shall be made available to Mechanical Contractor upon request.]

B. Product Data: Show dimensions, weights, capacities, ratings, fan performance, motor electrical performance, motor electrical characteristic, , and gauges and finishes of materials. Include all scheduled data.

C. Submit fan curves showing specified maximum and minimum operating points clearly plotted against fan total pressure and brake horsepower. Curves shall be multiple RPM type covering a range of plus or minus 20 percent of design operating RPM. Indicate surge points.

D. Submit sound power levels for fan inlet, outlet, and casing radiation at rated capacity. Base Test Data on submitted fan sizes rather than estimated data on other fan sizes.

1.4 INFORMATIONAL SUBMITTALS

A. Submittals require no response by A/E.

B. Operation and Maintenance Data: Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists and wiring diagrams.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Seal fluid and air openings prior to shipment.

B. Deliver Products in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs.

PART 2 – PRODUCTS

2.1 GENERAL

A. Provide factory-assembled unit. Unit may be shipped in assembled sections.

B. Furnish unit with sealing and fastening hardware supplied by the manufacturer. Include written instructions needed to complete field assembly of the components.

C. Provide units designed and constructed to that coils, panels, fan housing and fans can be removed without affecting the structural integrity of the unit.

D. Equipment Noise. The octave band sound power levels for each fan inside the air handling units shall be determined at the specified design operating point shown on the mechanical equipment schedule. Fan sound power levels may be calculated using the procedure outlined in AMCA 301, but base data must have been determined via laboratory testing using AMCA 300 with a fan of identical design and a wheel diameter that is not more than three fan sizes larger (or smaller) than the specified fan. The maximum allowable octave band sound power levels for each fan (radiating from the fan inlet) shall not exceed the following levels expressed in dB (ref 1 picowatt):

	SOUND POWER								
	Octave Band								A-Weighted
	1	2	3	4	5	6	7	8	dB
Supply Fans	103	104	104	101	97	94	92	93	103

2.2 ACCEPTABLE MANUFACTURERS

A. Temtrol

B. Trane

C. McQuay

D. York

2.3 CASING

A. Construction. Provide a double wall casing of substantial construction, fabricated from steel sheets, reinforced as required to produce structural integrity, and to prevent breathing or drumming. Seal casing openings airtight. Exterior casing panels shall be fabricated from

minimum 16 gauge galvanized steel, inner liner shall be minimum 22 gauge perforated galvanized steel. [Outdoor units shall have sloped roofs and drain channels as required to shed rainwater.] [Provide coil connection housings for units located outdoors or provision for routing piping to coils within the footprint of the unit.]

B. Unit Floor. Provide a double bottom insulated floor assembly consisting of 20 gauge galvanized steel outer surface and 14 gauge galvanized steel inner surface.

C. Access. Provide access to all sections of the unit by double wall access doors big enough to permit removal of internal parts. Provide gasketing on the casing to seal access doors. All access doors to have No. 310 or vent-lock handles. Provide fan section access doors with a tool operated safety latch. Provide dual thermal pane windows on access doors to each section.

D. Finish. Galvanized both inside and out, including belt guard and supports. [Outdoor units shall have manufacturer's standard enamel finish.]

E. Insulation. Insulate the conditioner casing with microbially treated closed cell or glass fiber insulation not less than 1-inch thick and with insulating coefficients equivalent to 3-pound density material.

1. Seal and secure all edges and penetrations of the insulation with a coating to prevent erosion and transmission of moisture.

2. Insulate to prevent unit casing from condensing moisture at 85□F dry bulb, 80□F wet bulb.

F. Casings shall be designed for +/- 8" w.g. pressure at SMACNA leakage rates.

G. Supports. Provide welded structural members as required around entire base of unit to ensure adequate support of the complete unit. Base rails shall be equipped with lifting lugs at the unit corners.

2.4 FAN SECTION

A. All fans shall meet the scheduled type, size and performance and shall not exceed the horsepower specified on the schedule. Fan base assembly shall be fabricated from welded structural steel. Fan assemblies shall be independently isolated with 2" spring-type vibration isolators.

B. Supply fans shall be [double-inlet, squirrel-cage, centrifugal fans with forward curved or air foil wheel] or [SWSI plenum fans, with air foil wheels] and constructed for full AMCA Class II or Class III as required. All fans shall bear the AMCA seal. Manufacturer shall provide fan curves identifying the surge point lines for each fan.

C. Provide guards for all moving equipment including fan belts, plenum fan guards and plenum fan inlet guards. Provide 12" x 12" removable covers for access to grease bearings.

D. Fan wheels shall be statically and dynamically balanced prior to fan assembly. Completed assemblies shall be dynamically IRD balanced in two planes to 0.080 in/sec or less at design

RPM with project belts and sheaves. Fan assemblies exceeding allowance shall be field balanced at manufacturer's expense.

E. Fan bearings shall be heavy-duty, pillow block, self-aligning ball or roller type, and grease lubricated. Bearings shall be selected for a minimum L-50 life of 200,000 hours, at the maximum horsepower and operating speed for classification.

F. Extended lube lines shall be provided and extended to the outside of the fan cabinet.

G. Fan shafts shall be solid turned and polished steel. Shafting shall be selected for operations not to exceed 70% of first critical speed. Shaft shall be "ring gauged" for precision fit in bearing journals. Each fan submittal shall include complete shaft material and dimensional specification for owner's use for shaft replacement.

H. Sheaves and Belts. All sheaves and belts shall be provided with a 1.5 service factor. Fixed pitch sheaves shall be provided on motors larger than 15 horsepower. Belts shall be oil and heat resistant.

I. Drives. Drives shall be driven by electrical motors through short center V-belt drives with cast-iron sheaves. All sheaves (motor and fan) shall be dynamically balanced and matched. In no case shall the driven pulley diameter exceed 0.57 of the drive pulley, or the number of drive belts increased if necessary to meet this requirement.

J. Motors.

1. Acceptable Manufacturers:

   a. Baldor
   b. Marathon
   c. Reliance
   d. Century

2. Provide grease-lubricated ball bearings with alemite fittings.

3. Provide fan motors that will not overload when scheduled fan rpm is increased 10%. Submit a fan curve for each scheduled unit showing operating points at scheduled conditions and at scheduled rpm increased 10%.

4. Motors shall be 1800 rpm, ODP (for indoor application), Reliance Electric Model XE or approved equal, premium high-efficiency NEMA design B rated for inverter duty.

Motor HP	Full Load Nominal Efficiency	3/4 Load Efficiency	2/4 Load Efficiency
3	88.5	88.8	87.5
5	89.5	89.5	89.2
7-1/2	91.0	91.0	90.8
10	91.0	91.0	90.8
15	91.7	91.7	91.4
20	93.0	93.0	93.0
25	93.0	93.0	93.0
30	93.0	93.0	93.0

40	93.8	94.0	94.0

Provide motor wiring in sealtight conduit to junction box mounted on unit exterior.

2.5 MOTORS CONTROLLED BY VFD

A. General Requirements - Shaft Grounding:

1. All motors operated on variable frequency drives shall be equipped with a maintenance free, conductive micro fiber, shaft grounding ring with a minimum of two rows of circumferential micro fibers to discharge damaging shaft voltages away from the bearings to ground, AEGIS Bearing Protection Ring.

2. Application Note: Motors up to 100HP shall be provided with one shaft grounding ring installed either on the drive end or non-drive end. Motors over 100HP shall be provided with an insulated bearing on the non-drive end and a shaft grounding ring on the drive end of the motor. Grounding rings shall be provided and installed by the motor manufacturer or contractor and shall be installed in accordance with the manufacturer's recommendations.

B. General Requirements - High Frequency Bonding:

1. All motors operated on variable frequency drives shall be bonded from the motor foot to system ground with a high frequency ground strap made of flat braided, tinned copper with terminations to accommodate motor foot and system ground connection.

2. Application Note: Proper grounding of motor frame for all inverter-driven induction motors.

3. References: ABB Technical Guide No. 5

a. Allen Bradley Publication 1770-4.1 Application Data, Industrial Automation Wiring and Grounding Guidelines

C. Variable Frequency Drive

1. Unit motors for air handling units, where scheduled, will be driven by a variable frequency drive as specified in Section 23 09 00.A, VARIABLE FREQUENCY DRIVES, supplied by mechanical contractor.

2.6 COILS

A. Standards. Supply products of leading manufacturers with dependable published ratings, or equal. Certify performance in accordance with ARI Standard 410-72. Submit coil descriptive literature and rating information for review.

B. Fabrication. Construct coils of 5/8-inch O.D. copper tubes with aluminum fins bonded to the tubes.

C. Mount in a stainless steel casing permitting removal of coil from unit. Coil sections shall have heavy-duty coil tracks extending the full width of the unit.

D. Fins may be either plate type, with tubes mechanically bonded into the fins, or ribbon type, helically wound on individual tubes. Provide a tight, mechanical bond between fins and tubes. Use a minimum of six and a maximum of 10 fins per linear inch of tube.

E. Design coil section to prevent condensate carryover at face velocities greater than design velocities.

F. Water Coils. Provide chilled water coils. Balance the circuits for equal pressure drop of no more than 10 feet on coils of 6 rows or fewer, nor more than 15 feet for coils with 8 rows or more.

G. Arrange each circuit for counterflow cooling with bottom supply connections. Provide drain and vent connections at bottoms and top. Furnish access holes and covers. Locate coil headers at the same end of the coil.

H. Select water coils for approximately 3 to 4 feet per second velocity (2 fps minimum, 5 fps maximum and 250 psig working pressure. Provide minimum .025 inch wall tubes and .008 inch fins.

I. Supply and return connections shall be red brass or schedule 40 black steel and shall be clearly marked.

J. Heating Coils.

1. Hot Water. Provide hot water coils two rows deep except where otherwise noted. Design and construct hot water coils the same as cooling coils.

K. Steam. Provide steam coils designed and constructed the same as hot water coils.

L. Steam. Inner distributing tube (nonfreeze type) coils shall have a minimum outer tube diameter of 1 inch with a 5/8 inch diameter inner distributing tube. Tubing shall be individually finned with smooth aluminum/copper fins. Coils shall have galvanized steel casings.

M. Electric. Heating coils shall have 80% nickel, 20% chromium resistance coils, insulated by floating ceramic bushings and supported in an aluminized or galvanized steel frame. The bushings shall be recessed into embossed openings and stacked into supportive brackets spaced on not more than 4-inch centers. Thermal cutouts for primary and secondary over-temperature protection shall be provided to meet UL and NEC requirements. Provide with disconnect switch, air flow switch, control transformer, NON or NOS fuses, and insulated terminal box. Electric heating coils must be manufactured in accordance with Section Duct Heaters, as applicable.

N. Direct Expansion Coils.

1. Provide direct expansion coils designed for use with thermostatic expansion valves and R-22 refrigerant. Use split coils, where scheduled.

2. Furnish multi-circuit, pressure-type distributors as required for each coil. Size and circuit distributors for uniform refrigerant distribution and for efficient operation under varying load conditions.

3. Provide coils with suitable conditions for auxiliary oil return lines. Provide suction headers with connections for auxiliary oil return lines and for balance lines.

4. Cooling Coil Drip Pan. Provide a double drip pan, insulated between pans.

5. Fabricate the drip pan from welded stainless steel sheets, reinforced as required.

6. Provide a large threaded drain connection on both sides at the low point of the pan.

7. Insulate the drip pan so that the bottom will not condense moisture at 85°F dry bulb and 80°F wet bulb.

8. Where coils are stacked, there shall be an intermediate drain pan with drop tubes at either end to drain condensate to main pan without flooding the lower coil.

2.7 FILTERS

A. Slide Racks. Provide and arrange suitable galvanized filter slide racks to permit easy removal of filters from the accessible side of unit.

B. Replacement Filters. Furnish one spare set of all air conditioning system filters.

C. Prefilters. 30% efficient, 2-inch thick pleat, Farr 30/30.

D. Final Filters. 65% efficient, 12-inch thick cartridge type.

E. Provide two (2) complete sets of all types of filters, one as specified and one construction set shipped within the unit.

F. A magnehelic differential pressure gauge for measuring the pressure drop across each filter bank shall be factory installed. Gauge shall be red-lined at maximum static pressure.

2.9 EXTERNAL RECEPTACLE

A. Provide one 120-volt GFI receptacle on unit exterior and wire into single 120-volt connection point for power by Electrical Contractor.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air handling unit according to manufacturer’s instructions.

B. Make ductwork connections to unit discharge plenum using bell-mouth fittings.

3.2 START-UP

A. Equipment start-up: When installed and connected, the unit shall be inspected, checked, and approved as ready for operation by the mechanical contractor before unit is initially operated. The contractor shall then initiate and thoroughly check the unit operation, make or direct all adjustments necessary to place the unit in satisfactory operation, and certify [in writing] that the unit is properly installed, connected and operating. The equipment shall not be placed in service until that certification is received. Also provide instruction of Owner's personnel on operation and maintenance after certification.

B. Owner's Instruction: After the AHU is operating normally, provide instructional time with the Owner's personnel to review the maintenance manuals and perform each step necessary for startup, shutdown, troubleshooting, and routine maintenance. This service orientation shall be scheduled through the contractor so that they may observe the training sessions.

END OF SECTION 23 73 00

SECTION 23 82 19.01 - CASED FAN COIL UNITS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section specifies horizontal draw-through cased fan coil units for concealed overhead installation.

1.2 RELATED WORK

A. Division 23 - HVAC.

1. Electric Motors.

2. Insulation.

3. High Temperature Piping Insulation.

4. Low Temperature Piping Insulation.

B. Division 26 - Electrical. Motors.

PART 2 - PRODUCTS

A. Assembly.

1. Provide a unit of horizontal draw-through design for concealed overhead installation.

2. Provide units complete with coils, motors and drives.

3. Furnish minimum 18-gauge galvanized steel casings with one-inch thick, 1 ½ pound minimum density insulation. Provide foil facing for insulation or galvanized inner liner.

4. Make provision for duct connections at each end of the fan coil unit.

B. Coils.

1. Provide 1/2-inch outside diameter copper tubes and up to 11 aluminum fins per inch.

2. Provide manual air vents and drain plugs for each coil.

3. Allow no more than 10 feet of water pressure drop.

C. Motors.

1. Provide motors of the open drip-proof type with permanently sealed ball bearings and a minimum service factor of 1.15..

2. Wire the motors to a unit-mounted control box.

3. Provide built-in thermal overload protection.

D. Fans.

1. Provide forward curved, centrifugal fans with adjustable speed V-belt drives.

2. Support the fan shaft with heavy-duty permanently sealed ball bearings.

3. Supply units with only one fan per unit. Provide with fan status switch wired to control box.

E. Drain Pan. Provide heavy-duty, rust-inhibited drain pans extending under coils, and pipe connection assembly within units. Provide primary and secondary drains and a condensate overflow switch to de-energize the unit upon a rise in condensate level.

F. Filters. Provide two-inch thick, 30% efficient filters, complete with dirty filter switch wired to control box.

G. Coil Valving. Provide coil piping package for each coil consisting of ball valve and strainer on supply piping and flow setting valve and two-way electric control valve on return piping.

H. Control Box.

1. Mount control box on outside of unit.

2. Provide with termination for fan motor, manual disconnect, control transformer, terminations for condensate overflow switch, fan status switch, dirty filter switch and interface connections to central DDC system.

PART 3 - EXECUTION

A. Coil connections are detailed on the drawings.

END OF SECTION 23 82 19.01

SECTION 26 00 00 - ELECTRICAL GENERAL PROVISIONS (REVISED)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Architectural Plans and Specifications, the General Conditions, Supplementary General Conditions and other requirements of Division 01, the Structural Plans and Specifications, the Mechanical Plans and Specifications, the Civil Plans and Specifications, and the Electrical Plans apply to the work specified in the Electrical Sections, and shall be complied with in every respect. The Contractor shall examine all of these documents, which make up the Contract Documents, and shall coordinate them with all electrical work on the Electrical plans and in the Electrical Sections of these Specifications.

B. Refer to architectural specifications and drawings for project alternate descriptions.

1.2 SUMMARY

A. The work covered by the electrical specifications shall include the furnishing of all materials, labor, transportation, tools, permits, fees, utilities (electrical, telephone and cable television services), and incidentals necessary for the complete installation of all electrical work required in the contract documents and specified herein. The intent of the contract documents is to provide an installation complete in every respect. In the event that additional details or special construction may be required for the work indicated or specified in this section or work specified in other sections, it shall be the responsibility of the Contractor to provide all material and labor which is usually furnished with such systems in order to make the installation complete and operative.

B. The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of other trades. The Contractor shall visit the site and thoroughly familiarize himself with the existing conditions that affect the work and to verify all dimensions. The Contractor shall advise the Architect of any discrepancy prior to bidding. The submission of a bid shall be deemed evidence of the Contractors site visit, the coordination of all existing conditions, and the inclusion of all consideration for existing conditions.

C. Electrical services and connections to motors and appliances furnished by others including, but not limited to, heating ventilation and air conditioning equipment, plumbing equipment and associated controls, and equipment specified by other specification divisions included in the Construction Documents.

1.3 DRAWINGS AND SPECIFICATIONS

A. These Specifications are accompanied by Drawings of the building and details of the installations indicating the locations of equipment, piping, ductwork, outlets, light fixtures, switch controls, receptacles, etc. The Drawings and these Specifications are complementary to each other, and what is required by one shall be as binding as if required by both. Phase, neutral and switch leg indications are shown only where it is considered that clarification is required to indicate typical wiring methods required.

B. If any departures from the contract documents are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted in writing to the Architect for review. No departures shall be made without prior written approval of the Architect.

C. The interrelation of the Specifications, the Drawings, and the Schedules is as follows: The Specifications determine the nature and quality of the materials, the Drawings establish the quantities, approximate dimensions and details, and the Schedules give the performance characteristics. Should the Drawings disagree in themselves, or with the Specifications, the better quality or greater quantity of work or materials shall be estimated upon, and unless otherwise directed by the Architect in writing, shall be performed or furnished. In case the Specifications should not fully agree with the Schedules, the latter shall govern. Figures indicated on Drawings govern scale measurements and large scale details govern small scale Drawings. In case of disagreement between Specifications and Drawings, see Division 1 of these Specifications for clarification.

D. Items specifically mentioned in the specifications but not shown on the contract drawings and/or items shown on the contract drawings but not specifically mentioned in the specifications shall be installed by the Contractor under the appropriate section of work as if they were both specified and shown.

1.4 REFERENCE CODES AND STANDARDS, REGULATORY REQUIREMENTS

A. Standards of the following organizations as well as those listed in Division 01, may be referenced in the specification. Unless noted otherwise, references are to standards or codes current at the time of bidding.

1. National Electrical Code (NEC) - 2014 Edition.

2. City of San Antonio 2015 Chapter 10 - Building Related Codes, Article VI - Electrical Code

3. Electrical Safety in the Workplace - NFPA 70E, 2012 Edition.

4. Occupational Safety and Health Act (OSHA).

5. ANSI 17.1 Safety Code for Elevators and Escalators.

6. NFPA 101 - Life Safety Code - 2015 Edition.

7. National Fire Protection Association (NFPA-780) - Lightning Protection Code - 2014 Edition.

8. International Energy Conservation Code IECC-2015 Edition.

9. National Fire Protection Association (NFPA-110) - Emergency and Standby Power Systems - 2014 Edition.

10. International Building Code (IBC) - 2015 Edition.

11. Texas Accessibility Standards TAS - TDLR - 2012 Edition.

12. Underwriters Laboratory Requirements and Listings for Use in Fire Protective Signaling Systems.

13. ASHRAE 90.1 Energy Standards for Buildings except Low-Rise Residential Building - 2013 Edition.

14. NEMA - National Electrical Manufacturer's Association.

15. NECA - National Electrical Contractors Association.

16. IEEE Standard 1100 - Powering and Grounding Sensitive Electronic Equipment.

17. IEEE Standard 142 - Grounding of Industrial and Commercial Power Systems.

18. IEEE Standard 241 - Electric Power Systems in Commercial Buildings.

19. IEEE Standard 242 - Protection and Coordination of Industrial and Commercial Power Systems.

20. IEEE Standard 446 - Emergency and Standby Power Systems for Industrial and Commercial Applications.

21. International Fire Code - 2015 Edition.

22. City of San Antonio 2015 Chapter 11, International Fire Code with Local Amendments Ordinance 2015-01-29-0067

23. NFPA 30 - Flammable and Combustible Liquids Code - 2012 Edition.

B. Work, materials and equipment must comply with the latest rules and regulations of the following.

1. National Electrical Code (NEC) and the City of San Antonio Electrical Code

2. Electrical Safety in the Workplace (NESC)

3. Occupational Safety and Health Act (OSHA)

4. American with Disability Act (ADA) and Texas Accessibility Standards (TAS-TDLR)

5. American Society for Testing and Materials (ASTM)

6. Applicable local state and federal codes, ordinances and regulations

C. Discrepancies. The drawings and specifications are intended to comply with listed codes, ordinances, regulations and standards. Where discrepancies occur, immediately notify the Owner’s representative in writing and ask for an interpretation. Should installed materials or workmanship fail to comply, the Contractor is responsible for correcting the improper installation. Additionally, where sizes, capacities, or other such features are required in excess of minimum code or standards requirements, provide those specified shown.

D. Contractor shall obtain permits and arrange inspections required by codes applicable to this Section and shall submit written evidence to the Owner and Engineer that the required permits, inspections and code requirements have been secured..

E. The Contractor shall resolve any code violation discovered in the contract documents with the Architect prior to award of the contract.

F. In any instance where these Specifications call for materials of a better quality or larger size than required by the codes, the provisions of these Specifications shall take precedence. The codes shall govern in case of direct conflict between the codes and the specifications.

1.5 REQUEST FOR INFORMATION

A. The Contractor may, after exercising due diligence to locate required information, request from the Consultant clarification or interpretation of the requirements of the Contract Documents. The consultant shall respond to such Contractor's requests for clarification or interpretation. However, if the information requested by the Contractor is apparent from field observations, is contained in the Contract documents or is reasonably inferable from them, the Contractor shall be responsible to the Owner for all reasonable costs charged by the consultant to the Owner for the Additional Services required to provide such information.

1.6 CONTRACT CHANGES

A. When submitting proposed changes, both additive and deductive, the Contractor shall include and set forth in clear and precise detail, a breakdown of labor and materials along with estimated impact on the construction schedule. Contractor shall furnish spreadsheets that include quantities, unit costs and extensions. Any special equipment, i.e., fixtures, switchgear, special systems included in change proposal, shall be listed separately on vendor-supplied quote with detailed itemization and unit costs, with additions and deletions listed separately. The vendor supply quotes shall be notarized by a notary public licensed in the State of Texas.

1.7 ELECTRICAL UTILITIES

A. The contract documents reflect the general location, voltage, ampacity, size and manner of routing for all utilities known to be required on this project. It shall be the responsibility of the Contractor to visit the site, meet with the local Electrical, Telephone Company and cable television personnel in order to coordinate and confirm the exact requirements for all electrical and telephone utilities. The bid submitted by the Contractor shall include costs for all such coordination work as well as any and all utility, telephone and cable television company charges and/or fees. Refer to Section 26 00 01 - Electrical Utilities.

1.8 TEMPORARY SERVICES

A. It shall be the responsibility of the Contractor to provide a complete system for temporary electrical power service and distribution. The Electrical Contractor shall provide the necessary wiring, connections, service switches, poles, wiring protective devices, lighting fixtures, lamps, outlet devices, disconnect switches, etc., as required for temporary lighting. In addition, a similar system shall be provided for the distribution of single and three phase power of voltage levels and adequate ampacity as required to facilitate the construction of the project. These services shall be installed in accordance with requirements of the National

Electrical Code (NEC), the Occupational Safety and Health Administration (OSHA), and the National Electrical Safety Code (NESC).

B. The General Contractor shall pay the cost of all electrical energy consumed on the job site throughout the entire construction period.

C. Remove all temporary wiring upon completion of the work.

1.9 BUILDING CONSTRUCTION

A. It shall be the responsibility of the Contractor to consult the Architectural and Engineering Drawings and Details so as to thoroughly familiarize himself with the type and quality of construction to be provided on this project.

B. The electrical drawings are diagrammatic in character and cannot show every connection in detail or every line or conduit in its exact location. These details are subject to the requirements of local ordinances and also structural and Architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall coordinate with all other trades in order to avoid interference between the various phases of work.

C. The approximate location of electrical items is indicated on the electrical drawings. These drawings are not intended to give complete and exact details in regard to location of outlets, apparatus, etc. Exact locations are to be determined by actual measurements at the job site and will in all cases be subject to the approval of the Architect. The Architect reserves the right to make any reasonable changes in the location indicated without additional cost.

1.10 BUILDING DEMOLITION

A. Unless noted otherwise, remove all electrical materials and equipment from areas designated for demolition. Refer to electrical and architectural drawings for areas designated for demolition.

B. Where electrical equipment is indicated for removal, the Contractor shall remove all associated wiring back to the last active outlet or to the panelboard. If all electrical equipment on the circuit is scheduled for removal, the Contractor shall remove the associated conduit system where run exposed or accessible in ceilings or floor plenums. Where conduit is concealed in walls, floors or ceilings the exposed portion of the conduit shall be cut off flush with the building surface and the concealed portion shall be capped and abandoned in place. All voids left by the removal of electrical equipment shall be filled with grout and finished to match existing adjacent surfaces. Removal of any electrical equipment shall be performed in such a way not to interfere with ongoing daily building operations.

C. All salvage shall remain the property of the Owner and be delivered to a location, on site, as designated by the Owner. In the event the Owner does not desire to retain the salvage material, the material becomes the property of the Contractor and shall be disposed of by the Contractor.

D. Existing electrical services and controls to items being removed by others must be disconnected as a requirement of this section.

E. Wherever a new to existing electrical connection is required, the Contractor shall provide all materials (e.g., junction boxes, conduit, fittings, wiring and wiring connections) and labor required to make the connections.

F. The Contractor shall be responsible to maintain all branch circuits, in an operational condition, in all areas not included under this contract that may be affected during the demolition.

G. The Contractor shall field verify power connection points of devices not scheduled for removal, by means of circuit tracing, prior to any rewiring. Equipment and devices not scheduled for removal and their associated branch circuitry shall remain in their original operating condition. Any equipment and devices not scheduled for removal disconnected during demolition shall be reconnected. The contractor shall provide all electrical materials and components to reconnect equipment and devices.

H. The Contractor shall provide new wiring for all branch circuits and feeders. Splicing new wiring to old wiring is not acceptable. Existing conduit system may be reused and extended as required unless visible conduit damage is noted, in which case the existing conduit system shall be replaced with a new conduit system.

1.11 CONTRACTOR QUALIFICATIONS

A. An acceptable contractor for the work under this division shall be a specialist in this field and have the personal experience, training, skill and the organization to provide a practical working system. If required, he shall be able to furnish acceptable evidence of having contracted for and installed not less than three systems of comparable size and type to this one, that have served their owners satisfactorily for not less than three years.

B. The foreman or superintendent for this work shall have had experience in installing not less than three such systems and shall be approved by the Architect before the work is begun. Adequate and competent supervision shall be provided to ensure first class workmanship and installation.

C. Work shall be executed and all materials installed in accordance with the best practice of the trades in a thorough, substantial, workmanlike manner by competent workmen, presenting a neat appearance when completed.

D. The Contractor shall be responsible for all construction techniques required for all electrical systems specified and shown on the drawings.

1.12 OBSERVATION OF THE WORK

A. Architect's authorized representative and/or owner's observer shall have the right to observe the work at any time. The contractor shall have a representative present when his work is being observed, and he shall give assistance, as may be required, to the architect's representative. Recommendations made by observer shall be promptly carried out, and all unsatisfactory material and/or workmanship shall be replaced to the satisfaction of the Architect.

1.13 SHOP DRAWINGS AND PRODUCT DATA

A. Submit shop drawings and product data as specified in Division 1 - General Requirements. Submittal data shall indicate the manufacturer's name, published performance, ratings and/or capacity data, detailed equipment drawings for fabricated items, wiring diagrams, installation instructions and other pertinent data. All submittals shall bear the specification section number they are related to or the specific sheet where products are shown on the contract drawings which are not referenced by the specifications. Where literature is submitted covering a group or series of similar items, the applicable items must be clearly indicated. Submittals shall be clearly marked highlighting all proposed equipment and devices to be used in this project. Submittals that do not comply with all requirements will be returned without review. Shop drawings shall note all deviations from contract documents.

B. Submittal review is only for general conformance with design concept of project and general compliance with the contract documents. The Contractor is responsible for conforming and correlating equipment dimensions at job site; for information which pertains to fabrication processes or construction techniques; and for coordination of work of all trades. Review of submittals shall not relieve the Contractor of responsibility for deviation from requirements of contract documents or errors of omissions in submittals.

C. Contractor's Check. Submittal of shop drawings, product data and samples will be accepted only when they are submitted by the Contractor. Each submittal shall indicate by signed stamp that the submittals have been checked and that they are in accordance with contract documents and that dimensions and relationship with work of other trades have been checked. Submittals that have not been checked and signed by the Contractor will be returned for checking before being reviewed.

D. Engineer's review of submittals constitutes an acknowledgment only and in no way relieves the contractor of full responsibility for providing all systems in accordance with the intent of the contract documents. Any material provided by this contractor without approved shop drawings constitutes the contractor's agreement to comply with the engineer's intent whether specified, shown or implied.

E. Organize data in a 3-ring binder indexed by specification section. Submittal data not organized in a 3-inch ring binder indexed by specification sections and clearly highlighting the products the contractor proposes to use in the project will be rejected without preview. Show any revisions to equipment layouts required by use of selected equipment.

F. Submittals are required for, but not limited to, the following items:

1. Shop Drawings.

(a) Fire alarm system.

(b) Submit 1/4 inch scale drawings for all electrical rooms for review prior to any rough-in.

(c) Panelboards (branch circuit and distribution), and load centers.

(d) Provide manufacturer’s prepared integrated shop drawings indicating the manufacturer’s recommended occupancy sensor type and recommended locations to all occupancy sensors for all areas with occupancy sensors.

(e) Surge protection devices (SPD’s/TVSS).

(f) Emergency generator.

(g) Automatic transfer switches.

(h) Switchboards.

(i) Pull boxes.

2. Product Data.

(a) Battery packs.

(b) Battery Chargers.

(c) Boxes (junction and pull boxes).

(d) Manholes and splice pull boxes.

(e) Surge protection devices (SPD's/TVSS).

(f) Switchboards.

(g) Enclosed safety switches (disconnect switches).

(h) Fuses and circuit breakers.

(i) Grounding materials and equipment.

(j) Insulated conductors, conductors termination materials, and conductors pulling compound.

(k) Lighting fixtures, including lamps and ballasts.

(l) Light standards (area light fixtures).

(m) Metal framing and supports.

(n) Motor starters.

(o) Electrical labeling and identification products.

(p) Raceways, raceway fittings and conduit bodies.

(q) Time switches and photocells.

(r) Wiring devices and wiring device cover plates.

(s) Electrical conductors pulling compound.

(t) Cold shrink cable end caps.

(u) Link-seal sleeves.

(v) Lugs.

(w) Occupancy sensors.

(x) Emergency generator.

(y) Automatic transfer switches.

(z) Panelboards.

(aa) Fire alarm system.

(bb) Conduit penetration seals (Link-Seal)

(cc) Cold shrink cable end caps

(dd) Surface mounted raceways

G. Each manufacturer is required to review the system design as related to the proper operation of his equipment, including electrical requirements, automatic controls, mechanical systems and equipment, locations and related items. Submit a letter with the submittals from the manufacturer stating that his equipment will operate satisfactorily under the design conditions, including air flows for all duct mounted smoke detectors. The manufacturer will also be required to review the final installation at the site and submit a second letter stating that the installation conforms to the design criteria and that the equipment will operate satisfactorily as installed, including air flows for all duct mounted smoke detectors. Furnish certification for the following systems:

1. Fire alarm system.

2. Duct mounted smoke detector.

3. Surge protection devices (SPD's).

4. Occupancy sensors.

5. Emergency generator.

6. Automatic transfer switches.

H. Provide the following with each submittal:

1. Catalog cuts with manufacturer's name clearly indicated. Applicable portions shall be circled and non-applicable portions shall be crossed out.

2. Line-by-line specification review by equipment manufacturer and contractor with any exceptions explicitly defined. Submittals received without line-by-line specification review by equipment manufacturer and contactor will be rejected without review.

I. Equipment Layout Drawing: Provide 1/4-inch scale minimum drawings indicating electrical equipment locations prior to any rough-in. Dimensions for housekeeping pads should be

indicated on these drawings. Indicate routing of conduit 2 inches and over on these drawings.

1.14 SUBSTITUTIONS AND PRODUCT OPTIONS

A. Within 30 days after contract date, submit to Architect a complete list of major products proposed to be used, with the name of the manufacturer and the installing subcontractor.

B. Contractor's Options.

1. For products specified only by reference standard, select any product meeting that standard.

2. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named, which complies with the specifications.

3. For products specified by naming one or more products or manufacturers and "or equal," Contractor must submit a request for substitutions for any product or manufacturer not specifically named.

C. Manufacturers' names and catalog numbers specified under sections of Division 26 are used to establish standards of design, performance, quality and serviceability and not to limit competition, nor to discriminate against an "approved equal" product of another manufacturer. Equipment of equal design to that specified, will be acceptable upon approval by the Engineer. The Architect/Engineer will consider written requests for substitution of specified products, if reviewed fourteen days prior to bid date. After bid date, request for substitution will be considered only in cases of product unavailability or other conditions beyond control of the contractor. It shall be the contractor's responsibility to:

1. Personally investigate the proposed substitute product to determine that it has all the same accessories and is equal or superior in all respects to that specified.

2. Provide the same guarantee for the substitution that he would for that specified.

3. Coordinate the installation of the equipment which he proposes to substitute with all trades and includes the costs for any changes required for the work to be complete in all respects. The contractor will prepare shop drawings where required by the Architect/Engineer or where dimensions vary.

4. Provide itemized cost breakdown including material and labor for the proposed product substitutions. Submit complete design and performance data. Refer to Section 26 00 00, Paragraph 1.6.A for additional requirements.

1.15 PROJECT RECORD DOCUMENTS

A. Throughout progress of the work of this Contract, maintain an accurate record of all changes in the Contract Documents. Upon completion of the Work of this Contract, transfer the recorded changes to the AutoCad drawing files and specification word processing files. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff. Thoroughly coordinate all changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to properly show the change. Include all

addenda items, request for information Architect's Supplemental Instructions and any other document that causes a change in the Construction Documents. Accuracy of records shall be such that future search for items shown in the Contract Documents may reasonably rely on information obtained from the approved Record Documents.

B. The Contractor shall mark any deviations on a daily basis. The Architect will visit the site and will require to see the "As-Built" documentation periodically. If the Contractor does not keep an accurate set of as-built drawings, the pay request may be altered or delayed at the request of the Architect. Mark the drawings with a colored pencil. Record installed feeder conduits. Dimension the location and elevation of the conduit.

C. Record Documents shall consist of the following:

1. Job Set: Promptly following award of Contract, secure from the Architect, at no charge to the Architect, one complete set of all electrical documents comprising the Contract.

2. Final Record Documents: Obtain the AutoCad drawings files and the specification word processing files at the Contractor's expense.

(a) The Contractor shall transfer all change data shown on the job set of to the corresponding electronic files, coordinating the changes as required, and clearly indicating at each affected detail and other drawing the full description of all changes made during construction and the actual location of items. Call attention to each entry by drawing a "cloud" around the area or areas affected.

3. Submit the completed total set of Record Documents to the Engineer as described above. Participate in review meeting or meetings as required by the Engineer, make all required changes in the Record Documents, and promptly deliver the final Record Documents to the Architect. Upon completion of Work, the Contractor shall certify the "Record Drawings" for correctness by signing the following certification:

CERTIFIED CORRECT (3/8" high letters)

(Name of the Contractor)

By

Date

(Name of the Sub-Contractor)

By

Date

D. Deliver record drawings to the Architect in the number and manner specified in Division 1 - General Requirements.

1.16 OPERATION AND MAINTENANCE INSTRUCTIONS

A. Prepare and submit sets of product data, shop drawings, wiring diagrams, instructions and parts lists for operating and maintaining the electrical equipment and systems installed. Include in the instructions a description of normal adjustments and a list of items to be lubricated. Specify the type and frequency of lubrication required. Provide special servicing tools as required for this equipment. Also include all approved submitted data, all warranties on equipment, contractor's warranty. Deliver manuals and tools to the Architect as a condition of final acceptance. Refer to Division 01 for other requirements. The Owner's manual shall include:

1. Manufacturer's installation instruction brochures.

2. Manufacturer's local representative and/or distributor's name and address.

3. Manufacturer's operating and maintenance brochures.

4. Manufacturer's internal wiring diagram.

5. Contractor's installation wiring diagram.

6. Control system installation drawings.

7. Replacement part number listings and/or descriptions.

8. Framed operating instructions when required.

9. Manufacturer's warranties and guarantees.

B. This manual shall include all of the listed data bound into a permanent hard-back, three ring binder(s) identified on the cover as "Operating and Maintenance Manual" with additional cover display of the names and location of Building, the Owner, the Architect, the Engineers, the General Contractor, and the Contractors installing equipment represented in the brochure.

C. Contents of the manual shall be grouped in sections according to the various sections of Division 26, and shall be listed in a Table of Contents. Sections shall be organized as follows:

1. Each "tab" in the brochure shall identify the grouping of all literature required for a single class of equipment; i.e., "transformers", "lighting fixtures", "switchgear", etc., for all types of equipment on the job.

2. Contents under each "tab" shall refer to a single class of equipment, and shall be arranged in the following sequence: First, the manufacturer's installation brochure; second, the manufacturer's operating and maintenance brochure; third, the manufacturer's installation wiring diagram; fourth, the Contractor's field wiring diagram; if different, and fifth, the manufacturer's brochure listing replacement part numbers and description.

3. Provide final tab "Warranties and Guarantees" behind which all such items will be located.

D. Upon completion of the work and at a time designated by the Architect, instruct the Owner's operating personnel in operation and maintenance of electrical equipment and systems.

Before proceeding with instruction, prepare a typed outline in triplicate listing the subjects that will be covered. Submit the outline for review by the Architect. At the conclusion of the instruction, obtain the signatures of the people instructed on each copy of the outline to signify that they have a proper understanding of the operation and maintenance of the system. Submit the signed outlines to the Architect as a condition of final acceptance. Provide a minimum of 8 hours of general instruction in addition to any time specified in other sections of Division 26.

E. Upon completion of the work, instruct the Owner's operating personnel in operation and maintenance of electrical equipment and systems furnished and installed under Division 26. The specified training shall be given at a time and location designated and provided by the Owner for personnel selected by the Owner, in addition to any necessary on-site orientation and training. A training program shall be submitted with materials, instructor qualifications and a proposed schedule, a minimum of 45 days prior to the proposed training for each electrical system in the project. The Owner reserves the right of approval of each training course. A minimum of 12 (other quantity if appropriate) bound copies of training materials shall be provided at the time of training, with additional copies submitted at the time of Substantial Completion included with the O & M Manuals. At the conclusion of instruction, obtain the signatures of the people instructed on one copy of the program to signify that they have a proper understanding of the operation and maintenance of the system. Submit the signed program to the Architect/Engineer as a condition of final acceptance. Provide a minimum of 8 hours of general instruction in addition to any time specified in other sections of Division 26. All training sections shall be videotape recorded. Video recordings shall be provided to the Owner.

PART 2 - PRODUCTS

2.1 CONSTRUCTION MATERIALS

A. All materials shall be new and shall conform to the National Electrical Code and National Fire Protection Association requirements and shall be listed, inspected, and approved by the Underwriters Laboratories and shall bear the U.L. label where labeling service is available. The label or listing of the Underwriters Laboratories, Inc. will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this listing, the Contractor may submit a statement from a nationally recognized, adequately equipped independent testing agency, indicating that the items have been treated in accordance with required procedures, and that the materials and equipment comply with all contract requirements.

2.2 STANDARD PRODUCTS

A. All materials and equipment shall be standard catalog products of domestic manufacturers regularly engaged in the manufacture of products conforming to these specifications. Materials and equipment shall have been in satisfactory use at least two years prior to bid opening. Where custom or special items are required, these shall be fully described by drawings and/or material list which detail the item proposed for use on this project.

2.3 MANUFACTURERS' INSTRUCTIONS

A. The Contractor is fully responsible for furnishing the proper electrical equipment and/or material and for seeing that it is installed as intended by the manufacturer's written instructions. If needed for proper installation, operation, or start up, the Contractor shall

request advice and supervisory assistance from the representative of the specific manufacturer. The manufacturers' published instructions shall be followed for preparing, assembling, installing, erecting, and cleaning all materials and equipment. The Contractor shall promptly notify the Architect in writing of any conflict between the requirements of the contract documents and the manufacturer's directions and shall obtain the Architect's instructions before proceeding with the work. Should the Contractor perform any work that does not comply with the manufacturer's directions or instructions from the Architect, he shall bear all costs arising in connection with correcting the deficiencies.

2.4 RUST PREVENTION

A. All metallic materials shall be protected against corrosion. Exposed metallic parts of outdoor apparatus shall be given a rust inhibiting treatment and standard finish by the manufacturer. All parts such as boxes, bodies, fittings, guards, and miscellaneous parts shall be protected in accordance with the ASTM A123 or A153, except where other equivalent protective treatment is specifically approved in writing or specifically allowed for in other sections of this specification.

2.5 CAPACITIES AND SPACE LIMITATIONS

A. Capacities shall be not less than those indicated but shall be such that no component or system becomes inoperative or is damaged because of start-up or other overload conditions. Where approved equipment requires electrical power other than that indicated in the contract documents for the specified equipment, the Contractor shall be responsible to adjust protective devices, starter sizes, conductors, conduits, etc., to accommodate this approved device electrically.

B. The Contractor shall be responsible to verify that the equipment he proposes to provide will physically fit within the space indicated on the contract documents and that the required code clearances and maintenance access are maintained. Any space conflicts shall be noted in the submittals. Provide scale drawings to the Architect indicating proposed solutions to any space conflict for the Architects review and approval.

2.6 NAMEPLATES

A. Each piece of equipment shall have a nameplate from the manufacturer with the following information: name, address, catalog number, voltage, phase, full load amperes or horsepower, and/or other pertinent information on a plate securely attached to the equipment. All data on nameplates shall be legible at the time of final inspection.

PART 3 - EXECUTION

3.1 DELIVERY STORAGE AND HANDLING

A. The Contractor shall not receive any equipment at the job site until the equipment is ready to be installed or until there is suitable space provided to properly protect equipment from rust, weather, humidity, dust, and physical damage.

B. All equipment shall be protected in accordance with the manufacturer's recommendations and the requirements of NFPA 70B, Appendix I, titled "Equipment Storage and Maintenance During Construction". The Contractor shall replace all damaged or defective equipment with new equipment.

C. All equipment injured or damaged in transit from factory, during delivery to premises, while in storage on premises, while being erected and installed, and while being tested, until time of final acceptance, shall be replaced by this Contractor.

3.2 PROTECTION OF EQUIPMENT

A. During construction, protect switchgear, transformers, motors, control equipment, and other items from insulation moisture absorption and metallic component corrosion by appropriate use of strip heaters, lamps or other suitable means. Apply protection immediately on receiving the products and maintain continually.

B. Keep products clean by elevating above ground or floor and by using suitable coverings.

C. Take such precautions as are necessary to protect apparatus and materials from damage. Failure to protect materials is sufficient cause for rejection of the apparatus or material in question.

D. Protect factory finish from damage during construction operations and until acceptance of the project. Satisfactorily restore any finishes that become marred or damaged.

3.3 INSTALLATION

A. Cooperation with trades of adjacent, related or affected materials or operations, and of trades performing continuations of this work under subsequent contracts, is considered a part of this work. The Contractor is responsible to coordinate with other trades in order to effect timely and accurate placing of work and to bring together, in proper and correct sequence, the work of such trades. Provide coordination drawings showing exact size and location of sleeves, openings or inserts for electrical equipment in slabs, walls, partitions and chases.

B. Provide 4-inch thick concrete housekeeping pads for indoor floor-mounted equipment, except where direct floor mounting is required. Pour pads on roughened floor slabs, sized so that outer edges extend a minimum of 3-inches beyond equipment. Trowel pads smooth and chamfer edges to a 1-inch bevel. Secure equipment to pads as recommended by the manufacturer.

C. All equipment shall be installed plumb and level.

D. Permanently seal outdoor equipment at the base using concrete grout. Seal or screen openings into equipment to prevent entrance of animals, birds and insects. Use galvanized steel or copper mesh with openings not larger than 1/16-inch for screened openings. Seal small cracks and openings from the inside with silicon sealing compound.

E. Conceal electrical work in walls, floors, chases, under floors, underground and above ceilings except:

1. Where shown or specified to be exposed. Exposed is understood to mean open to view.

2. Where exposure is necessary to the proper function.

3. Where size of materials and equipment preclude concealment.

F. All equipment shall be installed in a manner to permit access to parts requiring service. All electrical equipment shall be installed in such a manner as to allow removal for service without disassembly of other equipment. All required National Electrical Code clearances must be complied with.

G. All electrical equipment shall have working clearances as required by the latest version of the National Electrical Code.

3.4 HOISTING, SCAFFOLDING, AND TRANSPORTATION

A. The Contractor shall provide all hoisting, scaffolding and ladders as required to set the equipment in place in the building.

B. The Contractor shall provide necessary transportation to facilitate the delivery of all materials, equipment, tools, and labor to project.

3.5 CLEANING

A. The Contractor shall, at all times, keep the premises free from accumulations of waste material or rubbish caused by him, his employees, or his work. This debris shall be removed, not only from the building, but also from the site and from any street or alley adjacent to the site.

B. At completion of the project, the Contractor shall remove all of his tools, scaffolding, and surplus materials.

3.6 CONDUIT SLEEVES AND PENETRATION SEALS

A. For conduits passing through outside walls, the conduit to wall penetration closures shall be "Link-Seal" as manufactured by Thunderline Corporation or Crouse Hinds. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the conduit and wall opening. Seals located underground shall be manufactured from stainless steel. Links shall be loosely assembled with bolts to form a continuous rubber belt around the conduit with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the conduit and wall opening. The seal shall be constructed so as to provide electrical insulation between the conduit and wall, thus reducing chances of cathodic reaction between these two members.

3.7 ACCESS DOORS

A. Furnish and install access doors in all inaccessible wall or ceiling locations as required for access to conduit bodies, junction and pull boxes, outlet boxes, and other electrical equipment requiring maintenance, adjustment or operation. Doors or panels required in acoustical ceilings are provided for under Division 08. However doors required in plaster, gypboard, masonry, or other solid wall or ceiling are included under this paragraph. Access doors are not indicated on the drawings. The contractor will be responsible for proper coordination in locating access doors for ease of operation and maintenance of concealed equipment.

B. Non-fire-rated access doors.

1. Furnish INRYCO/MILCOR approved equal with 16-gage frames, 14-gage panels, and 22-gage casing head. Provide continuous concealed hinges and flush screwdriver cam lock. Use Style K access doors for plastered surfaces, Style M for masonry or gypboard surfaces, and Style AP for acoustical plaster ceilings, with 18-gage panel and all galvanized construction.

C. Fire-rated access doors (1-1/2 hour label doors).

1. Furnish INRYCO/MILCOR or approved equal UL-listed 1-1/2 HR Label "B". Access doors with 16-gage steel frames, and 20-gage insulated sandwich type door panel. Provide door with an automatic closing and latching mechanism. Fire-rated access doors are required.

3.8 ELECTRICAL CONNECTIONS TO MOTORS, EQUIPMENT AND CONTROL SYSTEMS

A. Contractor shall coordinate with Division 23 and other divisions as required to verify all electrical requirements of those divisions. This is to include, but not be limited to, verification of power, voltage, phase and other characteristics as being compatible with that called for on the electrical drawings and Division 26 specifications, as well as that called for in Division 23 drawings and specifications or other divisions requiring electrical connections. This shall be done prior to placing orders for equipment or material, and prior to any rough-in, etc.

B. Motors are specified in Divisions 22 and 23. Electrical work includes the electrical connection of all motors, except those which are wired as a part of equipment. Connection of motors specified in Divisions 22 and 23 but not reflected on electrical drawings shall be included in Division 26 scope of work.

C. The contractor shall refer to and coordinate with Divisions 22 and 23 and other divisions included in the construction documents and provide all power connections for all equipment requiring power connections.

3.9 CUTTING AND PATCHING

A. Where it becomes necessary to cut through any wall, floor, or ceiling to install any work under this Section of the Contract, or to repair any defects that may appear up to the expiration of the guarantee period, such cutting shall be done under the supervision of the Architect by this Contractor. This Contractor shall not be permitted to cut or modify any structural members without the written permission of the Architect.

B. Patching of all openings cut by this Contractor, or repairing of any damage to the work of other trades caused by cutting or by the failure of any part of the work installed under this Contract, shall be performed by the appropriate trade but shall be paid for by this Contractor.

C. Any openings cut through exterior walls or roofs shall be provided with suitable covers, while they are left open, to protect the property or materials involved. Any openings cut through walls below grade shall be properly protected to prevent entrance of water or other damaging elements. All openings shall be waterproofed upon completion of the work as specified by the architect. Any openings through fire rated walls or floors shall be sealed to meet the minimum fire rating of wall or floor penetrated.

3.10 VIBRATION ISOLATION

A. The Contractor shall furnish and install vibration isolation means for all equipment and materials furnished under this contract to prevent the transmission of perceptible vibration, structure borne or air borne noise to occupied areas. Items requiring vibration isolation shall include:

1. All transformers shall be mounted on one inch (1") thick cork rib pads and/or rubber or steel spring isolator units properly sized, spaced, and loaded, which in turn shall rest on a 4" minimum concrete base.

2. Where transformers are to be suspended from the structure above, each hanger shall be equipped with double deflecting steel spring and rubber in shear anti-vibration hangers. The rubber in shear mounting for each hanger shall provide a static deflection at least equivalent to the static deflection for a 1/4" rubber pad. Anti-vibration mountings shall be equipped with adequate leveling mechanisms which do not interfere with proper hanger operation.

3. Electrical Conduit: Raceway systems shall be isolated from all dry type transformers and rotating or reciprocating machinery. Provide 12" of liquidtight flexible metal conduit per 1" of conduit diameter. The minimum length of flexible conduit used for isolation shall be 24".

3.11 CORE DRILLING

A. All penetrations through concrete floors and walls shall be coordinated and approved by the Structural Engineer. The Contractor shall scan the area of the proposed penetration prior to performing any work to ensure that there are no existing conduit systems, concrete reinforcing steel etc., that could be damaged by core drilling the concrete slab. The scan shall be performed using ground penetrating radar technology.

3.12 EXISTING FACILITIES

A. The Contractor shall be responsible for loss or damage to the existing facilities as used by his workmen, and shall be responsible for repairing or replacing such loss or damage. The Contractor shall send proper notices and receive written permission from the Owner to enter existing areas. Before beginning work in existing areas, make the necessary arrangements and perform other services required for the care, protection, and in service maintenance of all electrical, communication, plumbing, heating, air conditioning, and ventilating services for existing facilities. The Contractor shall erect temporary barricades with necessary safety devices, as required to protect personnel from injury, removing all such temporary protection upon completion of the work.

B. The Contractor shall provide temporary or new services to all existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being accomplished under this project.

C. Where existing construction is removed to provide working and extension access to existing utilities, the Contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, air conditioning ductwork, and equipment, etc., to provide this access and shall reinstall same upon completion of work in the areas affected.

D. Where partitions, walls, floors, or ceilings of existing construction are indicated to be removed and equipment located in these areas is required to remain in operation, the

Contractor shall remove and reinstall all equipment required for the operation of the remaining electrical systems. This is to include but is not limited to electrical switches, relays, fixtures, conduit, etc.

3.13 CONDITIONS OF EQUIPMENT AT FINAL ACCEPTANCE

A. At time of acceptance, the Contractor shall have inspected all installed systems to assure the following has been completed:

1. Fixtures are operating, lenses and reflectors are free of dust, debris, and fingerprints.

2. Panelboards have all conductors neatly formed, laced and made-up tight. Enclosures shall be vacuum cleaned, surfaces clean of stray paint, dust, grease and fingerprints. All circuit directories to be neatly typed and in place.

3. Wall plates and exposed switch and receptacle parts to be clean, free of paint, plaster, etc.

4. Safety and disconnect switches and motor starters to be vacuum cleaned of debris, dust and all surfaces free of stray paint, grease and fingerprints.

5. Switchgear, transformers and system devices shall be cleaned internally and externally and have all surfaces restored to initial surface conditions.

6. Touch-up all scratched surfaces using paint matching the existing equipment paint. Where paint cannot be matched, the entire surface shall be repainted in a color and manner approved by the Architect.

7. All electrical equipment shall bare proper labeling as specified under this section.

8. All wiring devices labeled with corresponding panelboard I.D. and circuit numbers.

9. All electrical switchgear and panelboards shall be provided with arc flash warning labels.

3.14 GUARANTEE

A. The Contractor shall guarantee all materials and workmanship for a period of twelve (12) months after the final acceptance of work.

END OF SECTION 26 00 00

SECTION 26 00 01 - ELECTRICAL UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies the furnishing and installation of necessary materials and making arrangements for the connection of electrical utilities for the project. The required utilities are electrical, telephone and cable television services.

1.2 REFERENCE STANDARDS

A. Comply with all service installation standards of the serving utility companies.

1.3 APPLICABLE PROVISIONS

A. Refer to Section 26 00 00 - Electrical General Provisions.

PART 2 - PRODUCTS

2.1 ELECTRICAL SERVICE

A. The contract documents reflect the general location, voltage, ampacity, size and manner of routing for all utilities known to be required on this project. It shall be the responsibility of the Contractor to visit the site, meet with the local Electrical and Telephone Company personnel in order to coordinate and confirm the exact requirements for all electrical, telephone and cable television utilities. The bid submitted by the Contractor shall include costs for all such coordination work as well as any and all utility and telephone company charges and/or fees.

B. Electrical service will be provided from the local utility company's system. The source characteristics shall be 208/120 volt, three phase, four wire. The service entrance raceways shall be installed underground in accordance with the serving utility's construction standards.

C. The location of the service entrance shall be coordinated with the local utility company. Provide materials and equipment required to connect the project service to the utility system.

2.2 TEMPORARY SERVICES

A. It shall be the responsibility of the Contractor to provide a complete system for temporary electrical power service and distribution. The Electrical Contractor shall provide the necessary wiring, connections, service switches, poles, wiring protective devices, lighting fixtures, lamps, outlet devices, disconnect switches, etc., as required for temporary lighting. In addition, a similar system shall be provided for the distribution of single and three phase power of voltage levels and adequate ampacity as required to facilitate the construction of the project. These services shall be installed in accordance with requirements of the National Electrical Code (NEC), the Occupational Safety and Health Administration (OSHA), and the National Electrical Safety Code (NESC).

B. The General Contractor shall pay the cost of all electrical energy consumed on the job site throughout the entire construction period.

C. Remove all temporary wiring upon completion of the work.

2.3 OUTAGES

A. Outages of services as required by the project will be permitted but only at time approved by the Owner. The Contractor shall notify the Owner in writing two weeks in advance of the requested outage in order to schedule required outages. No outages shall be taken unless written approval has first been received from the Owner. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, shall be included in the contract amount.

2.4 TELEPHONE SERVICE

A. Telephone service will be provided from the local utility company's system. The service entrance raceways shall be installed underground in accordance with the serving utility company's construction standards.

B. The location of the service entrance shall be coordinated with the telephone company. Provide materials and equipment required to enable the telephone company to connect service to the project.

C. Secure approval from the Owner for the final locations of telephone outlets, especially those located in floor slabs.

D. Materials.

1. Raceways shall be in accordance with Section 26 05 33. All bends in the service entrance conduit shall be made with long sweep elbows. The minimum radius shall be four feet.

2. Boxes shall be in accordance with Section 26 05 33.01.

3. Coverplates shall be provided for each telephone outlet in accordance with Division 26.

4. Provide ground conductor from the telephone backboard to service entrance ground in accordance with the serving utility company grounding requirements and construction standards.

2.5 CABLE TELEVISION SERVICE

A. Cable television service requirements are the same as those specified for telephone service. Coordinate the location of the service entrance with will be provided from the local utility company's system. The service entrance lateral shall be installed underground in accordance with the serving utility company's construction standards.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the utility services so the systems are complete. Demonstrate that the electrical system is operational.

B. Conduct coordination meetings with the serving utility companies prior to installation of the utility work.

C. Comply with all of the construction installation standards and requirements of the serving utility companies.

END OF SECTION 26 00 01

SECTION 26 00 02 - FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies the furnishing and installation of necessary materials to seal electrical penetrations through fire rated walls and floors.

B. Apply firestops at all locations as required by national, municipal and local governing laws and codes. All conduits, cables, cable tray, etc. passing through fire rated floors and/or walls shall have the void area between the material passing through floor and/or wall sealed with an approved fire-stop material to maintain the fire rating of the floor and/or wall.

1.2 REFERENCE STANDARDS

A. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.

B. ASTM E 119: Methods of Fire Tests of Building Construction and Materials.

C. ASTM E 814: Standard Test Method for Fire Tests of Through Penetration Firestops.

D. UL 263: Fire Tests of Building Construction Materials.

E. UL 723: Surface Burning Characteristics of Building Materials

F. UL 1479: Fire Tests of Through-Penetration Firestops

G. UL Products Certified for Canada.

H. Factory Mutual Approval Guide Comply with all service installation standards of the serving utility companies.

1.3 APPLICABLE PROVISIONS

A. Refer to Section 26 00 00 - Electrical General Provisions.

B. Refer to Section 07 84 13 - Penetration Firestopping.

1.4 SUBMITTALS

A. Submit manufacturer's product literature for each type of firestop material to be used. Literature shall include documentation of UL classifications or approved third party testing.

B. Submit drawings of through penetrations which include the system to be utilized for the firestopping application.

C. Submit Copies of manufacturer's product data, Material Safety Data Sheets (MSDS), specifications, recommendations, standard details and installation instructions for all firestop assemblies.

D. Upon completion, installer shall provide written certification that materials were installed in accordance with the manufacturer's installation instructions and details.

1.5 QUALITY ASSURANCE

A. All firestopping systems material and design shall comply with the following:

1. Shall conform to both Flame (F) and Temperature (T) ratings as required by nationally accepted test agencies per ASTM E814 or UL 1479 fire tests in a configuration that is representative of field conditions.

2. Firestopping materials and systems must be capable of closing or filling through openings created by the burning or melting of combustible pipes, cable jacketing, or pipe insulation materials and deflection of sheet metal due to thermal expansion.

3. Firestopping material shall be asbestos and lead free and shall not incorporated nor require the use of hazardous solvents.

4. Firestopping sealants must be flexible, allowing for normal pipe movement.

5. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces.

6. Firestopping materials shall be moisture resistant, and may not dissolve in water after curing.

7. Materials shall be installed in accordance with the manufacturer's written installation instructions.

1.6 DELIVERY STORAGE AND HANDLING

A. Deliver materials to project site in manufacturer's original packaging clearly identified with manufacturer's name, product identification, lot number, and installation instructions as applicable.

B. Store and handle firestop materials in a location and manner providing protection from damage and exposure to the elements recommended by the manufacturer.

C. Material Safety Data Sheets (MSDS) will be available on the job site for all materials, including manufacturer's guidelines for use, handling and disposal.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the requirements, acceptable manufacturers shall be as follows:

1. Re-useable Sealing Systems.

(a) CSD Sealing Systems.

(b) Hilti.

(c) 3M.

2. Caulk

(a) International Protective Coatings.

(b) Johns Manville.

(c) O-Z Gedney/Nelson.

(d) Hilti.

(e) 3M.

2.2 GENERAL

A. Through-penetration firestop product(s) tested to ASTM E814 listed in the UL Fire Resistance Directory in which it is classified as a fill, void or cavity material or a firestop device. This should be classified for approval with the particular type of penetrating item and the wall or floor assembly that the item is penetrating in order to maintain the integrity required.

B. All firestop products and systems shall be designed and installed so that the basic sealing system will allow the full restoration of the thermal and fire resistance properties of the barrier being penetrated.

C. Penetrations containing loose electrical, data or communications cabling shall be protected using firestopping products that allow unrestricted cable changes without damage to seal.

D. Firestopping materials and systems must be intumescent or capable of filling through-openings created by the burning or melting of combustible pipes, pipe insulation materials or cable jacketing and the deflection of sheet metal due to thermal expansion.

E. Firestop sealants must be elastomeric or flexible to allow for normal pipe movement.

F. Firestop system shall have F and T Ratings suitable for intended service, UL tested.

G. All materials shall have a minimum one-year shelf life.

H. Materials shall not affect or derate the properties of cables in energized cable applications.

I. Firestop materials shall not contain flammable or toxic solvents and shall not produce toxic or flammable out gassing during the drying or curing process.

2.3 RE-ENTERABLE SEALING SYSTEM

A. This system shall consist of a metal casing with intumescent pads and removable cover. The system shall allow for the removal and addition of cables by removal of the cover and inserting or deleting the intumescent pads and reattaching the cover.

B. The enclosure is a two piece with a lower casing and top cover. The enclosure shall be formed of .061" thick steel. The lower casing shall have flanged edges of 2.375" and the top cover shall be reinforced with steel angle brackets.

C. A 0.25" steel angle bracket (fixation plate) is used as the main support for the firestop unit. The depth of the unit shall be 10"; the width and height dimensions shall be based on the size of the cable tray, or wall or floor opening.

D. Fill, Void or Cavity Materials shall be as follows:

1. Fire Resistant Rubber Sponge (FRR-SP) - Nominal 1" thick intumescent (expands on application of heat) material supplied in sheets of 10" by 12". This material reacts at temperatures of 500 degrees F and expands six to ten times its original size to completely seal the penetration.

2. Fire Resistant Rubber/Halogen Free Gaskets (FRR/HF). An insert material nominally 1" thick, is a stable material that does not react to temperature. The material acts as an insulator in the firestop system and is used on all four sides of the unit between the enclosure and the sponge material.

3. Fire Resistant, Water Repellent Sealant (FIWA). Fireproof sealant for both interior and exterior joints. In the event of fire, this sealant expands and forms a heat insulating char on its surface, which effectively seals minor cracks and also prevents the spread of flames, smoke, fumes, and water during a fire. The seal depth should be in the range of .5" to 1", depending on the joint configuration and backing material.

4. Forming or damming material. #8 Mineral Wool shall be required for filling the cavity in the penetration when units are installed on only one side of a wall or when a unit is installed in a floor.

5. Weather shields attach to firestop unit when firestop will be exposed to weather.

2.4 CAULK

A. Depending on the particular installation use FS900 or FST900 fire stop caulk or FS500/600 series fire-stop components. The firestop system shall consist of a water based firestop compound as the fill, void or cavity material along with appropriate damming material.

B. The firestop compound shall not contain any solvents, inorganic fibers or silicone compounds. The compound shall not be affected by moisture and must maintain the integrity of the floor or wall assembly for it's rated time period when tested in accordance with ASTM E814 (UL 1479).

C. The system shall be UL classified for up to and including three hours.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Individual runs of conduit and cable routing through fire rated walls or floors shall be sealed with caulk based system.

B. Multiple cables and cable tray penetrations through fire rated walls of floors shall be sealed with a re-enter able sealing system.

3.2 INSTALLATION

A. All material shall be installed in accordance with the Manufacturer's printed instructions for installation and when applicable, curing in accordance with temperature and humidity.

B. Furnish adequate ventilation as required to comply with all applicable safety requirements.

C. Examine adjoining construction and the conditions under which the work is to be completed. Do not proceed with work until any unsatisfactory conditions detrimental to the proper and timely completion of the work have been corrected. Verify adjacent materials are clean, dry and ready to receive installation. Verify that openings and items (penetrations) passing through them are ready for application of the firestop.

D. Verify that field dimensions are as shown on the drawings and as recommended by the manufacturer.

E. Do not proceed with installation of firestop materials when temperatures fall outside the manufacturer's recommended limits. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

F. Protect surrounding area to prevent contamination of adjacent surfaces by firestopping materials.

G. Remove any incompatible materials (dirt, debris, greases, oils and solvents) which may inhibit the adhesion or physical properties of the firestop products.

H. Coordinate with fire protection and other trades to assure that all pipe, conduit, cable and other items which penetrate fire rated construction have been permanently installed prior to installation of firestops. Schedule and sequence work to assure that partitions and other construction that would conceal penetrations are not erected prior to the installation of firestops.

3.3 INSPECTIONS

A. The General Contractor shall procure the services of an independent inspection service to review and provide a certified letter to the Contractor, Engineer and the City of San Antonio, stating all firestopping has been installed per UL listing and the manufacturer’s recommendations. Independent service shall have a minimum of five (5) years experience in the inspection of firestopping materials and methods installed.

END OF SECTION 26 00 02

SECTION 26 00 73 - FAULT AND COORDINATION STUDY AND ARC FLASH HAZARD ANALYSIS AND SELECTIVE COORDINATION STUDY

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Electrical Contractor shall provide the Architect/Engineer with a Fault and Coordination Study of the complete electrical system. The analysis and study shall include all power distribution systems, beginning at the CPS energy pad mounted service transformer to the secondary buses of each switchgear panelboard as described hereafter.

Contractor to furnish short-circuit and protective device coordination studies as prepared by equipment manufacturer. By using the equipment manufacturer the study allows coordination of proper breakers, fuses, and current transformers. The coordination study shall begin with the utility company's feeder protective device and include all of the electrical protective devices down to and include the largest feeder circuit breaker and power distribution panelboards. The study shall also include variable frequency drives, harmonic filters, power factor correction equipment, transformers and protective devices associated with variable frequency drives, emergency and standby generators associated paralleling equipment and distribution switchgear.

The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E - Standard for Electrical Safety in the Workplace, reference Article 130.5 and Informative Annex D.

B. The study shall be prepared by the equipment manufacturer and certified with the registration seal and signature of a Registered Professional Engineer. The Engineer shall be an employee of the electrical switchgear manufacturer. The Engineer shall be qualified by experience in the preparation of studies having similar requirements and magnitude to those specified in this Section of the Specification.

C. The initial copy of the Fault and Coordination Study shall be submitted with the electrical switchgear submittals prior to the purchase of any equipment so that the required interrupting current ratings and duties can be substantiated. Any modification to the electrical equipment, equipment bus bracing, overcurrent protective devices, etc. that are required by the recommendations of the short circuit and coordination study shall be provided by the switchgear manufacturer prior to manufacturing any electrical equipment.

D. The Short Circuit Analysis shall terminate at each branch bus at the lowest utilization voltage secondary bus where the symmetrical short circuit RMS amperes is less than 10,000 amperes (10,000 amperes total source plus all motor contribution). It is the intent of these specifications to determine all locations in the entire electrical system where the symmetrical short circuit amperes meets or exceeds 10,000 amperes at either 208 or 480 volts. The short circuit analysis shall compare interrupting ratings of all electrical protective devices connected to each bus with that of the available fault current at the load terminals of each protective device. Appropriate recommendations shall be made for corrective action where the interrupting rating of the electrical equipment is exceeded by the available fault current.

E. The Fault and Coordination Study shall include all of the primary protective device time current plots including the last source side protective device of the electrical service

equipment. The primary coordination plots shall be at the ampere scale of the primary voltage and shall include all transformer primary protective devices. The coordination plots shall terminate with each transformer secondary main fuse or breaker and the largest branch fuse or breaker immediately following the secondary main protective device. Where a single secondary main protective device is not installed, the plots shall terminate with the next load side protective device following the first secondary protective device. These secondary breakers or fuses shall be plotted on a secondary voltage ampere scale, and shall include the transformer primary protective device plotted at the same ampere scale as seen at the secondary voltage. The protective device study shall include a separate analysis for phase and ground protection.

The coordination study shall include selective coordination localization of an overcurrent condition to restrict outages to the circuit or equipment affected, accomplished by the selection and installation of overcurrent protective devices and their ratings or settings for the full range of available overcurrents, from overload to maximum available fault current, and for the full range of overcurrent protective device opening times associated with those overcurrents.

The overcurrent protective devices shall be analyzed for selective coordination. This analysis shall identify any potential selective coordination problems up the available short-circuit current. Any areas where the overcurrent protective devices are not selectively coordinated shall be explicitly noted and recommendations shall be made to achieve selective coordination if desired.

F. The Electrical Contractor shall verify all nameplate data from electrical gear and equipment that he has connected to the electrical distribution system, and that is to be used in the study. The Electrical Contractor shall furnish the Engineer performing the electrical system study all of the as-built wire sizes, insulation types, conduit types, and circuit length for use in the study. **The Manufacturer's Field Service Engineer shall set all adjustable protective devices according to the recommendations made in the study setting table**.

G. The as-built version of this study shall be submitted to the Architect/Engineer for approval a minimum of 60 days prior to final inspection of the electrical system. The Electrical Contractor shall be responsible for making and furnishing any required changes.

H. Primary distribution power shall come from CPS energy pad mounted service transformer. Obtain available short circuit current from CPS energy.

I. The Contractor shall furnish an Arc Flash Risk Assessment Analysis Study per NFPA 70E – Standard for Electrical Safety in the Workplace.

J. Two weeks after contract is awarded the electrical subcontractor shall provide the successful switchgear manufacturer with the lengths of all feeders for the short circuit study.

1.2 REFERENCES

A. Comply with the latest standards of:

1. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

(a) IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems

(b) IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems

(c) IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis

(d) IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings

(e) IEEE 1015 – Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems

(f) IEEE 1584 - Guide for Performing Arc-Flash Hazard Calculations

B. American National Standards Institute (ANSI):

1. ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers

2. ANSI C37.13 – Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures

3. ANSI C37.010 – Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis

4. ANSI C 37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories

5. ANSI C37.5 - Methods of Determining the RMS value of a Sinusoidal Current Wave and Normal - Frequency Recovery Voltage, and for Simplified Calculations of Fault Currents

C. The National Fire Protection Association (NFPA)

1. NFPA 70 - National Electrical Code, latest edition

2. NFPA 70E – Standard for Electrical Safety in the Workplace **(2015 Edition)**

1.3 SUBMITTAL

A. Submit a complete description of the analysis tool or program being used for the Fault and Coordination Study and Arc Flash **Risk Assessment** Analysis. Include the version of software being used and any accessory software including database type libraries.

B. If self generated type calculations are made by the Engineer, then a copy of all the calculations shall be included.

C. Submit three (3) copies of the complete Fault and Coordination Study. The study shall include a one-line impedance diagram which shall include all pertinent equipment data and identify all buses, a list of all fault contributors, a list of fault levels at each bus for three-phase bolted faults and ground faults, equipment confirmation data including feeder circuit sizes and length, confirmation of equipment interrupting ratings, recommendations on any required changes, time-current plots which graphically illustrate protective device design performance versus equipment operating characteristics, and a completely separate list of protective device settings.

D. The submittals are required prior to the purchase of any equipment so that the required interrupting current ratings and duties can be substantiated.

E. The Fault and Coordination Study and Arc Flash **Risk Assessment** Analysis shall be submitted with the electrical switchgear submittals. Failure to submit the short circuit and coordination study with the electrical submittals will result in the rejection of the entire switchgear submittal. The switchgear submittal will not be reviewed without the short circuit and coordination study.

F. Recycled Content Certification: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and post-industrial recycled content by weight for each Product specified under this Section.

G. Local/Regional Source Certification: Manufacturer or fabricator's certificate indicating location, and distance in miles from the Project Site, of each Product's final assembly, extraction, harvesting, or recovery prior to shipment to the Project Site.

1.4 AS-BUILTS

A. Provide three (3) copies of the complete Fault and Coordination Study and Arc Flash Risk Assessment Analysis which shall be accurate with reference to the actual field installed equipment.

B. The as-built copies shall include the seal and signature of the Registered Professional Engineer performing the study.

C. Provide three (3) copies of the protective device setting sheets. Separate listings shall be included for the circuit breakers.

1.5 SUBMITTALS FOR CONSTRUCTION

A. The results of the short-circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a final report. No more than five (5) bound copies of the complete final report shall be submitted. For large system studies, submittals requiring more than five (5) copies of the report will be provided without the section containing the computer printout of the short-circuit input and output data. Additional copies, where required, shall be provided on CD in PDF format.

B. The report shall include the following sections:

1. One-line diagram showing protective device ampere ratings and associated designations, cable size & lengths, transformer kVA & voltage ratings, motor & generator kVA ratings, and switchgear/switchboard/panelboard designations.

2. Descriptions, purpose, basis and scope of the study.

3. Tabulations of the worst-case calculated short circuit duties as a percentage of the applied device rating (automatic transfer switches, circuit breakers, fuses, etc.); the short circuit duties shall be upward-adjusted for X/R ratios that are above the device design ratings.

4. Protective device time versus current coordination curves with associated one line diagram identifying the plotted devices, tabulations of ANSI protective relay functions and adjustable circuit breaker trip unit settings.

5. Multi-function relay setting file printouts including all ANSI protective relay functions and associated logic and control. Metering, communication, and control logic settings not associated with ANSI protective functions are not required.

6. Fault study input data, case descriptions, and current calculations including a definition of terms and guide for interpretation of the computer printout.

7. Incident energy and flash protection boundary calculations.

8. Comments and recommendations for system improvements, where needed.

9. Executive Summary including source of information and assumptions made

1.6 QUALIFICATIONS

A. The short-circuit, protective device coordination and arc flash hazard risk assessment analysis studies shall be conducted by a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies. The Registered Professional Electrical Engineer shall be a full-time employee of the Engineering Services Organization.

PART 2 - PRODUCTS

2.1 SHORT CIRCUIT ANALYSIS

A. The Short Circuit Analysis shall include the following:

1. A schematic one-line drawing of the entire electrical system Included in the study, from the power plant bus to each primary transformer including all main secondary buses of each transformer. Secondary buses shall include multiple secondary transformations within the scope of the study. Each device shall be identified using the project assigned identification labels. Each motor 10 Hp and larger shall be shown and identified. Each bus shall be assigned an identification number.

2. Source voltage and impedance data shall be given in the analysis, including reactance and resistance in OHMS to the source, and available symmetrical and asymmetrical short circuit amperes at the point of delivery of electrical power. Short

circuit amperes shall be based on an assumed bolted three-phase short circuit. Similar calculations shall be made for an assumed phase-ground fault.

3. At each bus, including buses of all primary protective and switching devices, primary and secondary of all transformers, all secondary main and feeder breakers, and all secondary devices and panelboards, within the scope of the study, the following shall be calculated for assumed bolted three-phase short circuits:

   (a) Symmetrical RMS short circuit amperes, calculated using total source and motor contribution reactance and resistance values.

   (b) Asymmetrical average three-phase RMS amperes at 1/2 cycle, calculated using actual total source and motor contribution X/R ratio.

   (c) Reactance (X) and resistance (R) in OHMS at the voltage of the device being examined, including both Utility Co.'s Power Plant source and all motor contributions.

4. Calculation sheets for cable sections shall indicate voltage, wire, size, cable length, reactance and resistance of the section in OHMS, and total X & R to the source.

5. Calculation sheets for transformer sections shall indicate transformer KVA, secondary voltage, percent impedance, percent reactance, percent resistance, and total X & R value in OHMS at the secondary voltage to source, including the serving utility company's Power Plant source impedance plus any primary motor contribution.

6. Calculation sheets for busway and miscellaneous devices shall provide all pertinent parameters including operating voltage, section X & R values in OHMS, and total X & R values in OHMS to the source, based on source impedance plus any motor contribution.

7. Bus summary sheets shall be provided giving consecutive bus numbers, description, voltage, X & R values in OHMS including the serving utility company's Power Plant plus all motor contributions, symmetrical and asymmetrical short circuit amperes, X/R ratio, and asymmetrical factor.

8. Motor summary sheets shall provide motor description and all pertinent motor data including subtransient reactance for each motor 10 Hp and larger. Symmetrical short circuit amperes shall be given for each motor at the motor terminals.

2.2 PROTECTIVE DEVICE COORDINATION STUDY

A. The Protective Device Coordination Study shall include the following:

1. Time-current coordination plots shall be made on 11" by 15-1/2" log-log sheets and shall graphically indicate the coordination proposed for all of the key systems. The plots shall include complete titles, one-line diagram, and legend.

2. The transformer's primary protective device, transformer magnetic inrush, transformer ANSI withstand points, secondary voltage fuse or circuit breaker and

largest feeder fuse or circuit breaker shall be plotted at the secondary voltage. Circuit breaker curves shall include complete operating bands, terminating with the appropriate available short circuit current. Fuse curves shall be identified as either total clearing time or damage time as applicable.

3. Low voltage circuit breakers shall have instantaneous, short delay, and long-time pickup ampere values indicated and short delay-time values indicated as applicable to the specific circuit breaker. Sensor or monitor rating shall be stated for each circuit breaker. All regions of the circuit breaker curve shall be identified.

4. The coordination plots shall include significant motor starting characteristics and large motor protective devices for motors over 50 Hp.

5. Feeder circuit breakers shall have the time-damage curve of the feeder conductors plotted to indicate protection of the conductor insulation at the total clearing time of the circuit breaker or fuse. This time-damage point shall be calculated for the specific parameters of conductor insulation used, with average three-phase RMS asymmetrical amperes at 1/2 cycle calculated using actual resistance and reactance values of the source plus all motor contributions which exist at the load end of the feeder conductors. Conductor initial temperature and conductor maximum transient temperature for short circuits as recommended by ICEA shall be indicated.

6. A summary tabulation shall be included in the study listing all adjustable protective devices with all recommended settings and each adjustable band included in each device.

7. High voltage relays shall have coil taps, time-dial settings and pick-up settings as plotted, identified. Current transformer ratios shall be stated. Relays shall be separated by a 0.45 second time margin to assure proper selectivity where feasible. The relay operating curves shall be suitably terminated to reflect the actual maximum fault current sensed by the device.

8. Similar type plots shall be made for all ground fault conditions and shall indicate any time delay or zone blocking.

2.3 ARC FLASH RISK ASSESSMENT ANALYSIS STUDY

A. The Contractor shall furnish an Arc Flash Risk Assessment Analysis Study per NFPA70E – Standard for Electrical Safety in the Workplace, Reference Article 130.3 and Annex D.

2.4 ARC FLASH RISK ASSESSMENT ANALYSIS

A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2012 Edition.

B. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Alternative methods shall be presented in the proposal.

C. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, switchgear, motor-control

centers, panelboards, busway and splitters) where work could be performed on energized parts.

D. The Arc-Flash Hazard Analysis shall include all significant locations in 240 volt and 208 volt systems fed from transformers equal to or greater than 125 kVA.

E. Safe working distances shall be specified for calculated fault locations based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm^2.

F. The Arc Flash Hazard analysis shall include calculations for maximum and minimum contributions of fault current magnitude. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume a minimum motor load. Conversely, the maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

G. Arc flash computation shall include both line and load side of main breaker calculations, where necessary.

H. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 section B.1.2.

2.5 ARC FLASH RISK ASSESSMENT ANALYSIS REPORT SECTION

A. Incident energy and flash protection boundary calculations

1. Arcing fault magnitude

2. Device clearing time

3. Duration of arc

4. Arc flash boundary

5. Working distance

6. Available Incident energy

7. Hazard Risk Category

8. Recommendations for arc flash energy reduction

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Electrical Contractor shall furnish the Fault and Coordination Study per the specified schedule and make any of the required changes or modifications indicated.

B. The switchgear manufacturer Field Service Engineer shall perform the required functions as listed in Sections 26 24 13 and 26 28 13 of these Specifications.

3.2 ARC FLASH WARNING LABELS

A. The vendor shall provide a 4 in. x 4 in. thermal transfer type label of high adhesion polyester for each work location analyzed.

B. The label shall have an orange header with the wording, "WARNING, SHOCK & ARC FLASH HAZARD", and shall include the following information:

1. Location designation

2. Nominal **system** voltage

3. **Arc** Flash boundary

4. **Arc** Flash risk category

5. **Available** Incident energy

6. Shock boundaries

7. Working distance

8. Engineering report number, revision number and issue date.

9. **Minimum Arc rating of clothing.**

10. Site specific level of PPE.

C. Labels shall be machine printed, with no field markings.

D. Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings.

1. For each 600, 480 and applicable 208 volt panelboards, one arc flash label shall be provided.

2. For each motor control center, one arc flash label shall be provided.

3. For each low voltage switchboard, one arc flash label shall be provided.

4. For each switchgear, one flash label shall be provided.

5. For medium voltage switches one arc flash label shall be provided

E. Labels shall be field installed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

3.3 ARC FLASH TRAINING

A. The equipment vendor shall train personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours). Maintenance procedures in

accordance with the requirements of NFPA 70E, Standard For Electrical Safety Requirements For Employee Workplaces, shall be provided in the equipment manuals. The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET).

END OF SECTION 26 00 73

SECTION 26 05 19 - INSULATED CONDUCTORS

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies the furnishing and installation of 600 volt insulated conductors.

1.2 REFERENCE STANDARDS

A. ANSI/UL 83 - Thermoplastic-insulated Wires.

B. ICEA S-61-402 (NEMA WC 5) - Thermoplastic-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

C. UL 486A-486B - Standard for Safety Wire Connectors.

1.3 APPLICABLE PROVISIONS

A. Refer to Section 26 00 00 - Basic Electrical Requirements.

1.4 SUBMITTALS

A. Submit manufacturer's data on each electrical wires, cables connectors, accessories, wire pulling compound, cable end caps, etc.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver wire and cable properly packaged in factory-fabricated type containers, or wound on NEMA-specified type wire and cable reels.

B. Store wire and cable in clean dry space in original containers. Protect products from weather, damaging fumes, construction debris and traffic.

C. Handle wire and cable carefully to avoid abrasing, puncturing and tearing wire and cable insulation and sheathing. Ensure that dielectric resistance integrity of wires/cables is maintained.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, acceptable manufacturers shall be as follows:

1. Copper Insulated Conductors.

(a) Encore Wire Corp.

(b) Aetna Insulated Wire Corp.

(c) Southwire Company.

(d) American Insulated Wire Corp.

2. Wire Connectors.

(a) Burndy.

(b) 3M Electrical Products Division.

(c) Ilsco.

(d) Ideal.

(e) Thomas & Betts.

3. Cable End Caps (Cold Shrink).

(a) 3M Electrical Products.

(b) Thomas & Betts.

2.2 600-VOLT INSULATED CONDUCTORS

A. All branch circuit conductors and feeder conductors shall be soft-drawn annealed copper with conductivity of not less than 98% at 20 degrees C (68 degrees F). The conduit fill shall not exceed NEC requirements.

B. Conductors No. 10 AWG and smaller shall be solid and conductors No. 8 AWG and larger shall be stranded. Minimum wire size shall be #12 AWG unless otherwise noted on the drawings.

C. All wire and cable shall be permanently marked approximately every two feet to indicate size, voltage and type temperature rating in accordance with NEC Article 310.

D. Provide factory colored insulation for conductors for No. 10 AWG and smaller. Color code larger insulated conductors with an approved field applied tape. Conductors color coding shall match the color code requirements of the City of San Antonio electrical code.

E. The conductor's polyvinyl chloride jacket shall be lead free.

F. Copper conductors shall be as follows:

1. Type THW: For dry and wet locations; max operating temperature 75 degrees C (167 degrees F). PVC insulation, with a minimum insulation rating of 600 volts. Meet UL 83 and Federal Spec. J-C-30B.

2. Type THHN or THWN: For dry and wet locations; maximum operating temperature shall be 75°C (THWN) or 90°C (THHN). UL listed as gasoline and oil resistant. PVC insulation with nylon outer jacket. Meet UL 83 and Federal Spec J-C-30B.

3. Type XHHW: For wet or dry locations; maximum operating temperature 90°C. insulation shall be cross-linked polyethylene complying with UL 44 for XHHW-2.

2.3 INSULATED ELECTRICAL SPRING CONNECTORS

A. Provide color coded, electrical spring connectors with a pliable vinyl skirt. The connectors shall be temperature rated 105 degrees Celsius with 600 volt insulation. The connectors shall be U.L. listed and comply with Federal Specification W-S-160.

2.4 COMPRESSION CONNECTORS AND LUGS

A. The connectors shall be copper with tin plating. The connectors and lugs shall be designed to connect to the cable by means of dieless hydraulic compression tool.

2.5 INSULATED POWER DISTRIBUTION BLOCKS

A. The power distribution blocks shall be rated 600 volt, 90 degrees Celsius with tin plated copper connections. The blocks shall be mounted in an insulated base with a removable clear cover. The connector size and configuration shall be as recommended by the manufacturer for the conductors being spliced.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mechanically protect conductors for systems by installing in raceways. Do not install the conductors until raceway system is complete and properly cleaned. Do not bend any conductor either permanently or temporarily during installation to radii less than four times the outer diameter of 600-volt insulated conductors. Do not exceed manufacturer's recommended values for maximum pulling tension.

B. Use Ideal Wire Lube Yellow #77 Plus wire pulling lubricant or equal when pulling large conductors. The lubricant shall be compatible with rubber, neoprene, nylon polyvinyl chloride, high density or cross linked polyethylene, low density polyethylene, semiconducting jacket and hypalon cable types. Wiring pulling compound shall be U.L. listed and approved by wiring manufacturer.

C. Use Ideal Wire Lube Aqua-Gel II wire pulling lubricant or equal when pulling large conductors. The lubricant shall be compatible with rubber, neoprene, nylon polyvinyl chloride, high density or cross linked polyethylene, low density polyethylene, semiconducting jacket and hypalon cable types. Wiring pulling compound shall be U.L. listed and approved by wiring manufacturer.

D. Pull conductors simultaneously where more than one is being installed in same raceway.

E. Use pulling means including fish tape, cable, rope and basket weave wire/cable grips which will not damage cables or raceway.

F. Contractor may provide conductors with either THW or THHN-THWN insulation for general wiring.

G. Contractor shall provide conductors with XHHW insulation where called for on the drawings.

H. Neatly and securely bundle all conductors in enclosures using nylon straps with a locking hub or head on one end and a taper on the other.

3.2 SPLICES AND TERMINATIONS

A. Splices shall be kept to a minimum. Splices shall be made in junction and pull boxes. Splices shall not be made in conduit fittings, switch and circuit breaker enclosures, panelboards, motor starters, motor control centers or switchboards. All connectors shall be of material recommended by conductor manufacturer(s) to prevent any corrosion or electrolysis between dissimilar metals.

B. Use compression type connectors or insulated power distribution blocks for splices of all stranded conductors 6 AWG and larger. Mechanical, split bolt, type connectors for conductor splices are not acceptable.

C. Use ring-tongue type terminators on all control wiring.

D. Use insulated electrical spring connectors for conductors 8 AWG and smaller.

E. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A and B.

F. Furnish and install hot or cold shrink cable end caps to seal and insulate the portion of the conductor termination that is left exposed when conductors are terminated on mechanical lugs. The terminations shall be non-shielded and rated 1000 volts minimum and be sized in accordance with the manufacturer's recommendations.

3.3 CONDUCTOR SIZING

A. Conductors shall be provided as required by the more stringent requirements of the drawings or the specifications.

B. Provide No. 10 AWG conductor for single-phase, 120-volt, 20-ampere branch circuits for which the distance from panelboard to the first outlet is more than 100 feet. The entire branch circuit from the overcurrent device to the last outlet shall be No. 10 AWG minimum.

C. Provide No. 10 AWG conductors for single-phase 277 volt, 20 amp circuits for which the distance from panelboard to the first outlet is more than 200 feet. The entire branch circuit from the overcurrent device to the last outlet shall be No. 10 AWG minimum.

3.4 HOMERUNS

A. No more than three phase conductors, neutral and equipment ground conductor shall be installed in a single raceway for all feeders; HVAC and Plumbing equipment such as refrigeration equipment, fan motors, pumps, and compressors; elevators, and other similar types of equipment unless specifically noted on the drawings.

B. Multi-wire branch circuits and individual branch circuits shall be allowed to be combined in a single homerun. The maximum number of circuits shall be six. The contractor shall be

responsible to apply the conductor ampacity derating factors and increase the raceway size as required by the NEC.

C. All individual branch circuits shall have a separate neutral conductor and the neutral shall be considered a current carrying conductor.

D. Provide a separate neutral conductor for each receptacle circuit serving isolated ground receptacles. This neutral shall be considered a current carrying conductor.

E. Provide a separate neutral conductor for each branch circuit indicated by the tickmarks in the construction documents.

F. Use home run circuit numbers as indicated for panelboard connections.

G. Comply with ampacity adjustment factors as required by the NEC Article 310.16.

3.5 COLOR CODE

A. Provide color coding for the conductors of each feeder, and branch circuit. The conductor color coding shall be in accordance with the City of San Antonio Electrical Code Article VI, Section 10-52, Articles 200.6, 200.7, and 210.5. Verify the code with the City of San Antonio Electrical Code Ordinance prior to releasing the conductor materials for purchasing.

B. All wiring shall be color coded in accordance with Section 26 05 53.

3.6 SIGNAL, COMMUNICATIONS, AND/OR SIMILAR SYSTEMS

A. Special system(s) conductors (i.e., telephone, intercom, P.A., fire alarm system(s), etc.) shall be sized as required and recommended by the system manufacturer. Special systems conductor risers shall be installed in raceways inside walls.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Power system grounding.

B. Electrical equipment and raceway grounding and bonding.

C. This section specifies the furnishing and installation of grounding and bonding equipment for electrical systems.

D. Extent of electrical grounding and bonding work is as specified herein. Provide a completely grounded system sized in accordance with Article 250 of the NEC. Each piece of electrical apparatus shall be solidly grounded with separate insulated green ground wire.

E. All grounding conductors terminating in ground bus bar shall be labeled, i.e., water main ground, building steel ground, etc.

1.2 RELATED WORK

A. Division 26.

1.3 REFERENCES

A. NFPA 70 – National Electrical Code, latest edition

B. ANSI/UL 467 – Electrical Grounding and Bonding Equipment

C. ANSI/IEEE STD 142 – Recommended Practice for Grounding of Industrial and Commercial Power Systems

D. IEEE 81 – Guide for Measuring Earth Receptivity, Ground Impedance and earth Surface Potential of a ground System

E. IEEE 1100 – Recommended Practice for Powering and Grounding Sensitive Electronic Equipment

F. ANSI/TIA/EIA 607 – Commercial Building Grounding and Bonding Requirements for Telecommunications.

G. ANSI/IEEE Std. 142 – Recommended Practice for grounding industrial and commercial power systems.

1.4 SYSTEM DESCRIPTION

A. Ground the electrical service system neutral at service entrance equipment to grounding electrodes. Electrical systems that are grounded shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher-voltage lines and that will stabilize the voltage to earth during normal operations. Concrete

encased electrodes shall be connected as the most effective grounding electrodes. Provide a completely grounded system in accordance with Article 250 of the NEC. Provide a concrete encased grounding electrode in accordance with the City of San Antonio Electrical Code, Article VI, Section 10-52, Article 250.52.

B. Ground each separately-derived system neutral to separate ground buses that are installed in nearest electrical rooms. Transformer, emergency generator, automatic transfer switches, power conditioners, inverters, or other power supplies are separately derived systems. Standby or emergency generators are separately derived systems if the neutral is bonded to the generator frame and if there is no direct connection of the generator neutral conductor to the service neutral conductor.

C. Provide each telephone and data (IT rooms) rooms with ground bus. Connect ground busses to the main electrical ground with a #4/0 AWG. Ground conductor from each room ground bus to the main electrical room ground bus. Interconnecting ground busses in a daisy chain manner is prohibited and not allowed.

D. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, cable trays, auxiliary gutters, meter fittings, boxes, cable armor, cable sheath, ground bus in electrical rooms and telephone and data (IT rooms) rooms, metal frame of the building or structure, ground ring, lightning down lead conductor, grounding conductor in raceways and cables, receptacle ground connectors, and metal underground water pipe.

E. Bonding jumpers shall be installed around non-metal fittings or insulating joints to ensure electrical continuity. Bonding shall be provided where necessary to ensure electrical continuity and the capacity to conduct safely any fault current likely to be imposed.

F. Supplementary Grounding Electrode. Install ground rod in suitable recessed well; fill with gravel after connection is made.

G. Use minimum 6 AWG copper conductors for communications service grounding conductor. Leave 10 feet slack conductor at termination board.

1.5 SUBMITTALS

A. Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical Requirements, and Division 01 for submittal requirement.

1.6 ACCEPTABLE MANUFACTURERS

A. Heary Bros. Lightning Protection

B. East Coast Lightning Equipment

C. Thompson Lightning Protection

D. ERICO

E. Bonded Lightning Protection

1.7 QUALITY ASSURANCE

A. Commissioning of a system or systems specified in this section is part of the construction process. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Owner's Representative and the Commissioning Agent. Project Closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Grounding system components shall be as required to comply with the design and construction of the system indicated. Components shall be as indicated in manufacturer's submittal data.

B. Ground conductors shall be stranded tinned, annealed copper cable of the sizes indicated on drawings. Bond grounding conductors at both ends of metallic conduit.

C. Grounding clips shall be Steel City Type G, or equal.

D. Ground Rods shall be copper-encased steel, 3/4" diameter, minimum length 10 feet.

E. Use chemical ground rods in areas with rocky soil.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install ground system as indicated, in accordance with the applicable requirements of the National Electrical Code and the National Electrical Contractors Association's "Standard of Installation".

B. Install grounding conductors continuous, without splice or connection, between equipment and grounding electrodes. Install test wells as required per drawings.

C. In feeder and branch circuits, provide a separate, insulated equipment grounding conductor. Terminate each end on a grounding lug, bus, or bushing.

D. Connect grounding electrode conductors to metal water pipe where metal pipe is available and accessible using suitable ground clamp. Make connections to flanged piping at street side of flange. Provide bonding jumper around water meter.

E. Install fusion welded ground connectors where they are concealed or inaccessible.

F. Ground each outlet by the use of an approved grounding clip attached to the junction box in such a position to be readily inspected on removal of the cover plate; or by the use of an approved grounding yoke type receptacle.

G. No strap grounding clamps shall be used; connections requiring bolting shall be made up with monel metal bolts, washers and nuts. Connections shall be made only after surfaces have been cleaned, or ground to expose virgin metal.

H. Conductor connections shall be made by means of solderless connectors such as serrated bolted clamps or split bolt and nut type connectors.

I. The neutral of each transformer shall be bonded to system ground at one point only. This point shall be ahead of the first secondary protective device.

J. Connect grounding conductors to ground rods at the upper end of the rod with the end of the rod and the connection points below finished grade. Below grade connection shall be exothermic-welded type connectors as manufactured by Cadweld, Thermoweld. In manhole, install ground rods with 4 to 6 inches above the floor with connections of grounding conductors fully visible and accessible.

K. Provide grounding and bonding at Utility Company's metering equipment and pad-mounted transformer in accordance with Utility Company's requirements.

3.2 GROUNDING ELECTRODE

A. Provide a grounding electrode system for the service entrance equipment at the building. Provide a bonding conductor between the service equipment ground and neutral bus. The ground electrode systems shall consist of the following:

1. The grounded service conductor at the service entrance switchgear.

2. The building structural steel shall be grounded by means of a bonding jumper or conductor connected to the ground electrode system.

3. The metal underground water pipe (if available) shall be bonded to the ground electrode system. Provide bonding jumpers around insulated pipe joints as required.

4. A concrete encased electrode shall be provided. The electrode shall be installed per Article 250 of the NEC.

5. Other electrodes shall be connected to the system as called for on the drawings.

3.3 SYSTEM GROUND

A. The system neutral and ground shall be bonded to the grounding electrode conductor in the service entrance switchgear in accordance with NEC 250. The system neutral and ground shall not be bonded at any other point in the distribution system except for separately derived systems.

B. Ground all separately derived systems in accordance with NEC 250.

C. The system grounding electrode conductor shall be in accordance with NEC 250, unless larger sizes are indicated.

D. Bond the service entrance conduits together and connect to the main bonding jumper. Main and equipment bonding jumpers shall be sized in accordance with NEC 250.

3.4 EQUIPMENT GROUND

A. Provide a ground bus in all electrical and communications rooms. Mount bus 24 inches above finished floor and 1-inch from wall around perimeter of room. Connect bus by a grounding connector with a cross-sectional area equivalent to the ground bus to an acceptable grounding electrode as described in Article 250. Connect all noncurrent-carrying metallic parts of electrical equipment in the room to the bus.

B. Raceway Systems and Equipment Enclosures.

1. Ground cabinets, junction boxes, outlet boxes, motors, controllers, raceways, fittings, switchgear, transformer enclosures, other equipment and metallic enclosures. Ground equipment and enclosures to the continuous-grounded, metallic raceway system in addition to any other specific grounding shown.

2. Provide bonding jumpers and ground wire throughout to ensure electrical continuity of the grounding system. Bonding jumpers shall be sized in accordance with NEC 250.

3. Provide an equipment grounding conductor in each branch circuit and each feeder.

C. Grounding conductors shall be sized in accordance with NEC 250 unless larger sizes are indicated.

D. Bonding equipment jumpers shall be sized in accordance with NEC 250 unless larger sizes are indicated.

3.5 GROUNDING BUSHINGS

A. Feeder conduits terminating in switchboards, distribution panels, motor control centers and panelboards shall be provided with grounding bushings. Bushings shall be connected to the ground bus in the equipment. Connect the equipment grounding conductor to the grounding bushing and the equipment ground bus in the associated switchgear.

3.6 MOTORS

A. Ground each motor by means of a separate grounding conductor in the conduit connection to the motor. Grounding conductors shall be sized in accordance with NEC Table 250-122 and shall be securely and permanently attached to the motor body and to the ground bus in the panelboard, switchboard or motor control center.

3.7 TRANSFORMER GROUNDING

A. Ground all transformers a separately derived systems in accordance with NEC 250-30. The grounding connections shall be made in the transformer enclosure. Install a separate insulated equipment grounding conductor in the flexible conduit connection to the transformer. The equipment grounding conductor shall be bonded to the main bonding jumper in the transformer housing.

3.8 RECEPTACLES

A. All receptacles shall be bonded to their device box. This connection shall be made by means of a bonding jumper between the device and the box. Where the receptacle mounting yokes are designed and listed for the purpose of grounding the bonding jumper may be omitted.

B. All isolated ground receptacles shall have an isolated ground conductor installed complete from receptacle to the isolated ground bus in the associated panelboard.

3.9 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 10 ohms. Provide additional ground rod as required until resistance reading is 10 ohms or less.

C. Contractors' tests shall be scheduled and documented in accordance with the commissioning requirements.

D. System verification testing is part of the Commissioning Process. Verification testing shall be performed by the contractor and witnessed and documented by the Commissioning Agent.

END OF SECTION 26 05 26

SECTION 26 05 29 - METAL FRAMING AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies the furnishing and installation of metal framing, including channels, necessary hangers, fittings, clamps, anchor bolts and rods, hardware, supports, electrical accessories and brackets, for properly installing all electrical equipment and materials.

B. All support systems shall be adequate for weight of equipment and conduit, including wiring which they carry. Support systems shall be sized to support an additional 25 percent for future loads.

1.2 REFERENCE STANDARDS

A. NEMA ML 1 - Metal Framing.

B. NFPA 70 - National Electrical Code.

1.3 APPLICABLE PROVISIONS

A. Refer to Section 26 00 00 - Electrical General Provisions.

1.4 SUBMITTALS

A. Submit product data for all materials including, but not limited to: pipe straps, beam clamps, metal framing, rod hangers, trapeze hangers, u-bolts.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the requirements, acceptable manufacturers shall be as follows:

1. Metal Framing.

(a) American Electric.

(b) Allied Tube and Conduit.

(c) B-Line Systems Inc.

(d) Kindorf, Electrical Products Division.

(e) Unistrut.

2. Insert Anchors.

(a) Ackerman-Johnson Fasteners.

(b) American Electric.

(c) Hilti Inc.

(d) Star Expansion Co.

3. Supports.

(a) Caddy.

(b) Crouse-Hinds.

(c) Appleton.

(d) Steel City.

2.2 CHANNEL SYSTEMS

A. Fabricate channels from pre-galvanized stip steel in accordance with ASTM A-446, Grade A requirements. The minimum channel size shall be 1-5/8 inches wide by 7/8 inch deep. Provide larger channels as required to suit the particular installation requirements.

B. Fabricate clamping nuts steel bar stock. Channel clamping nuts shall meet the requirements of ASTM A-575, Grade M 1015 and shall be case hardened to 25 HRC. Hex head nuts and bolts shall meet the requirements of ASTM A-563 and ASTM A-307.

C. All nuts and bolts shall meet the requirements of the Unified Screw Threads standard ANSI B1.1, course series UNC, Class 2.

D. All fasteners shall have an electro-galvanized finish.

E. Channel system fittings shall be fabricated from bar or strip steel in accordance with the requirements of ASTM A-36. All fittings shall have an electro-galvanized finish.

F. Channel system clamps shall be fabricated from steel in accordance with the requirements of ASTM A-569. All clamps shall have an electro-galvanized finish. Provide clamps that eliminate metal to metal contact between the clamp and the conduit.

G. Channel system mounting brackets shall be fabricated from hot rolled steel. All fittings shall have an electro-galvanized finish.

H. Channel system beam clamps shall be fabricated from cold formed steel or cast from malleable iron. All beam clamps shall have an electro-galvanized finish.

2.3 ROD HANGERS

A. Rod hangers shall be selected for weight supported but shall not be smaller than No. 8.

B. Rod hangers and adjustable "J" pipe hangers equal to Kindorf Type C-149 for conduits. Conduits two inches (2") and smaller may be fastened with pipe hangers equal to Kindorf Type 6H.

2.4 MISCELLANEOUS FASTENERS

A. Galvanized U-bolts or Kindorf C-210 riser pipe clamps on channel iron bearing plates at intervals of at least one clamp per joint shall be provided for support of vertical runs of conduits of more than twelve feet (12').

PART 3 - EXECUTION

3.1 INSTALLATION

A. Securely fasten and support conduits and raceways of all types and all electrical boxes, devices, and equipment from the main building structure. Conduit system shall not be supported by ceiling hanger wires. Support conduits within three feet (3'-0") of each end, of each bend and each termination. Support conduit runs at ten feet (10'-0") intervals along the run to maintain true raceway alignment without sag or deformation. The use of cadi-clips for conduit supports from suspended ceiling systems is not acceptable. Caddy clips must be supported from their own independent hanger wires anchored to building structure.

B. On exposed raceways and cable run without conduit, provide supports at a minimum of six feet (6') on centers and on each side of each bend. Vertical conduits shall be supported at not more than 10' on center in addition to the above.

C. Maintain horizontal and vertical alignment of raceways to not adversely effect the building structure in strength or appearance. Cable and strap shall not be used.

D. Install exposed wall mounted conduits after wall surface is installed. Secure the conduits with anchors that provide adequate space to allow wall to be painted after conduit is installed.

E. Support cabinets and boxes to the floor and to the structure above independent of all raceways entering the boxes. Structural walls or columns may be used to support these cabinets or boxes.

F. Secure panelboard cabinets and boxes to the building structure independent of all raceways entering the cabinets and boxes.

G. Angle iron or framing channel supports or other load bearing approved support means shall be used to support all panelboards, cabinets, junction and pull boxes.

H. Fasten cabinets, boxes, panelboards, disconnects, motor controls and similar devices indicated other than at walls on channel iron racks mounted to floor and structure above. Three-fourths inch (3/4") thick plywood backboards painted to match the equipment finish may be used as a part of the rack.

I. All boxes shall be rigidly and securely fastened to the structural surface to which they attach. All boxes must be supported from a structural portion of the building independent of the raceway system.

1. Surface mounted boxes shall be fastened by means of wood screws to wood, expansion bolts on concrete, toggle bolts on hollow masonry units and machine screws on metal construction.

2. Exposed boxes shall be supported by means of all-thread rods 1/4" diameter minimum. The all-thread rods shall be secured to the structure.

3. Boxes concealed in walls shall be secured to the wall stud with a minimum of two fasteners. Use wood screws in wood and machine screws in metal. Boxes that attach to metal studs shall be fastened to a second wall stud by means of a backing brace or rod.

4. Boxes recessed in suspended ceilings shall be supported in the same manner as described for exposed boxes or by means of approved bar hangers that attach firmly to the ceiling grid.

5. Boxes embedded in concrete or masonry boxes shall have integral metal ears that embed into the concrete or masonry grout.

6. The methods of support outlined herein are not intended to cover every condition. If conditions other than these occur, the contractor shall propose a method to the engineer for approval prior to installation.

J. Place support and leveling channels for free standing type switchgear, transformers, and motor control equipment.

K. Rust inhibit all supports by galvanizing or other approved means. Supports shall be job rust inhibited at all cuts, breaks, welds, or other points where rust inhibitor coating is broken.

3.2 ANCHOR BOLTS

A. Use 3/8-inch diameter by 3 inches long expansion bolts to attach framing to concrete. Space bolts a maximum of 24 inches on center, with not less than two bolts per piece of framing.

3.3 TOUCH-UP

A. Touch up all scratches or cuts on steel components with an approved zinc chromate or a 90% zinc paint. Use a PVC compound on PVC-coated components.

END OF SECTION 26 05 29

SECTION 26 05 33 - RACEWAYS

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies the furnishing and installation of raceway systems.

1.2 REFERENCE STANDARDS

A. ANSI/ANSI C80.1 - Specification for Zinc-Coated Rigid Steel Conduit.

B. ANSI/ANSI C80.3 - Specification for Zinc-Coated Electrical Metallic Tubing.

C. ANSI/ANSI C80.4 - Specification for Fittings for Rigid Metal Conduit and Electrical Metallic Tubing.

D. ANSI/ANSI C80.5 - Specification for Rigid Aluminum Conduit.

E. ANSI/UL 1 - Safety Standard for Flexible Metal Conduit.

F. ANSI/UL 651 - Safety Standard for Rigid Nonmetallic Conduit.

G. ANSI/UL 797 - Electrical Metallic Tubing.

H. ANSI/UL 870 - Safety Standard for Wireways, Auxiliary Gutters and Associated Fittings.

I. NEMA 2.10-2003 - Selection and Installation Guidelines for Fittings for use With Non-Flexible Metallic Conduit or Tubing (Rigid Metal Conduit, Intermediate Metal Conduit and Electrical Metallic Tubing).

J. NEMA RN 1 - PVC Externally Coated Galvanized Rigid Steel Conduit and Electrical Metallic Tubing.

K. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80) and Fittings.

L. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

M. UL 6 - Rigid Metal Electrical Conduit.

N. UL 360 - Liquid-tight Flexible Steel Conduit.

O. UL 467 - Electrical Grounding and Bonding Equipment.

P. UL 1242 - Intermediate Metal Conduit.

1.3 APPLICABLE PROVISIONS

A. Refer to Section 26 00 00 - Electrical General Provisions.

1.4 HANDLING AND STORAGE

A. Handling shall be done to assure that raceways are not crushed or damaged in any way which would restrict cross sectional area or cause oxidation.

1.5 SUBMITTALS

A. Submit manufacturer's technical product data, including specifications and installation instructions, for each type of raceway system required.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide raceway of one of the following manufacturers:

1. Rigid Metal Conduit, Intermediate Metal Conduit and Electrical Metallic Tubing:

(a) Allied Tube & Conduit Corp.

(b) LTV Steel Tubular Products.

(c) Republic Conduit.

(d) Western Tube and Conduit Corporation.

(e) Wheatland Tube Co.

2. Flexible Metal Conduit, Liquidtight Flexible Metal Conduit:

(a) Alflex Corp.

(b) AFC Cable Systems.

(c) Electri-Flex Co.

3. (PVC) Rigid Nonmetallic Utilities Duct and Conduit:

(a) Carlon.

(b) Southern Pipe, Inc.

(c) Cantex Inc.

4. Conduit Fittings and Bodies:

(a) Appleton.

(b) O.Z. Gedney.

(c) American Electric.

(d) Crouse-Hinds.

(e) Thomas & Betts Corporation.

2.2 CONDUIT AND FITTINGS

A. Rigid Metal Conduit.

1. Hot-dipped galvanized rigid steel conduit per ASTM Standard A-153 galvanized after fabrication. All threads shall be galvanized after cutting. A uniform zinc coating shall applied to the inner and outer walls.

2. Fittings shall be threaded, insulated throat, malleable iron, either cadmium plated or hot-dipped galvanized.

3. Conduit shall be in manufactured accordance with UL Standard 6, ANSI C80.1 and Federal Specification WW-C-581E.

B. Rigid Metal Conduit

1. Either rigid aluminum (alloy 6063-TI) conduit or hot-dipped galvanized rigid steel conduit per ASTM Standard A-153 galvanized after fabrication. All threads shall be galvanized after cutting. A uniform zinc coating shall applied to the inner and outer walls.

2. Fittings for rigid aluminum conduit shall be threaded aluminum, insulated throat. Fittings rigid steel conduit shall be threaded, insulated throat, malleable iron, either cadmium plated or hot-dipped galvanized.

3. Conduit shall be in manufactured accordance with UL Standard 6, ANSI C80.1 and Federal Specification WW-C-581E.

C. Intermediate Metal Conduit.

1. Conduit shall be the same as rigid metal conduit except thinner wall.

2. Fittings shall be threaded, insulated throat, malleable iron, either cadmium plated or hot-dipped galvanized.

3. Conduit shall be manufactured in accordance with UL Standard 1242 and ANSI C80.6.

D. Electrical Metallic Tubing (EMT).

1. Shall be made of strip steel. The exterior shall be hot dipped galvanized with a zinc coating applied over the galvanized coating. The interior shall be coated with a silicone epoxy-ester lubricant.

2. Fittings shall be steel compression type. Fittings for circuits containing conductors 4 AWG and larger shall be the insulated throat type.

3. Conduit shall be manufactured in accordance with UL 797, ANSI C80.3 and Federal Spec. WWC-563.

E. Flexible Metal Conduit

1. Be made of spirally wound continuously interlocked zinc coated strip steel.

2. Fittings shall be malleable iron, squeeze type zinc plated or hot dipped galvanized. Fittings for circuits containing conductors 4 AWG and larger shall be the insulated throat type.

3. Conduit shall be manufactured in accordance with UL Standard 1 and Federal Spec. WW-C-566. Fittings shall be manufactured in accordance with UL Standard 467.

F. Liquid-Tight Flexible Metal Conduit.

1. Be made of spirally wound continuously interlocked zinc coated strip steel with a concentric PVC outer jacket. Conduits 1 1/4" in diameter and smaller shall have a continuous copper ground conductor built into the core. The PVC jacket shall be water and oil resistant, UV stabilized and be suited for installation in ambient temperatures of -20 to +60 degrees Celsius.

2. Fittings shall be compression type, malleable iron, with insulated throat, either cadmium plated or hot-dipped galvanized.

3. Conduit shall be manufactured in accordance with UL Standard 1 and Federal Spec. WW-C-566. Fittings shall be manufactured in accordance with UL Standard 467.

G. Rigid Nonmetallic Conduit.

1. Conduit shall be schedule 40 PVC, UV stabilized, rated for 90 degree C. conductors.

2. Fittings shall be solvent welded socket type.

3. Conduit shall be manufactured in accordance with NEMA TC-2, Federal Specification WC1094A and UL Standard 651.

2.3 CONDUIT EXPANSION COUPLINGS

A. Provide Thomas& Betts XJG-TB rigid or intermediate metal conduit expansion couplings or the equivalent.

1. The fitting body shall be constructed from malleable or ductile iron. The conduit body shall be PVC coated fittings when installed in runs of PVC coated conduit.

2. The fitting shall have an internal bonding jumper constructed of a tinned copper braid sized to comply with U.L. fault current requirements and NEC 250.98 bonding requirements.

3. The fitting shall be capable of compensating for a minimum of 4 or 8 inches thermal expansion and contraction. The amount of movement shall be calculated in accordance with the NEC. The fitting shall be rain tight.

2.4 WIREWAYS

A. Provide lay-in wireways with hinged cover, knockouts, connectors and fittings. All screws installed towards the inside shall be protected to prevent possible wire insulation damage. Wireways shall be NEMA 1 when located in dry areas and NEMA 3R when located in wet areas. Wireways shall be constructed from minimum 16 gage sheet metal for sizes 4" x 4" and smaller and 14 gage sheet steel for sizes larger than 4" x 4". NEMA 3R wireway shall have knockouts in the bottom only. Provide with wire retainers not less than 12" on center.

B. The finish shall be ANSI-49 gray epoxy and shall consist of not less than two coats of enamel over a rust-inhibiting prime coat.

C. The wireway shall be manufactured in accordance with UL Standard 870 and all components shall be UL listed.

PART 3 - EXECUTION

3.1 CONDUIT AND FITTINGS

A. The minimum conduit size shall be ½ “c. except for final connections to individual light fixtures. 3/8" flexible metal conduit. Minimum conduit size for data and telecommunication raceways shall be 1-inch.

B. Types According to Use. Use rigid metal conduit throughout the project except as specified below.

1. Electrical metallic tubing may be used for branch circuitry above accessible ceilings and work concealed in walls and where allowed by the National Electrical Code (N.E.C.). Electrical metallic tubing shall not be used in concrete slabs, in contact with earth or in areas that are subject to permanent moisture and physical damage.

2. Intermediate metal conduit may be used in lieu of rigid metal conduit for feeders in interior dry locations.

3. Schedule 40 PVC may be used for buried branch circuits as permitted by the NEC and local codes except where rigid is herein called for. All boxes, fittings, couplings, transition fittings, adhesives and installation procedures recommended by the manufacturer shall be strictly followed. All stub-ups shall transition to rigid steel conduit at the elbow.

4. PVC conduit may be installed in the fill beneath the structural floor slab for conduit sizes larger than 1 1/4" diameter for slab on grade applications. All stub-ups shall transition to rigid steel conduit at the elbow.

5. PVC conduit shall not be installed in floor slabs except for slab on grade.

6. Feeders installed underground may be schedule 40 PVC as permitted by the National Electrical Code (N.E.C.) and local codes.

7. Flexible and liquid-tight flexible metal conduit shall be used for final connections to utilization equipment. Maximum length shall be three foot. Liquid-tight shall be

used for all exterior locations and any interior location subject to moisture. Refer to Section 26 00 00 for further information.

C. Transitions.

1. Continue the heavier, more protective type conduit application not less than 4 inches into the area where lighter, less protective type conduit is permitted.

D. Place sleeves in the forms of walls and floor slabs for the free passage of conduits. Set sleeves in place a sufficient time ahead of concrete placement so as not to delay the work. Apply caulking for sleeves through floors and through exterior walls. Install plugs or caps on all conduits prior to concrete placement. Provide sleeves and penetrations in accordance with Section 26 00 00.

E. Installation Requirements.

1. Metallic conduits shall be continuous between enclosures such as outlets, junction and pull boxes, panels, cabinets, motor control centers, etc. The conduit shall be secured to enclosures so that the raceway system is electrically continuous throughout. Where threaded conduits enter enclosures provide locknuts on the inside and outside of the enclosure.

2. Where threaded conduits are terminated in enclosures, provide insulated bushings for conductor protection. In equipment having a ground bus, such as in switchgear, motor control centers and panelboards, provide an insulated grounding bushing and extend the grounding conductor to the ground bus.

3. Rigid nonmetallic conduit shall be adequately solvent welded at the joints to form a tight, waterproof connection.

4. All raceways shall be installed perpendicular and parallel to the building lines in a neat and orderly manner.

5. All raceways are to be concealed in all finished areas unless otherwise specifically indicated on the Drawings. When exposed the exact routing shall be confirmed in the field with the Architect/Engineer prior to rough in. Provide chrome-plated floor and ceiling plates around conduits exposed to view and passing through walls, floors, partitions, or ceilings in finished areas. Select plates to properly fit the conduit when securely locked in place.

6. Install raceway systems with all junction boxes and pullboxes as necessary and noted on plans.

F. Installation Methods.

1. All raceway systems shall be complete before installing conductors.

2. All raceways shall have openings temporarily plugged to exclude foreign objects. The interior of all raceways shall be cleaned before pulling installing conductors.

3. All joints shall be cut square and be reamed smooth. All field threaded conduits shall be coated with an approved zinc chromate or with a 90 percent zinc paint.

4. All turns shall be made with standard ells or conduit bent in accordance with the NEC. Conduit bodies may be used in lieu of conduit ells where ease of installation and appearance warrants their use. For exterior and exposed applications, conduit bodies may be used only where specifically approved by the Architect. Furnish access doors for conduit bodies located above inaccessible ceilings. Refer to architectural drawings for required access doors' fire ratings. All field bends shall be made using equipment designed for the particular conduit material and size. Bends shall be free from dents or flattening. There shall be no more than the equivalent of three ninety degree bends in any raceway between terminals and cabinets, or between outlets and junction boxes or pull boxes.

5. Securely fasten and support conduit to metal framing using hot-dipped galvanized, malleable iron pipe straps or other approved means. Refer to Section 26 05 29. Galvanized tie wires for securing conduits, is not acceptable. The use of cadi-clips for conduit supports from suspended ceiling systems is not acceptable.

6. Provide a No. 30 nylon pull cord in all empty conduits. Identify both ends of the line by means of labels or tags reading "Pulling Line".

7. Terminate concealed conduit for future use with a coupling at structural surfaces. Install an approved conduit plug flush with the surface.

8. All openings around electrical penetrations at fire rated walls, partitions, floors or ceilings shall be sealed to maintain the fire resistance rating of the penetration. Refer to Section 26 00 02.

9. All conduit in hazardous areas shall conform to NEC requirements for these areas and where feeding from or to a hazardous area to another room "seal offs" shall be used.

10. All feeders and branch circuit raceways shall be terminated in panelboard enclosures. The use of panelboard skirt is prohibited and not allowed under this contract.

3.2 THERMAL EXPANSION AND CONTRACTION

A. Provide expansion fittings where required to compensate for thermal expansion and contraction in runs of metallic conduit systems as required by the National Electrical Code and the Contract Documents. The full coefficient of thermal expansion and contraction shall be taken into account for in all outdoor locations and all interior locations that are not heated and air conditioned to maintain a fairly constant temperature (+/- 10 degrees F). An expansion fitting shall be provided in any conduit run that is calculated to have 0.20 inches or greater of expansion or contraction. The calculations shall be done in accordance with NEC 300.

B. Seal the interior of all raceways installed underground that will be subjected to water. All underground raceways shall be sealed in accordance with N.E.C. Article 300.

3.3 SEALING RACEWAYS

A. Seal the interior of all raceways that will be subjected to different temperatures such as penetration through walls between air conditioned and non-air conditioned spaces, walk-in

cooler, walk-in freezers and other similar areas to prevent the circulation of air. The sealing compound shall be compatible with the conductor insulation material and be U.L. listed.

3.4 WIREWAYS

A. Install wireways, where shown, according to NEC Article 376. Field apply a 90 percent zinc paint coating over cuts or scratches before any other finish is applied.

3.5 INSTALLATION OF UNDERGROUND RACEWAYS

A. The ground shall be excavated in open trenches to the proper width and depth for the installation of the underground conduits. Minimum conduit burial depth shall be 24" below finished grade to top of the conduit.

B. Where the bottom of the trench is excavated below the necessary elevation, it shall be brought to proper grade by the use of sand or three-eighth inch gravel.

C. No extra will be allowed because of the nature of the ground in which the trench or other excavations are made. All necessary sheathing to prevent cave-ins and barricades shall be provided in accordance with OSHA requirements.

D. Where unstable ground is encountered in the bottom of the trench, it shall be excavated to a depth of at least 12 inches below the line of the duct or slab, and replaced with coarse gravel to the proper height.

E. Where the excavation for its entire depth is in water or wet sand, pump and trench so as to drain it effectively.

F. Backfill trenches with the excavated material unless otherwise specified. It shall be thoroughly compacted to insure a satisfactory job. In surfaced areas, compactions shall be 95% of surrounding undisturbed soil. Sodded areas shall be compacted to 95% up to topsoil. Topsoil shall be lightly compacted then soil mounded to allow for settling.

G. Where conduits pass under existing sidewalks, roads or curbs cut and remove same in order to install the conduit or ducts. All sidewalks, roads or curbs shall be replaced with material equal to those now in place.

H. Provide a burial utility tape with magnetic tracer, over all underground electrical installations that are exterior to the building. This shall include all feeders, branch circuits and communications conduits.

1. Warning tape over electrical installation under 600 volts shall be red with black lettering stating "BURIED ELECTRICAL LINE".

2. Warning tape over electrical installations over 600 volts shall be red with black lettering stating "BURIED HIGH VOLTAGE LINE".

3. Warning tape over communications installations shall be orange with black lettering stating "BURIED TELEPHONE LINE".

Tape shall be installed one foot to six inches below finished grade, 3" wide as manufactured by T & B Westline or equal. Tape shall include magnetic tracer.

I. All raceways installed underground shall be sealed in accordance with the requirements of the National Electrical Code Article 300. Provide conduit sealing bushings to prevent entrance of moisture into the underground raceway systems. Acceptable sealing bushing manufacturer is O-Z. Gedney or approved equal.

END OF SECTION 26 05 33

SECTION 26 05 33.01 - ELECTRICAL BOXES

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies the furnishing and installation of all outlet boxes, floor boxes, junction boxes and pull boxes.

1.2 REFERENCE STANDARDS

A. ANSI/NEMA Publication No. OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers and Box Supports, and Cast Aluminum Covers.

B. ANSI/UL 514 - Electrical Outlet Boxes and Fittings.

1.3 APPLICABLE PROVISIONS

A. Refer to Section 26 00 00 - Electrical General Provisions.

1.4 SUBMITTALS

A. Submit manufacturer's product data on electrical boxes.

1.5 DELIVERY STORAGE AND HANDLING

A. Deliver boxes properly packaged in accordance with Section 26 00 00.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the requirements, acceptable manufacturers shall be as follows:

1. Appleton.
2. American Electric.
3. Cooper Crouse-Hinds.
4. Hubbell Electrical Products.
5. Hoffman Engineering Company.
6. O.Z. Gedney.
7. Raco Inc.
8. Thomas & Betts

2.2 OUTLET BOXES

A. Provide galvanized steel boxes of sufficient size to accommodate wiring devices to be installed at outlet. Provide an extension ring for the device to be installed. Square or rectangular boxes may be supplied. Provide boxes with threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding. Unless otherwise noted, provide 1 - ½ 2-1/8-inch deep by 4-inch box.

B. Provide corrosion-resistant cast-metal FS or FD rain tight outlet wiring boxes with threaded hubs for surface mounting in areas having exposed rigid metal conduit systems and all outdoor locations. Provide galvanized boxes for surface mounting in areas having exposed EMT.

C. Boxes for Lighting Fixtures. Provide galvanized steel octagonal boxes with fixture stud supports and attachments as required to properly support ceiling and bracket-type lighting fixtures. Unless otherwise noted, provide 1 - ½ 2-1/8-inch deep by 4-inch box.

D. Masonry Boxes. Provide galvanized steel, 3-1/2-inch deep, masonry boxes for all devices installed in masonry walls.

2.3 JUNCTION AND PULLBOXES

A. Junction and Pull Boxes: Provide galvanized code-gage sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers. Junction and pull boxes shall be 16 gauge for sizes up to 12' x 12' x 12' and 10 gauges for all sizes 12" x 12" x 12" and larger.

B. Provide NEMA 1 boxes in interior dry locations.

C. Provide NEMA 3R boxes in all exterior locations and interior locations subject to moisture.

PART 3 - EXECUTION

3.1 COORDINATION

A. In order that all outlets may come in proper relation to paneling, decorated areas, etc., this Contractor shall familiarize himself with the details of these spaces and shall carefully lay out all outlets so that the equipment or piping of other trades passing under, over, across or in close proximity to same, will not cause the device or fixtures at or in these outlets to be inaccessible for use or maintenance. This Contractor must consult with the other Contractors on the project and procure all details of the various locations so as to make the outlet boxes come in proper relation to the work of all other trades. The Architect/Engineer reserves the right to relocate any outlet within reason from its original location shown on the plans prior to the application of the walls at no cost.

3.2 OUTLET BOXES

A. Unless otherwise indicated, mount all outlet boxes flush within 1/4-inch of the finished wall or ceiling line. Provide galvanized steel extension rings where required to extend the box forward in conformance to NEC requirements. Attach ring with at least two machine screws. Provide plaster covers for all boxes in plastered walls and ceilings.

B. Boxes for suspended lighting fixtures shall not be attached to or supported from suspended ceilings, unless specifically approved by ceiling installer/manufacturer. Do not support boxes from ceiling grids.

C. Do not connect outlet boxes back to back unless specific approval is obtained. Where such a connection is necessary to complete a particular installation, fill the voids around the wire between the boxes with sound insulating material.

D. Provide only the conduit openings necessary to accommodate the conduits at the individual location. Provide knockout closures to cap all unused openings.

E. Provide weatherproof outlets and outlets in areas subject to moisture with gaskets between the box and the cover plate.

F. All boxes shall be provided with covers.

G. All outlet boxes installed in fire rated walls shall be fire rated with approved fire stopping material around the outlet boxes.

H. Mounting Height. Mounting height of a wall-mounted outlet box means the height from finished floor to horizontal center line of the cover plate. Where outlets are indicated adjacent to each other, mount these outlets in a symmetrical pattern with all tops at the same elevation. Where outlets are indicated adjacent, but with different mounting heights, line up outlets to form a symmetrical vertical pattern on the wall. None of the mounting heights listed in this section are to be construed as waiving of the regulations of any authority having lawful jurisdiction. Verify all device mounting heights with the Architect prior to rough-in. Device mounting heights shall be as follows:

1.	Receptacles and Telephone Outlets	+18" AFF
2.	Wall Switches	+48" AFF
3.	Manual Motor Starters	+54" AFF
4.	Disconnect Switches	+54" AFF

5. Fire alarm system visual and audio/visual devices shall be mounted at eighty inches (80") above the highest floor level within the space or six inches (6") below ceiling, whichever is lower.

6. Special system devices such as lighting motion sensors shall be mounted as recommended by the manufacturer's written instructions.

3.3 JUNCTION AND PULL BOXES

A. Install boxes as required to facilitate cable installation in raceway systems. Junction and pull boxes shall be sized to accommodate conductor system splices and associated insulation. Generally provide boxes in conduit runs of more than 100-feet or as required in Section 26 05 33. Locate boxes strategically and make them of such shape to permit easy pulling of wire or cables. The use of extension rings to increase the junction boxes interior space capacity is not acceptable.

B. Provide boxes so that covers are readily accessible and easily removable after completion of the installation. furnish and install suitable access doors for boxes located above inaccessible ceilings. Select a practical size for each box and cover. All boxes shall cover plates. Refer to architectural drawings for required access doors' fire ratings.

C. All pull boxes, junction boxes or any other electrical enclosure installed underground shall be U.L. listed and labeled for use in wet locations. Any connections and splices in an underground installation shall be approved for wet location applications.

3.4 FIRE ALARM SYSTEM BOXES

A. All junction boxes associated with the fire alarm system shall be painted red. Each box cover plate shall be labeled by zones, refer to Section 26 00 00 or 26 05 53 for acceptable label type.

3.5 EMERGENCY SYSTEM BOXES

A. All junction boxes associated with emergency power systems shall be painted red. Each box shall be labeled with corresponding panelboard I.D. and panelboard circuit number.

END OF SECTION 26 05 33.01

SECTION 26 05 33.02 - SURFACE MOUNTED METAL RACEWAYS AND FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

A. SCOPE OF WORK

1. This section includes minimum requirements for product design, quality, and performance, including preparation and installation of metal raceway.

2. Metal Raceway is an enclosed pathway used for surface distribution of branch circuit electrical wiring, and cabling for voice, data, multi-media, low voltage, and optical fiber. Raceway is typically installed in existing building structures, or after construction is complete. A complete raceway system includes raceway, covers, mounting hardware, various fittings, and outlet boxes installed at specific locations. Specific codes and standards apply to electrical wires and telecommunications cables that are deployed within metal raceway. Compliance to codes and standards is required for installation, grounding and bonding, and cable deployment.

3. This section includes specific requirements for the following:

   (a) METAL RACEWAY: ONE-PIECE, HBL750 SERIES

4. Related Sections from Division 26: Electrical

   (a) 26 05 13 Medium-Voltage Cables

   (b) 26 05 19 Insulated Conductors

   (c) 26 05 26 Grounding

   (d) 25 05 53 Electrical

1.2 QUALITY ASSURANCE

A. Product shall be manufactured by an ISO 9001 Certified facility.

B. Product shall be of the quality and manufacture indicated.

C. Product shall be free from defects in material or workmanship.

D. Specified product is based on acceptable manufacturers listed in the Construction Documents.

E. All methods of construction that are not specified in the contract documents shall be subject to control and approval of the Owner or Owner’s Representative.

F. Product shall be lot-traceable by date code.

G. All critical manufacturing processes of the product shall have documented in-process inspections and production testing according to ISO 9001.

H. Where "approved equal" is stated, any substitute product shall be equivalent to all requirements specified, and is subject to approval.

I. Materials and work specified in this document shall comply with, and are not limited to the codes, standards, and regulations listed below.

NOTE: Local codes always apply to construction. The Authority Having Jurisdiction (AHJ) should be consulted for clarification of any regulatory details to avoid code violations.

1. National Fire Protection Association, Inc., NFPA 70: National Electric Code (NEC), 2005.

   (a) NEC Article 300:Wiring Methods

   (b) NEC Article 386: Surface Metal Raceways

   (c) NEC Article 250: Grounding and Bonding

   (d) NEC Article 800: Communications Circuits

   (e) NEC Article 725: Remote Control, Signaling, and Power-Limited Circuits

   (f) NEC Article 770: Optical Fiber Cables and Raceway

2. CSA C22.1-06, Canadian Electric Code (CEC), 2006.

3. Underwriter's Laboratory, Inc. (UL)

   (a) UL5: Standard for Surface Metal Raceways and Fittings

   (b) UL5C: Standard for Surface Metal Raceways and Fittings for Use with Data, Signal, and Control Circuits

   (c) UL50: Standard for Enclosures for Electrical Equipment

   (d) UL498: Attachment Plugs and Receptacles

   (e) UL1863: Standard for Safety – Communications Circuit Accessories

4. National Electrical Manufacturer's Association (NEMA)

   (a) ANSI/NEMA WD-6-2002: Wiring Devices – Dimensional Requirements

   (b) NEMA 250-2003: Enclosures for Electrical Equipment

5. ANSI/TIA/EIA-568-B.1, Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements, 2001.

6. ANSI/TIA/EIA-568-B.2, Commercial Building Telecommunications Cabling Standard (and all published addenda), Part 2: Balanced Twisted Pair Cabling Components, 2001.

7. ANSI/TIA/EIA-568-B.3, Optical Fiber Cabling Components Standard, 2000.

8. ANSI-J-STD-607-A, Commercial Building Grounding and Bonding Requirements for Telecommunications, 2002.

9. ANSI/TIA/EIA-569-B, Commercial Building Standard for Telecommunications Pathways and Spaces, 2003.

10. ANSI/TIA/EIA-606-A, Administration Standard for Commercial Telecommunications Infrastructure, 2002.

11. ISO/IEC 11801, Information Technology – Generic Cabling for Customer Premises, 2002.

12. ISO/IEC 18010, Information Technology – Pathways and Spaces for Customer Premises Cabling, 2005.

13. ISO/IEC 14763-1, Information Technology – Implementation and Operation of Customer Premises Cabling – Part 1: Administration, 2004.

14. BS EN 50173-1, Information Technology – Generic Cabling Systems – Part 1: General Requirements, 2002.

15. BS EN 50174-1, Information Technology – Cabling Installation – Part 1: Specification and Quality Assurance, 2001

16. Telecommunications Distribution Methods Manual, Current Ed., Building Industry Consulting Services International (BICSI), 2003.

17. Information Transport Systems Installation Manual, Current Ed., Building Industry Consulting Services International (BICSI), 2004.

18. Federal Communications Commission (FCC), Code of Federal Regulations, Part 68: Connection of Terminal Equipment to the Telephone Network, 1998.

19. U.S. Public Law 336.,101st Congress, ADA: Americans with Disabilities Act of 1992.

1.3 SUBMITTALS

A. Section 26 05 33 Specification Text

B. Product Data Sheet

C. Manufacturer's Instructions

D. Product Catalog Literature

E. Product Drawing

1.4 REFERENCES

A. Master Format, 2004 Ed., The Construction Specifications Institute, 2004.

B. The Project Resource Manual, CSI Manual of Practice, 5th Ed., The Construction Specifications Institute, 2005.

1.5 WARRANTY

A. Product is warranted free of defects in material or workmanship.

B. Product is warranted to perform the intended function within design limits.

PART 2 - PRODUCTS

2.1 METAL RACEWAY: ONE-PIECE, HBL750 SERIES

A. Design requirements

1. Metal raceway HBL750 series shall be a one-piece design with base and cover, factory assembled, with mounting hardware and instructions included.

2. Metal raceway, cover, surface boxes, shall be a formed steel construction with a thickness of .040", and zinc plated. Related fittings shall be galvanized on all surfaces.

3. Metal raceway, cover, and related fittings shall have an Ivory color powder coat paint finish on all external surfaces.

4. Metal Raceway HBL750 Series assembled external dimensions shall be 0.75" wide by .85" deep with an internal cross sectional area of 0.40 square inches.

5. Raceway shall be available in 5 ft and 10 ft lengths.

6. Raceway shall have tools available for field cutting and bending.

7. Assembly and disassembly of raceway base, cover, and fittings shall require no special tools.

8. A compact, color-matched touch-up paint pen shall be available to facilitate coating of nicks, scratches, or exposed metal edges that may be incurred during construction.

9. Raceway shall have a 40% fill capacity of (5) Category 5e cables, or (3) Category 6 cables.

10. Raceway shall have a 40% fill capacity of (2) Category 6A cables, or (2) shielded Category 6 cables.

11. Available fittings shall include couplings, internal and external elbows, tees, entrance fittings, conduit adapters and bushings.

12. Available fittings shall include internal, external and flat elbows, and tee fitting, with a 1 ½" radius to accommodate communications UTP and fiber cabling minimum bend radius requirements.

13. Radius elbow and tee fittings shall be common for HBL500-series and HBL750-series metal raceway.

14. Radius elbow and tee fittings shall incorporate snap-off tabs to accommodate either HBL500-series or HBL750 series raceway.

15. Wire and cable fill capacities for all radius elbow and tee fittings shall be equivalent to, or exceed HBL750-series raceway fill capacity.

16. Installed fittings shall be designed to overlap the raceway to cover exposed or uneven edges from field cutting.

17. A UL classified transition fitting shall be available to adapt to Wiremold® installed raceway of similar style as required.

18. Compatible surface boxes shall have a removable knockout portion to permit metal raceway entry and exit.

19. Surface boxes shall be available in standard NEMA single- and double-gang, and multiple gang up to six-gang. Surface box depth shall range from 1.125" to 2.75".

20. Device boxes shall have a single seam construction with rounded corners to eliminate sharp edges.

21. Assembled device box front face design shall permit flush mounting of standard wall plates to minimize perimeter profile exposure.

22. Device boxes shall have threaded standoff posts attached to the base, to facilitate mounting of covers with short screws for ease of alignment during installation.

23. Device and fixture boxes shall accommodate various faceplates with modular connector inserts for balanced twisted pair, fiber optic, coaxial, multi-media, and other low voltage cabling.

24. Faceplates for surface boxes shall accommodate pre-printed labels for proper electrical identification, or telecommunications identification according to ANSI/TIA/EIA-606-A.

25. Category rated communications jacks installed in surface box faceplates shall have provisions for snap-in icons for further identification.

26. Extension boxes shall be available to adapt to existing standard flush switch and receptacle boxes.

27. Round fixture and extension boxes shall be available to mount fixtures and other devices with mounting hole centers of 1 15/32”, 1 5/8”, 1 11/16”, 1 27/32”, 2 3/4", 3 1/2", and 4 1/16”.

28. Round fixture and extension boxes shall be available in depths 1.06”, and in diameters of 3.00”, 4.75”, 5.50”, and 6.38”.

29. All device and fixture box covers shall be painted with powder coat finish, ivory color to match the raceway cover.

B. PERFORMANCE REQUIREMENTS: HBL750 SERIES RACEWAY

1. Metal Raceway shall be UL Listed and CSA Certified.

C. PRODUCTS SPECIFIED – HUBBELL WIRING Systems PART NUMBERS

1. The Hubbell HBL750 Series Metal Raceway and associated fittings, tools, device boxes, and accessories listed in the tables below comply with all requirements specified in this document.

HUBBELL CATALOG NO. HBL750 SERIES METAL RACEWAY AND ACCESSORIES	**PRODUCT DESCRIPTION**
HBL75010IV	RACEWAY HBL750 SERIES, 1 CHAN, 10', IVORY
HBL7505IV	RACEWAY HBL750 SERIES, 1 CHAN, 5', IVORY
HBL607CUT	RACEWAY CUTTER, HBL750 SERIES
HBL607K	RACEWAY CUTTER, HBL750 SERIES, REP BLADE
HBL600B	RACEWAY BENDER, HBL500/HBL750 SERIES
HBL702B	RACEWAY BUSHING, HBL750 SERIES
HBL704IV	RACEWAY MTG STRAP, HBL750 SERIES, IV
HBL706IV	RACEWAY SPLICE CVR, HBL750 SERIES, IV
HBL711IV	RACEWAY 90 FLAT EL, HBL750 SERIES, IV
HBL712IV	RACEWAY 45 FLAT EL, HBL750 SERIES, IV
HBL717IV	RACEWAY INT EL, HBL750 SERIES, IV
HBL718IV	RACEWAY EXT EL, HBL750 SERIES, IV
HBL5751IV	EXTENSION BOX, HBL500/HBL750 SERIES, IV
HBL5711BRIV	FLAT ELBOW W/BEND RADIUS, HBL500/HBL750 SER, IV
HBL5717BRIV	INT’L ELBOW W/BEND RADIUS, HBL500/HBL750 SER, IV
HBL5718BRIV	EXT ELBOW W/BEND RADIUS, HBL500/HBL750 SER, IV
HBL5786AIV	¾” KO CONNECTION COVER
HBL5715BRIV	TEE W/BEND RADIUS, HBL500/HBL750 SERIES, IV
HBL750TFIV	RACEWAY TRANS, H TO WM, HBL750 SERIES, IV
HBL57242IV	RACEWAY 1G UTIL BOX, HBL500/HBL750 SERIES, IV
HBL5700FIV	RACEWAY FLEX SECT, HBL500/HBL750 SERIES, IV
HBL5701C	RACEWAY COUPLER, HBL500/HBL750, IV
HBL5703IV	RACEWAY MOUNT CLIP, HBL500/HBL750 SERIES, IV
HBL5709	RACEWAY GRD CLAMP, HBL500/HBL750 SERIES

HBL5709GC	RACEWAY GRD COND, HBL500/HBL750 SERIES
HBL5711LHIV	RACEWAY INT TW EL LEFT, HBL500/HBL750, IV
HBL5711RHIV	RACEWAY INT TW EL RGHT, HBL500/HBL750, IV
HBL5715IV	RACEWAY TEE, HBL500/HBL750 SERIES, IV
HBL5719IV	RACEWAY CORNER BOX, HBL500/HBL750 SERIES, IV
HBL5731IV	RACEWAY 4" RND CVR, HBL500/HBL750 SERIES, IV
HBL5733IV	RACEWAY 4" RND BOX, HBL500/HBL750 SERIES, IV
HBL5735IV	RACEWAY DIST BOX, HBL500/HBL750 SERIES, IV
HBL5736IV	RACEWAY DIST BOX CVR, HBL500/HBL750 SERIES, IV
HBL5737IV	RACEWAY 1G EXT BOX, 4 3/4", HBL500/HBL750, IV
HBL5737AIV	RACEWAY 1G EXT BOX, 5 1/2", HBL500/HBL750, IV
HBL5739AIV	RACEWAY 1G EXT BOX, 6 3/8", HBL500/HBL750, IV
HBL5738IV	RACEWAY 1G FIXT BOX, 4 3/4", HBL500/HBL750, IV
HBL5738AIV	RACEWAY 1G FIXT BOX, 5 1/2", HBL500/HBL750, IV
HBL5739IV	RACEWAY 1G FIXT BOX, 6 3/8", HBL500/HBL750, IV
HBL5738AFIV	RACEWAY FAN BOX, HBL500/HBL750 SERIES, IV
HBL5744IV	RACEWAY 1G DEV BOX, XDEEP, HBL500/HBL750, IV
HBL57442IV	RACEWAY 2G DEV BOX, XDEEP, HBL500/HBL750, IV
HBL57443IV	RACEWAY 3G DEV BOX, XDEEP, HBL500/HBL750, IV
HBL5744SIV	RACEWAY 1G DEV BOX, DEEP, HBL500/HBL750, IV
HBL5744S2IV	RACEWAY 2G DEV BOX, DEEP, HBL500/HBL750, IV
HBL5744S3IV	RACEWAY 3G DEV BOX, DEEP, HBL500/HBL750, IV
HBL5745IV	RACEWAY 1G COMBO BOX, HBL500/HBL750, IV
HBL5747IV	RACEWAY 1G DEV BOX, SHAL, HBL500/HBL750, IV
HBL57472IV	RACEWAY 2G DEV BOX, SHAL, HBL500/HBL750, IV
HBL57473IV	RACEWAY 3G DEV BOX, SHAL, HBL500/HBL750, IV
HBL5748IV	RACEWAY 1G DEV BOX, STD, HBL500/HBL750, IV
HBL57482IV	RACEWAY 2G DEV BOX, STD, HBL500/HBL750, IV
HBL57483IV	RACEWAY 3G DEV BOX, STD, HBL500/HBL750, IV
HBL57484IV	RACEWAY 4G DEV BOX, STD, HBL500/HBL750, IV
HBL57485IV	RACEWAY 5G DEV BOX, STD, HBL500/HBL750, IV
HBL57486IV	RACEWAY 6G DEV BOX, STD, HBL500/HBL750, IV
HBL5751AIV	RACEWAY DEEP EXTENSION BOX, HBL500/HBL750, IV
HBL5752R	RACEWAY 2G ALARM BOX, HBL500/HBL750, RED
HBL5752IV	RACEWAY 2G ALARM BOX, HBL500/HBL750, IV
HBL5753R	RACEWAY 2G ALARM BX, XDEEP, HBL500/HBL750, RED
HBL5753IV	RACEWAY 2G ALARM BX, XDEEP, HBL500/HBL750, IV
HBL5760IV	RACEWAY 2G EXT BOX, HBL500/HBL750, IV
HBL5780	RACEWAY GALV NIPL, HBL500/HBL750 SERIES
HBL5781	RACEWAY GALV 1/2" BOX CONN, HBL500/HBL750 SER
HBL5781A	RACEWAY GALV 3/4" BOX CONN, HBL500/HBL750 SER
HBL5782C	RACEWAY GALV 1/2" COND CONN, HBL500/HBL750 SER
HBL5782A	RACEWAY GALV 3/4" COND CONN, HBL500/HBL750 SER
HBL5783IV	RACEWAY EL BOX CONN, HBL500/HBL750, IV
HBL5784IV	RACEWAY EL COND CONN, HBL500/HBL750, IV
HBL5785IV	RACEWAY COMBO CONN, HBL500/HBL750, IV
HBL5786IV	RACEWAY ADJ OFFS CONN, HBL500/HBL750, IV
HBL5790B	RACEWAY ARM CABLE CONN, HBL500/HBL750, IV
HBL5791	RACEWAY GALV EMT CONN, HBL500/HBL750, IV

HBLIWEP	PAINT, TOUCH-UP, IVORY

PART 3 - EXECUTION

3.1 PREPARATION

A. Layout drawings of the raceway system shall be approved prior to installation. NOTE: Metal Raceway shall not be installed in wet areas.

B. Manufacturer's instructions for installing raceway and fittings shall be followed by the installer.

C. All wall surfaces, or other permanent structures to which raceway is mounted shall be finished complete.

3.2 INSTALLATION

A. Mount base HBL500IV or HBL750IV base and cover together to wall or structure using the appropriate fasteners and clips, per manufacturer's instructions.

B. Raceway shall be securely supported in intervals not exceeding 10 ft. per manufacturers instructions.

C. Use the tools specified in PART 2 of this document for cutting and bending metal raceway as required by the installation.

D. Install fittings and device boxes in the specified locations, per manufacturer's instructions and per contract drawing specifications.

E. Completed raceway installation shall be mechanically continuous and connected to all electrical outlets, device boxes, and enclosures with no gaps or exposed cuts.

F. Completed raceway installation shall be electrically continuous, and bonded to an approved ground per NECÒ Article 250, and ANSI-J-STD-607-A if communications wiring is installed.

G. Prior to wire and cable installation, the raceway system shall be installed complete, including insulating bushings, adapters, fittings, outlets, boxes, and enclosures. Unused raceway openings shall be closed.

H. Wiring connections shall be made with the proper approved insulated wire connectors or lugs. Exposed conductors at harness wiring junctions are prohibited regardless of connection method. **CAUTION**: Exposed conductors at any wiring junction may cause short circuits, electrical shock or fire. Proper wiring practices must be followed.

I. Power and communication wiring shall be separated in raceway and boxes by a physical barrier. **CAUTION**: Power and communications wiring not separated by a physical barrier is a code violation.

J. Install covers on raceway, boxes and fittings after wiring is complete, or if wire and cable installation is to be done at a later date.

K. For 10GBASE-T communications cabling, refer to detailed manufacturer's guidelines for termination of raceway outlet connectors with Category 6A or shielded Category 6 (STP) cabling.

3.3 FIELD QUALITY CONTROL – TESTING AND INSPECTION

A. Verify layout of system to contract drawings.

B. Raceway system shall be free of dents, scratches, bare metal edges, and exposed uneven cuts.

C. All outlets, boxes, and enclosures shall be fastened securely to walls or permanent structures.

D. Verify that all wiring junctions or connections have no exposed conductors prior to energizing the circuits.

E. Verify that all bonding locations are code and standards compliant.

F. Verify that power and communications wiring are separated by a physical barrier in raceway and boxes.

END OF SECTION 26 05 33.02

SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes identification of electrical materials, equipment, and installations. It includes requirements for electrical identification components including but not limited to; buried electrical line warnings, identification labeling for raceways, cables, and conductors, operational instruction signs, warning and caution signs, equipment labels and signs.

B. Label all wiring devices, and disconnect switches with corresponding panelboard I.D. and circuit number.

1.2 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code

B. ANSI - American National Standards Institute

C. OSHA - Occupational Safety and Hazard Association

D. City of San Antonio Electrical Code.

1.3 APPLICABLE PROVISIONS

A. Section 26 00 00 - Electrical General Provisions

1.4 SUBMITTALS

A. Submit manufacturer's product data for all electrical identification materials.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Ideal Industries, Inc.
2. LEM Products, Inc.
3. Panduit Corp.
4. Seton Name Plate Co.
5. Standard Signs, Inc.
6. Thomas & Betts Corp.

7. T & B Westline.

8. W.H. Brady, Co.

2.2 ADHESIVE TAPE

A. Colored Adhesive Marking Tape for Wires, and Cables shall be self-adhesive vinyl tape not less than 7 mils thick by 3/4 inch wide. Color shall be as required by the color code table. The tape shall be Scotch #35 or equal.

2.3 UNDERGROUND LINE MARKING TAPE

A. Underground line marking tape shall be WBT 4 mil polyethylene, 3" wide, with lettering as specified. All underground line marking tape shall be foil backed detectable buried utility tape as manufactured by Thomas & Betts or approved equal.

2.4 PLASTIC LAMINATE SIGNS

A. Engraving stock melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 square inches, or 8 inches in length; 1/8-inch thick for larger sizes.

B. Engraved legend in white letters on black face and punched for mechanical fasteners.

2.5 INTERIOR BAKED ENAMEL WARNING SIGNS

A. Provide printed aluminum signs, punched for fasteners, with colors, legend, and size appropriate to the location.

2.6 EXTERIOR SIGNS

A. Exterior Metal-Backed Butyrate Warning and Caution Signs: Weather-resistant, non-fading, printed cellulose acetate butyrate signs with 20-gage, galvanized steel backing, with colors, legend, and size appropriate to the location. Provide 1/4-inch grommets in corners for mounting.

2.7 CABLE TIES

A. Cable Ties shall be self-locking nylon cable ties, 3/16-inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range from minus 40 degree F to 225 degree F. T & B Ty-wrap or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install identification devices in accordance with manufacturer's written instructions and requirements of NEC.

B. Where identification is to be applied to surfaces that require a finish, install identification after completion of finish work.

3.2 SWITCHGEAR

A. In general, the following information is to be provided for the types of electrical equipment as listed. Verify the nameplate legend with the A/E.

1. 5 KV and 15 KV Switchgear. For each switch or circuit identify the load served.

2. Switchboards, Motor Controls Centers and Distribution Panelboards. Identify the piece of equipment, and the voltage characteristics, i.e., 480/277V, 3PH, 4W. Identify the load served for each overcurrent protective device.

3. Transformers. Identify the equipment.

4. Panelboards.

(a) Identify the panelboard designation and voltage characteristics.

(b) Prepare a neatly typed circuit directory behind clear heat-resistant plastic for each panelboard. Identify circuits by equipment served and by room numbers. The room names and numbers shall be verified with the Architect. Indicate spares and spaces with light, erasable pencil marking. Identify the panelboard with an engraved plastic laminate sign.

3.3 MISCELLANEOUS ELECTRICAL EQUIPMENT

A. Identify all power receptacles with panelboard I.D. and circuit number. The information shall be contained on the face plate. The device cover plate shall be labeled with the “Brother P-Touch” or equal. The label material shall be white self adhesive vinyl cloth that is oil, water and humidity resistant. The minimum size of the label material shall .5" wide by .5" high. Provide other sizes of label material as required for the particular applications so that the printing is clearly legible.

3.4 JUNCTION AND PULLBOXES

A. Junction and pull boxes shall be labeled legibly with a black felt tip permanent marker on the covers and include the following:

1. Panel which the circuits contained in the box originate.

2. Circuits contained in the box.

3. Voltage of the circuits contained in the box.

3.5 UNDERGROUND ELECTRICAL LINE IDENTIFICATION

A. Provide a burial utility tape, over all underground electrical installations that are exterior to the building. This shall include all feeders, branch circuits and communications conduits.

1. Warning tape over electrical installation under 600 volts shall be red with black lettering stating "BURIED ELECTRICAL LINE".

2. Warning tape over electrical installations over 600 volts shall be red with black lettering stating "BURIED HIGH VOLTAGE LINE".

3. Warning tape over communications installations shall be orange with black lettering stating "BURIED TELEPHONE LINE".

B. Tape shall be installed one foot to six inches below finished grade.

3.6 CONDUCTOR COLOR CODE

A. Provide color coding for the conductors of each feeder, and branch circuit. The conductor color coding shall be in accordance with the City of San Antonio Article VI Electrical Code, Section 10-52, Articles 200.6, 200.7, and 210.5. Verify the conductor color code with the City of San Antonio Inspection Department prior to releasing the conductor materials for purchasing.

CONDUCTOR COLOR CODE

SYSTEM VOLTAGE	208/120 Volt, 3 Phase, 4 Wire	480/277 Volt, 3 Phase, 4 Wire	120/240 Volt, 1 Phase
PHASE A	Black	Purple	Black
PHASE B	Red	Brown	Red
PHASE C	Blue	Yellow	--
NEUTRAL	White	Gray	White
GROUND	Green	Green	Green

B. Furnish and install conductors with color factory-applied the entire length of the conductors except as follows:

1. Furnish and install conductors with factory applied color the entire length of the conductor, for all conductors that are 10 AWG and smaller.

2. For conductors larger than 10 AWG, apply colored pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 3/4-inch-wide tape in colors as specified. Do not cover cable identification markings by taping. Tape locations may be adjusted slightly to prevent such covering.

3.7 WARNING SIGNS

A. Apply warning, caution, and instruction signs and stencils as follows:

1. Install "Danger: High Voltage" signs on entry doors to electrical rooms and on outdoor medium voltage switchgear.

2. Provide instruction signs where required to explain functions of emergency systems, remote lighting controls, etc.

3.8 NAMEPLATES.

A. Apply equipment identification labels of engraved plastic- laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with ½-inch high lettering on 1-inch high label (1-1/2-inch high where two lines are required), white lettering in black field. Text shall match terminology and numbering of the Contract Documents and shop drawings. Verify the exact terminology with the A/E.

Lettering Height	
1/2"	Panelboards, electrical cabinets, and enclosures.
1/2"	Access doors and panels for concealed electrical items.
1/2"	Electrical switchboards.
1/2"	Electrical substations.
1/2"	Motor control centers.
1/4"	Motor starters.
1/2"	Pushbutton motor control stations.
1/2"	Power transfer equipment.
1/4"	Contactors.
1/5"	Switch remote from equipment controlled.
1/2"	Transformers.
1/4"	Disconnect switches.
1/2"	Emergency generating units.
1/2"	Fire alarm control panels and all transponders.
1/2"	Security monitoring master station or control panel

B. Install nameplates labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment. Nameplate shall be secured to equipment by means of self tapping machine screws.

END OF SECTION 26 05 53

SECTION 26 08 00 - ELECTRICAL TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies testing of the electrical systems.

B. All testing shall be performed by a recognized independent testing laboratory. The testing laboratory shall provide all material, equipment, labor and technical supervision to perform such tests and inspections.

C. It is the intent of these tests to assure that all electrical equipment is operational within industry and manufacturer's tolerances and is installed in accordance with design specifications and manufacturer's recommendations.

D. Set all adjustable trip settings on over current protective devices in accordance with Section 26 00 73.

E. The following test are included in this section. This does not preclude other system test and testing requirements in other specification sections and testing and demonstration required by the Authorities Having Jurisdiction.

1. Ground resistance test.

2. 600V cable insulation (Megger) test.

3. Panelboard, switchboards, switchboard instruments.

4. Motor controllers and motor control centers.

5. Dry type transformers.

6. System voltage test.

7. Special systems.

8. Miscellaneous systems.

9. Infrared thermal inspections.

1.2 APPLICABLE PROVISIONS

A. Section 26 00 00 - General Electrical Provisions.

1.3 SUBMITTALS

A. Records of all test reports.

1.4 QUALIFICATIONS OF TESTING AGENCY

A. The testing agency shall meet federal OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907. Membership in the National Electrical Testing Association constitutes proof of meeting such criteria.

1.5 ACCEPTABLE TESTING AGENCIES

A. General Electric Service Department.

B. E.T.I.

C. Shermco Industries.

D. Or approved NETA certified contractor.

1.6 TEST INSTRUMENT CALIBRATION

A. The testing laboratory shall have a calibration program which maintains all applicable test instrumentation within rated accuracy.

B. Instruments shall be calibrated in accordance with the following frequency schedule

1. Field instruments - 6 months maximum.

2. Laboratory instruments - 12 month.

3. Leased specialty equipment - 12 months.

4. Dated calibration labels shall be visible on all test equipment.

1.7 SETTINGS OF OVER CURRENT DEVICES

A. The testing laboratory shall be responsible for implementing all settings and adjustments on protective devices in accordance with values shown in the coordination study.

B. Enter "address" codes for power monitoring devices or similar instrumentation where shown. Test monitoring instrumentation for accuracy in combination with associated PT's and CT's.

1.8 TEST REPORTS

A. The test reports shall include the following:

1. Description of equipment tested.

2. Description of test.

3. List of test equipment used in calibration and calibration date.

4. Test results.

5. Conclusions and recommendations.

6. Appendix, including appropriate test forms.

B. The test report shall be bound and its contents certified.

C. Submit five copies of the completed report to the Architect no later than fifteen working days after completion of test.

1.9 TEST FAILURE

A. Any system material or workmanship which is found defective on the basis of acceptance tests shall be reported directly to the Architect and the contractor shall replace the defective material or equipment and have test repeated until test proves satisfactory without additional cost to the Owner.

1.10 NOTIFICATION OF TESTING

A. Notify the engineer and the Owner two weeks (10) working days before any scheduled testing. The engineer and the Owner observe the testing at their option.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 SYSTEM VOLTAGE TESTS

A. Measure and record system voltages under maximum load conditions available during construction. Incoming service voltage, as well as transformer secondary voltages shall be checked and adjusted to be equal to the voltage rating, or not exceeding 2-1/2% above the voltage rating. Line-to-line voltages should be adjusted between 460 and 480 volts, or 208 and 213 volts. A record of each final test along with time of day, date, and conditions of loading should be recorded for each test location. Submit test results in the Operation and Maintenance Manuals.

B. With the system energized, make line-to-line voltage and line current measurements at all motors under full load conditions. Should measured values deviate +/- 5% from the nameplate ratings, the condition shall be corrected. Notify the Architect immediately should deviations occur. Submit test results in the Operation and Maintenance Manuals.

3.2 GROUND RESISTANCE TEST

A. Building ground electrode resistance testing shall be accomplished with a ground resistance direct-reading single test meter utilizing the Fall-of-Potential Method.

B. Test results shall be in writing, and shall show temperature, humidity, and condition of the soil at the time of the tests. In the case where the ground resistance exceeds 10 ohms, provide additional grounding electrodes to reduce the resistance to ground to 10 ohms.

C. Tests shall include measurement of ground resistance at the following equipment and structures:

1. Main Electrical Room Ground Bar.

2. Signal reference grids (ground rod grid and on-slab metallic plane).

3.3 600 VOLT CABLE INSULATION TEST

A. Measure and record insulation resistence of all feeders using a 1000 volt megger for one minute. Make tests with circuits isolated from source and load.

B. After the branch circuit conductors have been installed, but before they have been connected to the associated wiring devices, test all conductors for short circuits, open circuits. These tests shall be performed by reading resistance in ohms with a multi-meter. Records of these test are not required.

C. Test for load division between all conductors in parallel feeders. The difference in current carried between the individual feeders comprising the parallel feeder shall not exceed 10% of feeder current. Records shall indicate amperage, voltage, and feeder identification. Any feeder not in compliance shall be modified to correct the load division to within 10% and shall be retested. Submit test results in the Operation and Maintenance Manuals.

3.4 PANELBOARDS AND SWITCHBOARDS

A. Test the torque of all bolted cable to bus connections and all bus to bus connections and paint red dot using Torque seal as manufactured by Organic Products (tel # 214-438-7321) on each bolt to confirm the torque test. Check for A-B-C phase rotation.

B. Perform a dielectric test all buses.

C. Perform the following test and observations of all molded case circuit breakers in distribution panels and distribution switchboard and all molded case circuit breakers 225 amps and above in branch circuit panels.

1. Circuit breakers to be operated several times to ensure smooth operation.

2. Inspect the circuit breaker molded case for cracks.

3. Rated current to be passed through each phase and millivolt readings to be taken across contacts.

4. Time-current characteristic tests to be performed by passing 300% rated current through each phase and monitoring trip time.

5. Instantaneous pick-up current to be determined by finding the current level at which breaker trips out in less than 2 cycles.

6. Insulation resistance tests to be performed at 1000 volts D.C.

7. Contacts, shunts, etc. to be visually inspected for alignment.

8. Inverse time, instantaneous pick-up and millivolt drop across contacts, including resistance values as well as deficiencies causing breaker to function outside published limits to be recorded. Times are compared with manufacturer's or NEMA published values.

D. Perform infrared thermal inspection of all bussing, bus connection and cable terminations.

3.5 MOTOR CONTROLLERS

A. Measure and record the insulation resistance of all motor windings to ground with a megohm meter before applying line voltage to the motors. If these values are less than 1 megohm, the Contractor furnishing the motor shall be notified and shall correct the deficiency.

B. Check operation of combination motor starters. Test shall include short circuit and overload protective devices as well as contactor operation and interlock. Primary injection shall be used to test the overload protection.

C. Torque test feeder terminations and paint red dot using torque seal on each lug to confirm the torque test. Check for A-B-C phase rotation.

D. Perform infrared thermal inspection of all bussing, bus connection and cable terminations.

3.6 DRY TYPE TRANSFORMERS

A. Clean all debris from transformer enclosure. Clean coils and termination points.

B. Verify the secondary voltage and adjust taps as required to bring the secondary voltage to within +/- 1% of nameplate voltage.

C. Confirm neutral and equipment ground. Measure and record impedance to ground.

D. Inspect enclosure for damage.

E. Confirm air clearance around transformer per manufacturer's listed requirement.

F. Torque test feeder terminations and paint a red dot using torque seal on each lug to confirm the torque test. Check for A-B-C phase rotation.

G. Test sound level of transformer to confirm it is within the manufacturer's rated level.

H. Perform infrared thermal inspection of all cable terminations.

3.7 SPECIAL SYSTEMS

A. Systems such as fire alarm, intercom, nurse call, public address, security and special access systems shall be tested by the system supplier. Following the test, provide an affidavit that the system has been tested by him, and that the system is complete and operational as specified.

3.8 MISCELLANEOUS SYSTEMS

A. The Contractor shall test all receptacles for power polarity and ground to assure that all receptacles are operating properly, correctly wired and suitably grounded. Provide an affidavit to the effect that this work has been accomplished.

B. Do not subject Ground Fault Interrupter (GFCI) type breakers or receptacles to megger tests.

3.9 INFRARED THERMAL INSPECTIONS

A. Provide an in depth thermal evaluation of all equipment and/or objects specified one year after move-in date..

B. The infrared thermographer shall exercise reasonable care in the performance of work to prevent hazard to self or others, and/or prevent unscheduled interruption of utility services.

C. Quality Control:

1. The infrared thermographer shall have sufficient knowledge of the system, object or process being inspected to understand the observed patterns of radiation. All infrared thermographers shall be a certified Level 2 Thermographer: A Certified Level 2 Thermographer shall have successfully met and passed the experience, training, and testing requirements for a Level 2 Thermographer set forth by the American Society for Nondestructive Testing (ASNT) and pursuant SNT-TC-1A, 1992. Training and certification will be recognized only if administered by one of the following:

(a) An accredited third party independent training organization such as The Academy of Infrared Thermography, The Infraspection Institute, John Snell and Associates, etc.

(b) An ASNT Certified Level 3 Thermographer as prescribed in SNT-TC-1A, 1992.

D. The infrared thermographer will use radiometric thermal imaging equipment that incorporates the use of Focal Plane Array (FPA) technology having a temperature sensitivity of 0.15^0C, obtain accurate thermal data to $.2^0$C, and provide high resolution color thermal images that make the hot spots and affected component easily discernible to maintenance personnel without the need for other real time photographs or images. Thermal imaging equipment will be cooled by a closed loop electronic cooler and not require the use of liquid nitrogen. Thermal imaging equipment will have a minimum spatial resolution of 1.4 mrad. Thermal imaging equipment will have a minimum thermal sensitivity of 2^0C. When providing quantitative infrared thermal data, the thermographer will assure that the infrared measuring equipment meets the manufacturer's standard equipment specifications for accuracy by performing a field test of the equipment. All temperature measuring equipment will be calibrated at intervals recommended by the manufacturer and at least every three years.

E. Submit two complete copies of the results in bound format. Provide digital files of all of the thermal images on a CD. The report shall include the following at a minimum:

1. The printed image of each item inspected. Each image shall be identified by the unit’s name as indicated on the Drawings or as marked in the field for existing equipment.

2. Date and time of inspection.

3. Name of person or persons performing the inspection.

4. A brief written statement about each image. If the image indicated that there may be a potential problem, provide recommendations on how to correct the problem.

3.10 DEMONSTRATION TESTING

A. Demonstration Test of Completed Systems. Demonstrate the features and operation of the following systems:

1. Special systems.

(a) Security systems.

(b) Fire alarm systems.

(c) Intercommunication equipment.

(d) Paging and public address systems.

2. Electrical service entrance equipment:

(a) Fuses, fuse holders and switches.

(b) Meter sockets and meters.

(c) Switching.

(d) Operation of circuit breakers.

(e) Ground fault protection devices.

3. Electrical system and control and equipment:

(a) Power distribution equipment.

(b) Motor control centers.

(c) Motor control devices.

(d) Contactors.

(e) Switchboards.

(f) Panelboards.

4. Lighting systems:

(a) Lighting controls.

(b) Interior and exterior light fixtures.

(c) Emergency lighting systems.

(d) Light fixtures, with emergency power pack.

5. Emergency power systems:

(a) Emergency generators.

(b) Automatic transfer switches.

B. Each system shall be demonstrated once only, after completion of satisfactory testing and acceptance.

C. The demonstration shall be held upon completion and acceptance of all systems at a date to be agreed upon in writing by the Architect.

D. The demonstration shall be held by the appropriate Contractors in the presence of the Architect or his representative and the manufacturer's representative.

E. Demonstrate the functions and location (in the structure) of each system, and indicate its relationship to the riser diagrams and drawings.

F. Demonstrate by "start-stop operation" how to work the controls, how to reset protective devices, how to replace fuses, and what to do in case of emergency.

G. Check rotation of all equipment and correct if necessary.

END OF SECTION 26 08 00

SECTION 26 24 13 - SWITCHBOARDS 600 VOLT AND BELOW

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies the furnishing and installation of a free-standing dead-front type low voltage distribution switchboard utilizing group mounted circuit protective devices 600 volt and below.

B. The switchboard shall be provided with an internally mounted UL 1283 listed type 2 surge protection device (SPD).

1.2 REFERENCE STANDARDS

A. NEMA AB1 - Molded Case Circuit Breakers.

B. NEMA P81.2 - Application Guide for Ground Fault Protective Devices for Equipment.

C. NEMA PB2 - Dead-Front Distribution Switchboards.

D. NEMA SG3 - Low Voltage Power Circuit Breakers.

E. NEMA SG5 - Power Switchgear Assemblies.

F. ANSI C37.13 - Low Voltage AC Power Circuit Breakers.

G. ANSI C 37.20 - Switchgear Assemblies Including Metal Enclosed Bus.

H. UL 489 - Molded Case Circuit Breakers and Circuit Breaker Enclosures.

I. UL 891 - Switchboards and Switchboard Unit Substations.

J. UL 977 - Fused Power Circuit Devices.

1.3 APPLICABLE PROVISIONS

A. Refer to Section 26 00 00 - Electrical General Provision.

B. Refer to Section 26 43 13 - Surge Protection Devices Integrated Units

1.4 SUBMITTALS

A. Submit shop drawings and product data for switchboards, overcurrent protective devices, metering, and accessories.

B. Shop drawings shall include but not be limited to dimensional drawings of the switchboard. Provide top and bottom views showing entry space for conduits and busways, front and side elevations showing arrangement of all devices. Include dimensional data on all buses including material type and capacity of the buses.

C. Submit a one line diagram for each switchboard being provided. Submit product data on all overcurrent protective devices including type ratings and settings of all trips provided to include ground fault relay settings.

D. Submit schematic diagram.

E. Submit assembly rating including short circuit rating, voltage, and continuous current.

1.5 OPERATION AND MAINTENANCE DATA

A. Provide operation and maintenance data in accordance with section 26 00 00. The data shall include, but not be limited to, manufacturer's published installation and maintenance brochure covering the switchboard and all overcurrent protective devices, a record of all settings for each adjustable trip overcurrent device, and a record of all field wiring installed by the contractor.

1.6 DELIVERY STORAGE AND HANDLING

A. Deliver switchboards and components properly packaged and mounted on pallets, or skids to facilitate handling of heavy items. Utilize factory-fabricated type containers or wrappings for switchboards and components which protect equipment from damage.

B. Store switchboard equipment in original packaging and protect from weather and construction traffic.

C. Handle switchboard equipment carefully to prevent physical damage to equipment and components. Remove packaging, including the opening of crates and containers, avoiding the use of excessive hammering and jarring which could damage the electrical equipment.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate the size and location of concrete equipment pads. Concrete, reinforcement, and form work requirements shall be as specified in Section 26 00 00. Pad shall extend 2" beyond all sides of the switchboard and be a minimum 4" high for indoor switchboards and minimum of 8" deep for outdoor switchboards.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, acceptable manufacturers shall be as follows:

1. Eaton.

2. General Electric Co.

3. Square D.

2.2 GENERAL

A. Furnish and install factory assembled, dead front, front accessible, metal enclosed, self supporting secondary power switchboards. The switchboards shall consist of the required number of vertical sections bolted together to form one rigid structure.

B. The physical size and configuration of the switchboard may be varied to suit the manufacturer's standard design, provided the intended functions are accomplished and the switchboard will fit into the space allocated on the drawings while maintaining all required working clearances and maintenance access. Any change in size or configuration shall be noted on the submittal.

C. Furnish and install all control wiring, terminal blocks and fuse blocks as required.

D. The switchboard shall comply with the requirements of UL 891 and NEMA PB2. The switchboard shall comply with all NEC and UL requirements for service entrance equipment and shall be provided with a UL service entrance label.

E. There are two (2) switchboards in the project. The switchboard ampere, voltage, phase, frequency, and short circuit ratings shall be as specified on the drawings. (480Y/277 volt, 60 Hz, 100 KAIC, and 208Y/120 volt, 60 Hz, 100 KAIC).

2.3 STRUCTURE

A. The switchboard shall be 90 inches high and of width and depth to fit in the space shown on drawings. The vertical sections shall be front and rear aligned and bolted together to provide a rigid freestanding, metal-enclosed unit. Provide permanent lifting means on the top of each shipping section.

B. The frame shall be formed from code gauge steel rigidly welded and bolted together to support all of the cover plates, bussing and overcurrent devices.

C. Steel base channels shall be bolted to the frame to rigidly support each shipping section and to facilitate installation.

D. Each section shall have an open (barriered) bottom and a removable top cover plate.

E. All front and side covers shall be removable and shall be attached with captive machine screws. All doors shall be hinged.

F. All interior and exterior surfaces shall be painted with the manufacturer's standard color finish. All surfaces shall be thoroughly cleaned and phosphatized prior to the application of the paint.

G. The enclosure shall be rated NEMA 1 or NEMA 3R. Refer to drawings.

2.4 BUSSING

A. All bus bars shall be tin-plated aluminum silver plated copper. Provide tin-plated aluminum copper bus and connections to switching devices and branches of the main bus. The bus bars shall be of sufficient capacity to limit rated continuous current operating temperature rise of no greater than 65 degree C above average ambient temperature of 40 degree C. The main through bus shall be rated as indicated on the drawings. The vertical bus in each section

shall be determined based on the feeder devices, including spares and spaces, but shall not be less than 60 percent of the main bus rating.

B. All connections shall be silver/tin plated and bolted tightly according to manufacturer's torquing requirements for maximum conductivity.

C. All bussing shall be factory insulated in accordance with industry standards.

D. Make provisions for extension of the bus to add future sections.

E. Provide the switchboard with a full rated neutral bus.

F. Provide the switchboard with a ground bus, firmly secured to each vertical section and extending the entire length of the switchboard.

G. Furnish and install lugs as required to terminate all conductors. The lugs shall be rated for 75 degree C wiring.

2.5 LOW VOLTAGE BREAKER CIRCUIT BREAKER TRIP UNITS - MAIN CIRCUIT BREAKERS

A. Provide a fixed mount Eaton Magnum DS low voltage power circuit breaker or equivalent. The circuit breaker shall be equipped with a microprocessor based tripping system consisting of three current sensors, a trip unit and a flux-transfer shunt trip. Interchangeable rating plugs shall establish the continuos trip rating of the circuit breaker. The rating plug shall be interlocked so they are not interchangeable between frames and interlocked such that a breaker can not be closed and latched with the rating plug removed.

The main circuit breaker trip unit shall be Eaton 1150 with arcflash reduction maintenance system technology. The main circuit breaker shall be provided with a built-in arcflash reduction switch and an indicating blue red light.

B. System coordination shall be provided by the following microprocessor based time-current curve shaping adjustments.

1. Adjustable long time setting, set by the rating plug and delay.

2. Adjustable short time setting and delay with curve selective shaping.

3. Adjustable instantaneous setting.

4. Adjustable ground fault setting and delay.

C. The trip unit shall have both powered and unpowered thermal memory to provide protection against cumulative overheating should a number of overload conditions occur in quick succession.

D. The ground fault adjustable setting shall not exceed 1200 amperes. Provide a neutral ground fault sensor for all four wire loads.

E. Breakers shall have built in test points for testing the long time delay, instantaneous, and ground fault functions of the breaker by means of a 120 volt operated test set. Provide one test set capable of testing all breakers 400 ampere frame and higher.

F. A status LED indicating light shall be provided.

G. Circuit breaker shall have a minimum symmetrical interruption rating of 100,000 amperes. To ensure a selective system all circuit breakers shall have a 30-cycle short-time withstand equal to their symmetrical interrupting ratings through 85,000 amperes regardless of whether equipped with instantaneous trip protection or not.

2.6 LOW VOLTAGE BREAKER CIRCUIT BREAKER TRIP UNITS - FEEDER CIRCUIT BREAKERS

A. Provide a Cutler Hammer Digitrip 310 trip unit or equivalent. The circuit breaker shall be equipped with a microprocessor based tripping system consisting of three current sensors, a trip unit and a flux-transfer shunt trip. Interchangeable rating plugs shall establish the continuos trip rating of the circuit breaker. The rating plug shall be interlocked so they are not interchangeable between frames and interlocked such that a breaker can not be closed and latched with the rating plug removed. All feeder circuit breakers shall have a minimum symmetrical interrupting rating of 100,000 amperes.

B. System coordination shall be provided by the following microprocessor based time-current curve shaping adjustments.

1. Adjustable long time setting, set by the rating plug and delay.

2. Adjustable short time setting and delay with curve selective shaping.

3. Adjustable instantaneous setting.

4. Adjustable ground fault setting and delay.

C. The trip unit shall have both powered and unpowered thermal memory to provide protection against cumulative overheating should a number of overload conditions occur in quick succession.

D. The ground fault adjustable setting shall not exceed 1200 amperes. Provide a neutral ground fault sensor for all four wire loads.

E. Breakers shall have built in test points for testing the long time delay, instantaneous, and ground fault functions of the breaker by means of a 120 volt operated test set. Provide one test set capable of testing all breakers 225 ampere frame and higher.

F. A status LED indicating light shall be provided.

G. All feeder breaker trip units shall be equipped with arcflash reduction maintenance technology.

2.7 METERING

A. Provide a microprocessor - based multifunction power and energy meter, designated (MM250/MM260) device equal to Eaton type IQ-250 or IQ-260 series. The MM250/MM260 shall be UL listed, CUL and CE certified and also meet ANSI standard C37.90.1 for surge withstand.

2.8 CONTROL WIRING

A. Provide 600-volt, Type TBS or SIS wire as required. All control wiring shall be factory installed. All control wiring shall be terminated on terminal blocks and labeled.

B. Provide each vertical section with two 500-watt, 120-volt space heaters located near bottom. Connect two heaters in parallel and use as one 250-watt, 120-volt heater. Provide suitable thermostat control.

2.9 UNDER VOLTAGE AND PHASE REVERSAL PROTECTION

A. Provide a General Electric ICR, or equal Square D relay which provides both under voltage and reverse phase (100 percent negative sequence) protection.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Make field connections of buses between switchboard sections with splice bus and hardware provided by the switchboard manufacturer.

B. Set adjustable current and voltage settings as noted on shop drawing submittals.

C. Thoroughly inspect the switchboard for items such as loose connections and presence of foreign materials and correct prior to energizing the switchboard. All bolted connections shall be torqued to the manufacturer's recommendations.

D. Thoroughly clean the switchboard's interior and exterior surfaces as specified in Section 16010. Touch up all damage to the painted finish of the switchboard with the manufacturer's standard touch up paint.

3.2 PROTECTION OF SWITCHBOARD

A. Protect the switchboard as specified in this Section and Section 26 00 00.

3.3 HOUSEKEEPING PAD

A. Provide a housekeeping pad for the switchboard as specified in Section 26 00 00 - Electrical General Provisions. Secure the switchboard to the pad as recommended by the manufacturer. Include openings for bottom feeds to the switchboard which are compatible with the equipment provided.

3.4 IDENTIFICATION

A. Furnish and install electrical identification as specified in Section 26 05 53.

B. Furnish and install a mimic bus on the front of the switchboard. Use symbols similar to a one-line diagram. Secure mimic bus with screws.

3.5 TESTING

A. Test all connections before energizing switchgear to verify no short circuits exist. Perform all tests required by manufacturer to ensure proper installation.

B. After installation and before acceptance by the Owner, the Contractor shall provide the services of an independent testing organization such as General Electric Installation and Service Engineering or Westinghouse Engineering Services to performance test all ground fault relays in accordance with NEC paragraph 230-95. This test shall involve passing a primary current through the current sensor with a suitable, low voltage test set and timer, which shall allow verification that the ground fault relays track their published curves and that they actually trip the devices on which they are applied. This test shall also include the polarity of the current sensors and give an indication of satisfactory operation of voltmeters, ammeters and their selector switches.

C. The Contractor shall notify the Architect of this test date 2 days in advance so the tests can be properly witnessed.

END OF SECTION 26 24 13

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Distribution panelboards.

B. Branch circuit panelboards.

C. All distribution panelboards shall be provided with built-in surge protection devices (SPDs). The SPD devices shall be manufactured and installed built into the panelboards by the switchgear manufacturer. Refer to Section 26 43 13 - Surge Protection Devices Integrated Units.

D. All distribution panelboards shall be furnished and installed with oversized wiring gutters on each side of the enclosure.

E. All panelboard typewritten circuit directories shall be submitted to the Owner for their review and approval. The contractor shall edit typewritten directories as required by the Owner review and shall provide new typewritten directories.

F. The parking garage main distribution panelboard shall be U.L. listed and labeled for use as service entrance equipment.

1.2 REFERENCES

A. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.

B. NAME KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

C. NEMA PB 1 - Panelboards.

D. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

E. NEMA PB 1.2 - Application Guide for Ground-fault Protective Devices for Equipment.

F. NEMA AB 3 – Molded Case Breakers and Their Application

G. ANSI/UL 67 – Electric Panelboards

H. ANSI/UL 50 – Cabinets and Boxes

I. ANSI/UL 508 – Industrial Control Equipment

1.3 SUBMITTALS

A. Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical Requirements, and Division 01 for submittal requirement.

B. Submit dimensioned drawings showing size, circuit breaker arrangement and equipment ratings including, but not limited to, voltage, main bus ampacity, integrated short circuit ampere rating, and temperature rating of circuit breaker terminations.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver distribution panelboards in factory-fabricated water-resistant wrapping.

B. Handle panelboards carefully to avoid damage to material component, enclosure and finish.

C. Store in a clean, dry space and protected from the weather.

1.5 QUALITY ASSURANCE

A. Commissioning of a system or systems specified in this section is part of the construction process. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Owner's Representative and the Commissioning Agent. Project Closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Square D Company.

B. Eaton.

C. Siemens.

2.2 PANELBOARD CONSTRUCTION

A. General: Provide flush or surface mounted, or surface mounted deadfront circuit breaker type distribution or branch circuit panelboards with electrical ratings and configurations, as indicated on the drawings and schedules. Load center type of panelboards are not acceptable. All panelboards shall be 225 amp mains.

B. Enclosure:

1. Enclosure shall be proper NEMA type as shown on the drawings.

2. NEMA 1

(a) Back box shall be galvanized steel for flush mounted branch circuit panelboards. Back box shall have gray enamel electro-deposited finish over cleaned phoshatized steel for all other type panelbaords.

(b) Provide panelboard fronts with screw cover and hinged door with flush lock.

3. NEMA 3R, 3S and 12

   (a) Enclosure and doors shall have gray enamel electro-deposited finish over cleaned phoshatized steel.

   (b) Doors shall be gasketed and equipped with tumbler type vault lock and two trunk latches where required by UL standard. Interior trim shall consist of four pieces, each covering one gutter top, bottom and both sides.

4. Construct cabinet in accordance with UL 50. Use not less than 16-gauge galvanized sheet steel, with all cut edge galvanized. Provide a minimum 4-inch gutter wiring space on each side. Provide large gutter where required to accommodate the size and quantity of conductors to be terminated in the panel, and where required by code.

5. Exterior and interior steel surfaces shall be cleaned and finished with gray enamel over rust inhibiting phosphatized coating. Color shall be ANSI 61 gray.

6. Doors shall be provided with door-in-door construction equipped with flush-type combination catch and key lock. All locks shall be keyed alike.

7. Branch circuit panelboards shall be 5 ¾ inches deep.

8. A directory holder with heavy plastic plate, metal frame, and index card shall be mounted inside of each door.

9. Reinforce enclosure and securely support bus bars and overcurrent devices to prevent vibration and breakage in handling.

10. Rating: Minimum integrated short-circuit rating, voltage and current rating as shown on drawings.

11. Labeling: The Contractor shall furnish and install engraved, laminated plastic nameplates on the trim per Section 26 05 53, Electrical Identification.

C. Bus:

1. Provide panelboards with rounded edge phase, neutral and ground buses, rated full capacity as scheduled on drawings. Buses shall be full-length tin-plated aluminum ~~copper~~ and braced for the maximum available fault current as shown on drawings. Neutral bus shall be 200% rated for those panels feeding non-linear loads.

2. Phase bussing shall be stacked front-to-back, A-B-C.

3. The neutral and ground bus bars shall have termination locations for each of the individual feeders and the lugs sized appropriately. In addition, space shall be provided to terminate the neutrals and grounds in two feeders equal to the largest size circuit breaker that can be installed in the panelboard. The ground bus shall be mounted in the panelboard, opposite the incoming line and neutral lugs and shall be accessible to allow easy installation of bolts, nuts and lock washers used

to attach ground lugs. The neutral and ground buses in branch circuit panelboards shall have spaces to terminate 42 neutral and 42 ground wires.

4. Where isolated ground buses are specified or indicated, provide copper grounding bus bars mounted in the panelboard on insulated standoffs to ensure isolation from equipment ground potential. Isolated ground buses shall be drilled and tapped as appropriate for connection of the individual isolated grounding conductors.

5. All lugs for phase, neutral, and ground buses shall be tin-plated copper.

6. Panelboard shall be rated SE where required for service Entrance duty.

2.3 SWITCHING AND OVERCURRENT PROTECTIVE DEVICES

A. Provide molded case circuit breakers with manufacturer's standard construction, bolt on type, with integral inverse time delay thermal and instantaneous magnetic trip in each pole. Circuit breakers shall be constructed using glass reinforced polyester insulating material providing superior dielectric strength.

B. Circuit breakers shall have an over center, trip-free, toggle operating mechanism that will provide a quick-make, quick-break contact action.

C. Provide handle padlock attachments on circuit breakers where indicated on drawings. Device shall be capable of accepting a single padlock. All circuit breakers shall be capable of being individually padlocked in the off position.

D. The circuit breakers shall be connected to the bus by means of solidly bolted connection. In multi-pole breakers, the phase connections on the bussing shall be made simultaneously without additional connectors or jumpers. Multi-pole breakers shall be two or three pole as specified. Handle ties are not permitted. The circuit breaker shall have common tripping for all poles.

E. All circuit breakers shall be provided with visible ON and OFF indications.

F. Provide GFI circuit breakers as indicated on drawing or per NEC requirement.

G. Breaker voltage and trip rating shall be per drawings. Breaker faceplate shall indicate UL certificate standards with applicable voltage systems and corresponding short current rating as per drawings.

H. Molded Case Circuit Breakers:

1. Breakers 400 ampere frame and less shall be manufacturer's standard industrial construction, bolt-on type, integral inverse time delay thermal and instantaneous magnetic trip. Breakers 225 ampere through 400 ampere shall have continuously adjustable magnetic pick-ups of approximately five to ten times trip rating.

2. Breakers 600 ampere frame and above shall be equipped with solid-state trip complete with built-in current transformers, solid-state trip unit and flux transfer shunt trip.

I. Current Limiting Molded Case Circuit Breakers:

1. Breakers 100 ampere frame shall be inverse time delay thermal and instantaneous magnetic trip.

2. Breakers 250 ampere and 400 ampere frame shall be solid-state trip with built-in current transformers, solid-state trip unit and flux transfer shunt trip.

3. Current limiting breakers shall protect downstream molded case breakers. Submit manufacturer's test data proving the protection, from both peak currents and I^2T energy of downstream devices.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards in accordance with manufacturer's written instructions and the applicable requirements of the NEC, NEMA, ANSI and the National Electrical Contractors Association's "Standard of Installation".

B. Anchor enclosed firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secured. Direct attachment to dry wall is not permitted. Freestanding panelboards shall be installed on a concrete housekeeping pad with anchors per manufacturer’s recommendation.

C. Mounting height:

1. Distribution Panelboards: As per Drawings, but such that highest operating handle is no greater than 79 inches above finished floor.

2. Branch Circuit Panelboards: As per Drawings, but such that highest operating handle is no greater than 79 inches above finished floor.

3. Where panelboards occur in groups, the tops shall be aligned if it can be done without exceeding items 1 and 2 above.

D. Install panelboards plumb. Adjust trim to cover all openings. Seal all conduit openings and cap all used knockout holes.

E. Provide blank plates for unused open spaces in panelboards. Keep the front door closed after work to protect from damage, dirt, and debris at all times.

F. Install identification nameplates in accordance with Section 26 05 53, Electrical Identification.

G. Provide a minimum of two (2) 1-1/2” spare empty conduits from each branch circuit panelboard to above nearest accessible ceiling. Label pull wires “Spare Conduits”.

H. The use of panelboard skirts is not allowed under this contract.

3.2 FIELD QUALITY CONTROL

A. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers and lugs.

B. Provide testing in accordance with Section 26 08 00 – Electrical Testing.

3.3 PANELBOARD SCHEDULE

A. The Contractor shall provide engraved, laminated plastic nameplates for circuit identification as indicated on the Drawings for distribution panelboards. All panelboard schedules shall be computer generated.

B. The Contractor shall fill the index directory inside the front door of branch circuit panelboards identifying each circuit as shown on Panel Schedule drawings. Where changes are made, the schedule shall reflect the changes. At the end of the job, these schedules shall reflect as-built record conditions.

C. Provide electronic copies of all panelboard schedules as part of the close-out documents.

D. All panelboard schedules shall include the following information.

1. Panelboard ID No.

2. Room number where panelboard is located. Coordinate room number designations with final Owner-approved room number schedule.

3. Serve from: Transformer or distribution panel ID number serving panelboard.

4. Date published.

5. Circuit number: each circuit number identified.

6. Description: room number(s) which the circuit feeds and equipment name, i.e., printer, VAV box, security camera, if applicable, or device type, i.e., receptacle, IG recept., floor box and furniture, TVSS, or spare if the circuit is not used.

END OF SECTION 26 24 16

SECTION 26 24 16.01 - LOAD CENTERS

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish and install loadcenters incorporating circuit breakers of the number, rating and type as specified herein and as shown on the contract drawings.

1.2 REFERENCES

A. The loadcenter and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of UL and NEMA including:

1. UL 67 – Standards for Panelboards
2. UL 50 – Standards for Cabinets and Boxes
3. UL 489 – Standards for Molded Case Circuit Breakers
4. UL 869 – Standards for Service Equipment
5. Federal Specification W-C 375B – Circuit Breakers

1.3 SUBMITTALS – FOR REVIEW/APPROVAL

A. The following information shall be submitted to the Engineer:

1. Dimension outline drawing
2. Component list
3. Knockout configurations
4. Loadcenter ratings including:
   (a) Voltage
   (b) Continuous current
   (c) Short-circuit rating
5. Breaker ratings including:
   (a) Voltage
   (b) Continuous current
   (c) Interrupting ratings
6. Cable terminal sizes

7. Product data sheets

1.4 SUBMITTALS – FOR CONSTRUCTION

A. The following information shall be submitted for record purposes:

1. Final as-built drawings and information for items listed in Paragraph 1.04, and shall incorporate all changes made during the manufacturing process.

2. Wiring diagrams

3. Certified production test reports

4. Installation information including equipment anchorage provisions

1.5 QUALIFICATIONS

A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

1.6 REGULATORY REQUIREMENTS

A. The loadcenters shall be UL labeled.

1.7 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with the manufacturer’s instructions.

1.8 OPERATION AND MAINTENANCE MANUALS

A. Equipment operation and maintenance manuals shall be provided with each assembly shipped, and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Eaton

B. Square D

C. General Electric

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.

2.2 RATINGS

A. Loadcenters shall be rated for 240 volts ac and shall have short-circuit ratings as shown on the drawings or as herein scheduled, but not less than 25,000 amperes rms symmetrical.

B. Breakers shall be a minimum of 125-ampere frame. Breakers 10- through 125-ampere trip size shall take up the same pole spacing.

C. Loadcenters shall be labeled with a UL short-circuit rating. When series ratings are applied with integral or remote devices, a label shall be provided. Series ratings shall cover all trip ratings of installed frames. It shall state the conditions of the UL series ratings including:

1. Size and type of upstream device

2. Branch devices that can be used

3. UL series short-circuit rating

2.3 CONSTRUCTION

A. All interiors, with the exception of the branch circuit breakers, shall be completely factory assembled with main breaker, main lugs or no main device.

B. Interiors shall be designed so that circuit breakers can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be designed so that circuits may be changed without machining, drilling or tapping.

C. Physical means must be provided to prevent the installation of more over-current devices than that number for which the enclosure was designed. Full size breakers are required.

2.4 BUS

A. Bus bars for the main and cross connectors shall be of copper construction in accordance with UL standards. Busing shall be braced throughout to conform to industry standard practice governing short-circuit stresses in load centers. All connection points shall be tin-plated copper. Bus bars shall be mounted to a rigid metal backpan.

B. Neutral bus shall have a suitable lug for each outgoing feeder requiring a neutral connection that is the same of same ampacity as the branch circuit.

2.5 WIRING/TERMINATION

A. All wire connectors and terminals shall be of the anti-turn solderless type and suitable for copper or aluminum wire of the sizes indicated. All connectors shall meet the “Requirements for Wire Connectors and Soldering Lugs” UL 486B.

B. All loadcenters where marked shall be suitable for use with 60/75 degrees C rated wire.

2.6 CIRCUIT BREAKERS

A. Circuit breakers shall be molded case type, 3/4-inch wide per pole. Multi-pole circuit breakers shall be of a stack pole design to provide electrical phase isolation and have an internal common trip.

B. Each pole of the circuit breaker will have inverse time delay overload and instantaneous short-circuit protection by means of both thermal and magnetic sensors.

C. The circuit breaker calibration shall not be affected by environmental changes in relative humidity. Breakers shall be calibrated after assembly.

D. All circuit breakers shall be operated by a toggle-type handle and multi-pole circuit breakers shall have an internal common trip mechanism. The circuit breakers shall incorporate trip mechanisms that are mechanically trip-free from the handle. The handle position shall provide good visual trip indication.

E. Contacts shall be of non-welding silver alloy.

F. All branch breaker handles shall be of a different color than the case of the breaker.

G. All circuit breakers shall be molded case thermal-magnetic quick-make/quick-break, over toggle type. Loadcenters shall be suitable for use in systems having a short-circuit capacity of 25,000 RMS amperes at the loadcenter location as indicated on the drawings.

H. Branch breakers shall be full-size and have a range of 10 amperes through 125 amperes. Plug-in surge arrestor shall be available for single-phase applications. Ground fault breakers for personnel (5 ma) and equipment (30 ma) protection shall be available through 60 amperes: 2 pole breakers as indicated on the drawings.

I. All terminals shall be listed for use with copper or aluminum conductors. Terminals shall be of the box lug design. The terminals shall meet UL 486B requirements and shall be suitable for use with either 60 degree or 75 degree C wire. (Unless otherwise specified)

J. Breakers shall be SWD rated and/or HACR rated as required.

K. Supply arc fault circuit interrupters (AFCI) or arc fault circuit interrupters with ground fault circuit interruption (AFCI w/GFCI) in all 15 and 20 amp branch circuits supplying outlets installed in dwelling units as required by the N.E.C. Article 210.12. The breaker shall provide parallel arc detection and protection in addition to overload and short-circuit protection. AFCI breakers shall be “Classified for mitigating the effects of arcing faults” or conforming to UL Standard 1699 and as defined by Article 210-12 of Section A of the 2014 NEC.

L. Main Circuit Breakers greater than 125 amperes shall be a molded case design. Main breakers utilizing 4-pole bundled mains are not permitted. Single-phase main breakers 200 amperes and less shall have a side-to-side toggle mechanism allowing for top or bottom mounting.

2.7 ENCLOSURES

A. Loadcenters shall have NEMA 1 general purpose enclosures and shall be flush/recessed mounted, except where otherwise noted.

B. Boxes shall be made from cold rolled code gauge sheet steel having multiple knockouts, except where noted. Raintight boxes shall use galvanized steel or an approved coating system which meets or exceeds standards for outdoor type 3R enclosures. Boxes shall be of sufficient size to provide at least a minimum code gutter space on all sides.

C. The cover shall have an easy adjustment feature for flush applications.

D. Boxes shall be factory assembled into a single rigid structure.

E. Provide circuit breaker marking labels and directories.

2.8 FINISH

A. Boxes and trims shall be finished with a high scratch resistant aesthetically pleasing finish. The finish paint shall be of a type to which field applied paint will adhere.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The equipment shall be installed in accordance with manufacturer’s recommendations.

B. The equipment shall conform to all NEC and local codes.

C. Provide load center circuit directory identifying each circuit served from load center.

END OF SECTION 26 24 16.01

SECTION 26 24 16.02 - FUSIBLE BRANCH CIRCUIT PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install fusible branch circuit panelboards as specified, and as shown on the associated drawings.

1.2 RELATED SECTIONS

A. Section 26 28 13 – Overcurrent Protective Devices.

B. Section 26 00 73 – Short circuit, coordination study, arc flash hazard analysis and selective coordination study.

1.3 REFERENCES

A. UL 248 – Low-Voltage Fuses.

B. UL 98 – Enclosed and Dead-front Switches.

C. UL 67 – Panelboards.

D. UL 50/ UL 50E – Enclosures for Electrical Equipment.

E. NEMA PB 1 – Panelboards.

F. NEMA PB 1.1 – Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

G. NEMA FU 1 – Low Voltage Cartridge Fuses.

H. NFPA-70 – National Electrical Code®.

I. CSA Standard C22.2 No. 248 – Low Voltage Fuses.

1.4 SUBMITTALS

A. Submit ten copies of product data sheets or bulletins detailing items B-D.

B. Construction drawings including:

1. Overall, wiring gutter, and interior mounting dimensions

2. Conduit entrance/exit locations, size, number/phase, and termination types

3. Main/branch device, neutral, and ground locations

4. Assembly and component device and nameplate information

C. Assembly ratings including:

1. Voltage, ampacity, and short-circuit current ratings, including any specific lineside overcurrent protection requirements

D. Main disconnect ratings (if applicable):

1. Voltage and ampacity ratings of the disconnect

2. Voltage, ampacity, and interrupting ratings of fuses

E. Branch device ratings including:

1. Voltage, ampacity, and interrupting ratings of fused branch devices

1.5 CLOSEOUT SUBMITTALS

A. Submit ten copies of:

1. Final as-built drawings, assembly and component device ratings as required with Section 1.04

2. Operation and Maintenance manuals including replacement parts list if available

1.6 SYSTEM DESCRIPTION

A. The panelboards shall be UL and cULus Listed.

B. Selective Coordination:

1. Panelboards overcurrent protective devices shall be selectively coordinated with all supply side (fed from both the normal and emergency source) Eaton's Bussmann series Low-Peak™ LPJ_SP, TCF_, LPN-RK_SP/LPS-RK_SP or KRP-C_SP fuses sized at a minimum amp ratio of 2:1. Consult Eaton for coordination ratios with other fuse types or upstream Eaton circuit breakers

1.7 QUALIFICATIONS

A. The equipment manufacturer shall have a minimum five years experience in producing electrical distribution panelboards.

B. Fusible branch circuit panelboards shall be listed to UL 67 and cULus to CSA Standard 22.2.

1.8 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be shipped without branch circuit fuses installed. Branch circuit fuses shall be shipped separately with the chassis. Where >100A main fuses are specified, equipment shall be shipped with main fuses installed. Where <=100A main fuses are specified, fuses shall be shipped separately with the chassis.

B. Inspect equipment for possible damage during delivery and prior to installation.

C. Handle and store in accordance with manufacturer's instructions.

1.9 INSTALLATION, OPERATION, AND MAINTENANCE MATERIALS

A. Furnish operation and maintenance tools/key(s) if available from manufacturer.

B. Manufacturer shall provide copies of installation, operation and maintenance manuals to owner including replacement parts list if available.

1.10 WARRANTY

A. Manufacturer shall warrant specified equipment free of materials and workmanship defects for 18 months from the date of shipment or 12 months from date of first use, whichever occurs first.

1.11 ADDITIONAL MATERIALS

A. Furnish 20% or minimum of three fuses of each rating and type of fuse installed.

B. Furnish a minimum of one spare fuse cabinet or as indicated on the drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Fusible Panelboards shall be Eaton's Bussmann series Quik-Spec™ Coordination Panelboards type QSCP.

B. Substitutions will be accepted only if the below requirements are met and written approval is provided from the engineer:

1. The electrical contractor supplies a written request to the engineer three weeks prior to the project bid date

2. The electrical contractor provides product documentation to prove complete compliance with specification and all pertinent codes and standards requirements as specified in this section

2.2 PANELBOARD RATINGS

A. Panelboards shall be labeled with a short-circuit current rating equal to or greater than that indicated on the associated schedules or drawings.

B. Non-service entrance rated panelboards shall be UL and cULus Listed. Service entrance rated panelboards shall be UL Listed.

C. Panelboards shall be rated >= system voltages up to 600Vac/125Vdc and have a current rating as indicated on the associated schedules or drawings.

D. Panelboard overcurrent protective device interrupting ratings shall be fully rated for the maximum available fault current and have a UL Listed interrupting rating of 300kA and CSA Certified interrupting rating of 200ka.

E. Current ratings, configuration of poles and number of circuits shall be indicated on associated schedules or drawings.

2.3 CONSTRUCTION

A. Panelboard circuits 100A and less shall incorporate overcurrent protection and branch-circuit rated disconnecting means into a single integrated component.

B. Interiors shall be factory assembled.

C. Panelboard shall be equipped with a six-space spare fuse compartment for storing replacement branch circuit fuses. Spare fuse compartment shall be located behind locking panel door.

D. Bus bars shall be tin-plated copper with sufficient cross sectional area to meet UL 67 temperature rise requirements.

E. 200A/400A rated neutrals shall be standard, 400A or 800A rated neutral shall be provided where indicated in the associated schedules or drawings.

F. Bonded neutral shall be provided where specified in associated drawings.

G. Isolated or non-isolated equipment ground bar shall be provided as indicated in the associated schedules or drawings.

H. Where a service-entrance rated panelboard is indicated in associated schedules or drawings, a bonded neutral and non-isolated equipment ground bar shall be provided by the manufacturer.

I. Main lug conductor terminations:

1. MLO terminations shall be rated for 60/75°C, Cu-Al

2. Main disconnect terminations shall be rated for 75°C, Cu Only

J. NEMA 1 panelboards shall be field convertible for top or bottom incoming feed. NEMA 3R panelboards are bottom feed only.

2.4 MAIN DISCONNECT

A. Permanently installed lockout means shall be provided on the main disconnect for lockout tagout procedures.

B. Main disconnect shall be quick-make, quick-break type.

2.5 BRANCH FUSED DISCONNECTS

A. Device shall have visible circuit ON/OFF indication with colored and international symbol markings.

B. Device shall provide open fuse indication via permanently installed indicating light.

C. Device shall be UL and cUL Listed 600Vac/200kA or 125Vdc/100kA voltage/short-circuit current rating, load-break disconnect with amp ratings and number of poles as indicated on the panelboard schedule.

D. Fuse and disconnect assembly shall be a finger-safe component with trim installed.

E. Fuse and disconnect shall be mechanically interlocked so as not to allow fuse removal while fuse terminals are energized.

F. No special tools shall be required for fuse removal.

G. Devices shall have bolt-on style bus connectors.

H. Device housing shall be clearly marked with device amperage.

I. Permanently installed lockout means shall be provided on the device for lockout tagout procedures. Permanently installed means for locking device in the ON position shall also be available.

J. Device shall provide fuse amp rating rejection at the following ampacities to ensure continued circuit protection at the specified circuit rating: 15A, 20A, 30A, 40A, 50A, 60A, 70A, 90A & 100A.

2.6 MAIN & BRANCH OVERCURRENT PROTECTION

A. All overcurrent protective devices shall have a minimum UL Listed interrupting rating of 300kA and CSA Certified interrupting rating of 200kA.

B. Branch circuit overcurrent protection shall be 600Vac UL Listed minimum 300kA IR and CSA Certified minimum 200kA IR finger-safe fuse with Class CF (equivalent to Class J) performance characteristics.

C. Main overcurrent protective devices shall be 600Vac UL Listed minimum 300kA IR and CSA Certified minimum 200kA IR Class J fuses or Class CF (equivalent to Class J) performance fuses.

D. Where panelboard main fuses are installed, fuses in panelboard branch circuits shall selectively coordinate with main fuses for all overcurrents up to 200kA.

2.7 ENCLOSURE

A. NEMA 1 enclosures shall be surface or flush mount as indicated in associated schedules or drawings. NEMA 3R enclosures shall be surface mount only.

B. Boxes shall be a nominal 20 inches wide and 5-¾ inches deep (NEMA 1) or 6.3” (NEMA 3R) with wire bending space per the National Electrical Code®.

C. Panelboard trim shall be supplied with lockable door covering all disconnect handles.

D. Panelboard trim shall be dead-front construction covering all energized parts.

E. Enclosures shall be NEMA Type 1 or Type 3R as indicated in associated schedules or drawings.

F. Door-in-door type trim shall be provided for NEMA 1 enclosures where it is specified in the associated schedules or drawings.

G. Front trim shall be lockable. All lock assemblies shall be keyed alike with like NEMA rated enclosures.

2.8 INTEGRAL SURGE PROTECTION

A. For code required applications, panelboard should include an integral UL 1449 3rd Edition Recognized Type 2 Component Assembly. Device should be certified by UL to a 20kA Inominal Rating. Device should also be CSA Accepted.

B. SPD status monitoring shall be provided by local visual indication and, if needed, by remote contact signaling using an optional Form C contact relay.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment shall be installed in accordance with NEMA PB1.1 and manufacturer's recommendations.

B. Equipment shall have a nameplate installed and mounted to the front cover and indicate: panelboard type, amp rating, voltage rating and short-circuit current rating.

C. Verify connected load(s) and selection of fuse sizes prior to installation.

D. Inspect completed installation for physical damage, alignment, and support.

E. The directory card on the inside of the door shall be completed, identifying every circuit.

3.2 FIELD ADJUSTMENTS & TESTING

A. Tighten chassis, device and termination connections in accordance with manufacturer's recommendations.

B. Measure load currents for each branch device and balance phase loads where possible.

3.3 CLEANING

A. Touch up scratched or marred surfaces to match original finish..

END OF SECTION 26 24 16.02

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies the furnishing and installation of wiring devices, and device cover plates.

B. Install the occupancy sensors, power packs and control wiring in accordance with the recommendations of the manufacturer.

1.2 REFERENCE STANDARDS

A. ANSI/UL 20 - General-Use Snap Switches.

B. ANSI/UL498 - Electrical Attachment Plugs and Receptacles.

C. UL 943 - Ground Fault Circuit Interrupters.

D. NEMA WD 1 - General-Purpose Wiring Devices.

1.3 APPLICABLE PROVISIONS

A. Refer to Section 26 00 00 - Electrical General Provisions.

1.4 SUBMITTALS

A. Submit manufacturer's product data on wiring devices.

1.5 DELIVERY STORAGE AND HANDLING

A. Deliver wiring devices properly packaged in accordance with Section 26 00 00.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the requirements, acceptable manufacturers shall be as follows:

1. Wiring Devices

(a) Arrow Hart, Division Crouse-Hinds.

(b) Hubbell Inc., Wiring Device Division

(c) Leviton Manufacturing Co.

(d) Pass & Seymour Inc.

2. Dimmers

(a) Lutron Electronic Co., Inc.

(b) Lithonia Controls

2.2 SWITCHES

A. Provide heavy-duty, AC, quiet switches. The switches shall be Hubbell CS 1221 or equal, 120-277 volt, 20 amperes, commercial specification grade. Switches shall be single pole, double pole, three way, four way, or key operated as scheduled on the drawings and shall be the self grounding type.

2.3 DIMMER SWITCHES

A. Provide solid-state AC dimmer controls for incandescent fixtures; wattage as required to control the load indicated, 120-volts, 60 Hz, with continuously adjustable slide dimmer and preset on/off switch. Provide with electromagnetic filters to eliminate noise, RF and TV interference.

2.4 LOW VOLTAGE DIMMER

A. Provide Lithonia “SLD” series dimmers or equal. The low voltage dimmers shall provide dimming intensity level and on/off control of low voltage incandescent, incandescent light fixtures using magnetic step-down transformers and low voltage lamps, and neon and cold cathode lamps using magnetic step-down transformers. The control shall be a vertical linear slide, full to minimum range. The switch shall be a mechanical air-gap switch, initiated at bottom of slider travel on single pole dimmers, push/push type mechanism on three-way and preset dimmers.

B. The dimmers operate on 120V two-wire circuits only. Neutrals from multiple dimmers may not be shared in 120/208V applications. The dimmer response shall follow the square law dimming curve. Voltage compensation shall be by means of a firing angle adjustment. The dimmer shall include an output filter network to minimize interference.

C. The dimmer shall mount in a standard single-gang device box. Follow the manufacturers recommendations for derating if multiple dimmers are ganged together. Wire connections shall be made by means of pigtails on the dimmer

2.5 DUPLEX RECEPTACLES

A. Provide heavy-duty commercial grade receptacles, 2- pole, 3-wire, grounding, 20-amperes, 125-volts. The NEMA configuration shall be 5-20R unless otherwise indicated. The receptacles shall be Hubbell 5262W or equal. Provide all receptacles including , isolated ground and ground fault interrupting types in accordance with the following:

1. The grounding shunt between the ground terminal screw and the ground contact blades shall be 0.50" one piece solid brass without rivets.

2. The wall plate mounting assembly shall be an integral component without rivets.

3. The base and face plate shall be high strength, glass re-enforced nylon.

4. The contact arrangement shall be triple wipe, configured so that contact is made on both sides of each blade inserted into the device.

5. All terminal screws shall be solid brass. Provide screws with combination slot and Philips heads.

2.6 GROUND FAULT CIRCUIT INTERRUPTERS

A. Provide feed through type self test ground-fault circuit interrupters, with heavy-duty duplex receptacles with ground fault indicator light, capable of protecting connected downstream receptacles on single circuit, and of being installed in a 2-3/4" deep outlet box without adapter, grounding type UL-rated Class A, Group 1, rated 20-amperes, 120-volts, 60 Hz; with solid-state ground-fault sensing and signaling; with 5 milliamperes ground-fault trip level; with NEMA configuration 5-20R Hubbell GF20LA. Include indicator light that shows when GFCI has malfunctioned and no longer provides GFCI protection.

B. Provide feed through type self test ground-fault circuit interrupters, with heavy-duty duplex receptacles with ground fault indicator light, capable of protecting connected downstream receptacles on single circuit, and of being installed in a 2-3/4" deep outlet box without adapter, grounding type UL-rated Class A, Group 1, rated 20-amperes, 120-volts, 60 Hz; with solid-state ground-fault sensing and signaling; with 5 milliamperes ground-fault trip level; with NEMA configuration 5-20R. The receptacles shall be Hubbell GFR8200 commercial specification grade or equal.

C. The device shall trip if the line or load connections are miswired.

2.7 ARC FAULT CONVENIENCE RECEPTACLES

A. Arc Fault Convenience Receptacles, 125 V, 15A and 20A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated; Wiring Device-Kellems; AFR25TRW, AFR20TRW, or a comparable product by one of the following:

(a) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.

(b) Leviton Manufacturing Co., Inc.

(c) Pass & Seymour/Legrand (Pass & Seymour).

2.8 TAMPER-RESISTANT CONVENIENCE RECEPTACLES

A. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Wiring Device - Kellems; BR20TR 8300or a comparable product by one of the following:

(a) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; TRBR20.

(b) Leviton Manufacturing Co., Inc.; TBR20.

(c) Pass & Seymour/Legrand (Pass & Seymour); TR63.

2. Description: Labeled shall comply with NFPA 70, "Health Care Facilities" Article, Tamper-Resistant Convenience Receptacles, 125 V, 20 A. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

2.9 WEATHER RESISTANT AND TAMPER RESISTANT CONVENIENCE RECEPTACLES

A. Weather Resistant and Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Wiring Device - Kellems; BR20 WRTR or a comparable product by one of the following:

(a) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; TWR20.

(b) Leviton Manufacturing Co., Inc.; TWR20.

(c) Pass & Seymour/Legrand (Pass & Seymour); NO EQUAL.

2. Description: Labeled shall comply with NFPA 70, "Health Care Facilities" Article, Tamper-Resistant Convenience Receptacles, 125 V, 20 A. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

2.10 TAMPER RESISTANT CONVENIENCE RECEPTACLES

A. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated; Wiring Device-Kellems; GFTR20 or a comparable product by one of the following:

(a) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; TRVGF20.

(b) Leviton Manufacturing Co., Inc.; T7899.

(c) Pass & Seymour/Legrand (Pass & Seymour); 2095TR.

2.11 RESIDENTIAL DEVICES

A. Residential-Grade, Tamper-Resistant Convenience Receptacles, 125 V, 15 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated; Wiring Device-Kellems; RR15STR or a comparable product by one of the following:

(a) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; TR270.

(b) Leviton Manufacturing Co., Inc; T5320.

(c) Pass & Seymour/Legrand (Pass & Seymour); 3232TR.

2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.

B. Weather-Resistant and Tamper-Resistant Convenience Receptacles, 125 V, 15 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R , and UL 498.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated; Wiring Device-Kellems; RR15SWRTR or a comparable product by one of the following:

(a) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; TWR 270.

(b) Leviton Manufacturing Co., Inc.; W5329TO.

(c) Pass & Seymour/Legrand (Pass & Seymour); 3232TRWR.

2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.

C. Fan Speed Controls:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated, Wiring Device-Kellems; RDVFSQ or a comparable product by one of the following:

(a) Leviton Manufacturing Co., Inc.

(b) Pass & Seymour/Legrand (Pass & Seymour).

2. Modular, 120-V, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters.

3. Comply with UL 1917.

2.12 DEVICE COVER PLATES

A. Device cover plates in finished spaces shall be impact resistant nylon thermoplastic. Device plate shall be provided with positive bow to assure that all four edges of the plate are flush against the wall. All cover plates shall be provided with captive screws.

B. Device cover plates in weatherproof locations shall meet UL 514 for continuous use in a wet location. The cover plates shall be P&S 3700 or Taymac #20510, deep cover, vertical mount.

C. Emergency Powered Devices and cover plates shall be red. The emergency panel and circuit shall be indicated by means of a nameplate on the front of each cover plate.

2.13 DEVICE COLOR

A. The wiring devices and cover plates shall be white unless otherwise directed by the project architect. Coordinate all wiring devices and wiring device finish colors with Architect prior to their procurement.

PART 3 - EXECUTION

3.1 GENERAL

A. Where items of equipment are provided under other sections of this specification or by the Owner, provide a compatible receptacle for the cap or plug and cord of the equipment.

B. Multiple gang cover plates shall be used for all multiple device locations.

C. Where cover plates do not completely conceal the rough openings for the devices, it shall be the responsibility of the Contractor to paint, patch, etc. around the opening to the satisfaction of the Architect/Engineer.

D. Tighten connectors and terminals securely, including screws and bolts.

E. Install wiring devices only in electrical boxes which are clean; free from excess building materials, dirt, and debris.

F. Install cover plates after painting work is completed, tight to surfaces over which they are installed.

3.2 WALL SWITCHES

A. Install switch on the strike side of the door as finally hung.

B. Install wall switches in a uniform position so the same direction of operation will open and close the circuits throughout the job, generally up or to the left for the ON position.

C. Where more than one device occurs in an outlet box, resulting in a 300 volt or higher potential between them, provide a barrier between the devices.

3.3 DIMMERS

A. Provide all equipment, labor and other services for proper installation of the dimmers.

B. Provide a separate neutral wire to prevent dimmer interaction and neutral harmonic current rise.

C. Provide multi-gang coverplates for installations of dimmers and switches ganged as specified. The coverplate shall attach without exposed fasteners. The Contractor shall be responsible for derating the dimmer if side sections are removed. All derating shall be done in accordance with the manufacturer’s recommendations.

3.4 RECEPTACLES

A. Mount receptacles vertically centered at the height specified.

3.5 DEVICE COVERPLATES

A. Provide device cover plates for each device of the type required for service and device involved.

B. Label plates in accordance with Section 26 05 53 - Electrical Identification.

END OF SECTION 26 27 26

SECTION 26 28 13 - OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies the furnishing and installation of low voltage fuses rated 600 volts and below, 6000 amperes and below and automatic circuit breakers.

B. Refer to Section 26 00 73. Fault and Coordination Study and Arc Flash Hazard Analysis.

1.2 REFERENCE STANDARDS

A. ANSI/ANSI C97.1 - Standard for Low Voltage Cartridge Fuses 600 Volts and Less.

B. ANSI/UL 198.2 - High-Interrupting-Capacity Current-Limiting Fuses.

C. NEMA FU 1 - Low Voltage Cartridge Fuses.

D. NEMA AB 1 - Molded Case Circuit Breakers.

E. NEMA AB 2 - Procedures for Verifying the Performance of Molded Case Circuit Breakers.

F. UL 198.3 - High-Interrupting-Capacity Class K Fuses.

G. UL 198.4 - Class R Fuses.

1.3 APPLICABLE PROVISIONS

A. Refer to Section 26 00 00 - Electrical General Provisions.

1.4 SUBMITTALS

A. Submit shop drawings and product data for fuses and circuit breakers.

B. Include time current curves, dimensions, voltage, short circuit ampere interrupting rating, continuous current rating and number of poles.

1.5 OPERATION AND MAINTENANCE DATA

A. Provide operation and maintenance data in accordance with Section 26 00 00.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the requirements, acceptable manufacturers shall be as follows:

1. Fuses.

(a) Bussman - Cooper Industries.

(b) Ferraz Shawmut.

2. Circuit Breakers.

(a) Square D.

(b) Eaton.

(c) General Electric.

2.2 FUSES

A. Provide fuses with a voltage rating suitable for the normal voltage of the system in which they are to be applied.

B. Class RK1 Time-Delay Fuses: Fuses rated from 1/10 to 600 amperes shall be UL Class RK1, dual element time-delay type. The fuses shall have separate overload and short circuit elements. The fuses shall have a spring assisted thermal element with a melting point of 284°F. The two elements shall be physically separated in different chambers. The fuse shall be capable of maintaining an overload of 500% of its rated current for a minimum of 10 seconds. The fuses shall have a U.L. listed interrupting rating of 200,000 amperes rms/sym.

C. Class RK5 Time-Delay Fuses: Fuses rated from 1/10 to 600 amperes shall be UL class RK5, dual element time-delay type. The fuses shall have separate overload and short circuit elements. The fuses shall have a spring assisted thermal element with a melting point of 284°F. The two elements shall be physically separated in different chambers. The fuse shall be capable of maintaining an overload of 500% of its rated current for a minimum of 10 seconds. The fuses shall have a U.L. listed interrupting rating of 200,000 amperes rms/sym.

D. Class L Time-Delay Fuses: Fuses rated from 601 to 6000 amperes shall be UL Class L, time-delay type. The fuses shall have "O" ring seals between the end bells and the glass melamine fuse barrel. The fuse links shall be 99.9% pure fine silver. All terminals shall be silver plated. The fuses shall be capable of maintaining an overload of 500% of it's rated current for a minimum of 4 seconds. The fuses shall have a UL listed interrupting rating of 200,000 amperes rms symmetrical.

2.3 MOLDED CASE CIRCUIT BREAKERS

A. Provide molded-case thermal magnetic circuit breakers. Provide breakers with permanent thermal and instantaneous magnetic trips in each pole. Two and three pole breakers shall be common trip. Construct with over center, trip-free, toggle type operating mechanisms with quick-make, quick-break action and positive handle indication. Construct breakers for mounting and operating in any physical position and operating in an ambient temperature of 40 degrees C. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated for 65° or 75°C wire for breaker sizes less than 100 amperes and 75°C for breaker sizes 100 amperes and greater. The circuit breakers shall have a minimum 10,000 AIC at 120/208 volts and 14,000 AIC at 277/480 volt. Provide breakers with an AIC rating equal to or greater than the minimum rating noted on the panelboard schedules.

2.4 ARC FAULT CIRCUIT INTERRUPTING CIRCUIT BREAKERS

A. Provide arc fault circuit interrupting circuit breakers (AFCI) for all receptacle circuits in the bedroom/sleeping areas of the facility. The AFCI device shall clear a 5 ampere arc in no more than one second and clear a 30 ampere arc in no more than 0.11 seconds.

B. The device requires that the branch circuit neutral conductor not be shared for proper operation of the device. Provide a separate neutral conductor for each branch circuit serving the receptacles in the bedroom/sleeping areas of the facility.

2.5 GROUND FAULT CIRCUIT BREAKERS FOR HEAT MAINTENANCE CABLE SYSTEMS, AND HEAT TRACE SYSTEMS

A. Provide ground fault type circuit breakers serving heat maintenance cable system and heat trace systems. The ground fault circuit protector shall have a sensitivity of 30 mA (thirty milliamps). The circuit breakers shall be Cutler-Hammer Quicklag type: QBGFEP or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install overcurrent protective devices for all wiring and equipment as indicated, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.

3.2 FUSES

A. Check all fuse clip fasteners for alignment and tightness in accordance with the manufacturers recommendations.

B. Install fuses so label is in an upright, readable position.

C. Fuses for HVAC equipment shall be provided in accordance with equipment manufacturer's recommendations.

D. All fused disconnects shall have a label placed on the inside of the door that indicates fuse size and type. The manufacturers standard label shall suffice.

E. 1/10 to 600 ampere fuses for individual motor circuits shall be Class RK5/RK1 sized at 1.25 times the full load amperes of the motor for 1.15 service factor motors and 1.15 times the full load amperes for 1.0 service factor motors.

F. 601 to 6000 ampere Class L fuses for individual motor circuits shall be sized at 1.5 times the motor full load amperes.

3.3 CIRCUIT BREAKERS

A. Fasten circuit breakers without mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cabling.

B. Set field-adjustable circuit breakers for trip settings as recommended by the short circuit and coordination study.

C. Inspect circuit-breakers operating mechanisms for malfunctioning and, where necessary, adjust or replace units for free mechanical movement.

D. The elevator circuit breakers shall be installed in accordance with NEC and ANSI 17.1. Provide all conduit and wiring to interlock the shunt trip coil of the circuit breaker with fire alarm system and elevator controller as required by ANSI 17.1.

3.4 SPARE FUSES

A. As spares, provide the greater amount of either three fuses or 10 percent of each size and type installed. Deliver the spare fuses to the Owner at the time of final acceptance of the project. Neatly encase the spare fuses in suitable containers or cabinets.

B. Provide spare fuse cabinet, labeled "SPARE FUSE CABINET", and sized to accommodate the required spare fuses. Mount cabinet adjacent to main switchboard, unless otherwise noted. Attach list of all fuses provided on the project to inside cabinet door.

END OF SECTION 26 28 13

SECTION 26 28 16 - ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies the furnishing and installation of enclosed switches.

B. Provide enclosed switches as the disconnecting means for equipment.

1.2 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code.

B. UL 98 - Safety Standard for Enclosed Switches.

C. NEMA KS 1 - Enclosed Switches.

D. NFPA 70E - Electrical Safety in the Workplace.

1.3 APPLICABLE PROVISIONS

A. Section 26 00 00 - Electrical General Provisions.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product data on enclosed switches. Submittals shall include the following:

1. Voltage, Phase, Horsepower/Ampere Rating

2. NEMA Enclosure Type

3. Dimensions

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the requirements, acceptable manufacturers shall be as follows.

1. Square D.

2. Eaton.

3. General Electric.

2.2 CHARACTERISTICS

A. Provide switches with voltage rating of 240 volts or 600 volts a-c, as required to match the distribution system voltage.

B. Provide heavy duty switches conforming to NEMA KS 1 standard for Type HD switches.

C. Provide switches with quick-make, quick-break contacts.

D. Unless otherwise indicated, provide 3-pole, visible blade switches.

2.3 CONSTRUCTION

A. Switches shall be furnished in NEMA 1 general purpose enclosures in interior dry locations and NEMA 3R enclosures in exterior locations and indoor areas subject to moisture. Covers on NEMA 1 enclosures shall be attached with pin type hinges. NEMA 3R covers shall be securable in the open position. Enclosures shall be manufactured from galvanized steel. Enclosures shall have a gray baked enamel finish, electrodeposited on cleaned, phosphatized steel.

B. The operating handle shall be suitable for padlocking in the OFF position with as many as three padlocks of 5/16-inch diameter shank. The switch cover shall be interlocked with the operating mechanism to prevent opening the cover when the switch is in the ON position and to prevent turning the switch ON when the door is open.

C. The lugs shall be front accessible, UL listed for 65 or 75 degree C, aluminum or copper wires.

D. Provide incoming line terminals with an insulated shield so that live parts are not exposed when the door is open.

E. Provide switches with isolated, fully rated neutral block in circuits with a neutral conductors.

F. Provide each switch with a ground lug for termination of the circuit grounding conductors.

G. Provide fused switches with rejection-type fuse holders which are suitable for use with fuses specified.

H. Provide factory nameplate, front cover mounted, indicating the switch type, catalog number and voltage, amperage and horsepower ratings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide switches for all equipment as required to comply with NEC requirements for equipment disconnecting means.

B. Mount the switches so that the operating handle is approximately 54 inches above finished floor. Where switches are group mounted, align the tops of all of the switches.

3.2 DISCONNECT SWITCHES MARKING

A. All disconnect switches shall be labeled as required by Section 26 05 53 - Electrical Identification.

3.3 GROUNDING

A. Connect the equipment ground conductor to the grounding lug in the enclosed switches.

END OF SECTION 26 28 16

SECTION 26 29 13.13 - MOTOR STARTERS 600 VOLT AND BELOW

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies the furnishing and installation of individual and motor control center mounted motor starters 600 volt and below.

1.2 REFERENCE STANDARDS

A. ANSI C19 - Industrial Control Apparatus.

B. NEMA ICS - Industrial Controls and Systems.

C. UL 508 - Industrial Control Equipment.

1.3 APPLICABLE PROVISIONS

A. Refer to Section 26 00 00 - Electrical General Provisions.

B. Refer to Divisions 22 and 23.

1.4 SUBMITTALS

A. Submit manufacturers shop drawings and product data on motor starters. Submittals shall include, but not be limited to the following.

1. Rated voltage, phase and frequency.

2. NEMA size.

3. Elementary control diagrams.

4. All control devices and accessories.

1.5 OPERATION AND MAINTENANCE DATA

A. Provide operation and maintenance data in accordance with Section 26 00 00.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the requirements, acceptable manufacturers shall be as follows:

1. Square D.

2. Eaton.

3. General Electric.

2.2 GENERAL

A. Motor starters for three phase motors shall be full voltage non-reversing unless otherwise indicated on the drawings and schedules.

B. Motor starters for single phase fractional horsepower motor shall be manual type unless otherwise indicated on the drawings and schedules.

C. All starters shall be provided with thermal overload relays sized in accordance with the motor manufacturers recommendations and NEC requirements.

D. All three phase motors 20 horsepower and above shall be provided with protection against single phasing above and beyond protection provided by the thermal overloads. Provide a solid state protective relay to monitor the three phase system. The relay shall monitor the system voltage and trip all of the starters using an auxiliary relay under any of the following conditions:

1. Under voltage with an adjustable trip set point from 10 to 20 percent of nominal circuit voltage.

2. Phase unbalance with an adjustable trip set point from (2 to 4) or (5 to 10) percent based on the maximum deviation from average system voltage.

3. Phase loss with trip within 50 milliseconds if one or more of the phases is lost while motor is running. Inhibit a start if one or more of the phases is lost.

4. Phase reversal with trip within 50 milliseconds if two or more phases are reversed. Inhibit a start if two or more phases are reversed.

E. The enclosures shall be NEMA 1 unless otherwise noted on the drawings.

2.3 MAGNETIC STARTERS

A. Shall be minimum NEMA size “0”.

B. The contacts shall be double break silver alloy. The contacts shall be replaceable without removing the starter or disconnecting the power wiring.

C. Coils shall be 120 volt. Each starter shall have an individual control power transformer to provide 120 volt control power. Each phase of the primary side of the transformer shall be fused with RK1 fuses. The secondary leaving transformer terminal X1 shall be fused. The secondary leaving terminal X2 shall be grounded. Coordinate primary fuses with secondary fuse to clear a faulted transformer but not open on magnetizing inrush current. The minimum control power transformers size shall be the sum of the operating coil plus 50 VA extra capacity. Coordinate additional control power transformer capacity requirements with control contractor. The VA rating of the control power transformer shall be increased as directed by the Division 15 control contractor. Coordinate control power transformer requirements with Division 15 control contractor prior to releasing the related equipment.

D. Each control unit shall be furnished with two (2) N.O. and two (2) N.C. auxiliary contacts. All auxiliary contacts shall be brought out to terminal strips.

E. Each control unit shall have three melting alloy overload relays. Thermal units shall be one piece and interchangeable. The starter shall be inoperative if the thermal units are removed.

2.4 FULL VOLTAGE NON REVERSING STARTERS

A. Each control unit shall be provided with a hand-off-auto selector switch, red run and green off pilot lights. Provide additional controls and accessories as specified on the drawings.

2.5 TWO SPEED STARTERS

A. Each control unit shall be provided with a high-low-off-auto selector switch, red-high speed, amber low speed and green off pilot lights.

B. The starter shall single two winding type.

2.6 COMBINATION STARTER DISCONNECTS

A. Each unit shall consist of a magnetic starter and a disconnecting means with an overcurrent protective device. Starters shall be full voltage non-reversing as specified herein unless otherwise indicated on the drawings.

B. An operating mechanism shall be mounted on the primary disconnect of each unit. The door shall be mechanically interlocked with the operating handle to prevent the door from being opened unless the switch is in the off position. A defeater shall be provided to bypass the interlock.

C. The overcurrent protective device shall be a fused disconnect switch. The disconnect shall be quick make quick break and shall accept class "R" fuses. Fuses shall be as specified in Section 26 28 13.

D. The overcurrent protective device shall be a thermal magnetic circuit breaker unless otherwise specified.

2.7 MANUAL MOTOR STARTERS

A. Manual motor starters shall be one, two or three pole as required. The operator shall be a toggle switch. The toggle switch shall be capable of being locked in the off position. Contacts shall be double break silver alloy. Melting alloy thermal overload protection shall be provided. Provide the toggle-operated starter in a NEMA 1 enclosure unless otherwise indicated. The unit shall be provided with a flush mounting enclosure where wall mounted in finished areas in the building.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Furnish and install all motor starters as indicated on the drawings. Mount units so that operating handle is approximately 54 inches above finished floor. Where individual starters are group mounted, align the top of the enclosure of all units.

B. All manual motor starters, remote push buttons, remote control stations and multi-speed switches shall be flush mounted at 54 inches above finished floor, unless otherwise shown on the Drawings or directed by the Architect/Engineer.

C. All starters shall be mounted to structural walls, columns or equipment curbs. Do not mount starters on equipment or fan housings.

3.2 FIELD ADJUSTMENTS

A. Adjust all overload relays as required to comply with the motor manufacturers recommendations and NEC requirements.

B. Adjust all overcurrent protective devices as required to compensate for abnormal starting conditions and as required to comply with the motor manufacturers recommendations and NEC requirements.

3.3 IDENTIFICATION

A. Provide unit nameplates as specified in Section 26 05 53.

B. Provide nameplates for all remote mounted control devices in accordance with Section 26 05 53. The nameplate shall indicate the designation of the equipment controlled.

END OF SECTION 26 29 13.13

SECTION 26 32 13.13 - EMERGENCY/STANDBY POWER SYSTEMS GENERATOR SET(S)

PART 1 - GENERAL

1.1 SCOPE

A. Provide complete factory assembled generator set equipment with digital (microprocessor-based) electronic generator set controls, digital governor, and digital voltage regulator.

B. Provide factory test, startup by a supplier authorized by the equipment manufacturer(s), and on-site testing of the system.

C. The generator set manufacturer shall warrant all equipment provided under this section so that there is one source for warranty and product service. Technicians specifically trained and certified by the manufacturer to support the product and employed by the generator set supplier shall service the generator sets.

1.2 CODES AND STANDARDS

A. The generator set installation and on-site testing shall conform to the requirements of the following codes and standards, as applicable. The generator set shall include necessary features to meet the requirements of these standards.

1. CSA 282, 1989 Emergency Electrical Power Supply for Buildings

2. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications

3. NFPA37

4. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.

5. NFPA99 – Essential Electrical Systems for Health Care Facilities

6. NFPA110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1prototype tests required by this standard shall have been performed on a complete and functional unit, component level type tests will not substitute for this requirement.

B. The generator set and supplied accessories shall meet the requirements of the following standards:

1. NEMA MG1. Alternator shall comply with the requirements of the current version this standard as they apply to AC alternators.

2. UL142 – Sub-base Tanks

3. UL1236 – Battery Chargers

4. UL2200. The generator set shall be listed to UL2200 or submit to an independent third party certification process to verify compliance as installed..

C. The control system for the generator set shall comply with the following requirements.

1. CSA C22.2, No. 14 – M91 Industrial Control Equipment.

2. EN50082-2, Electromagnetic Compatibility – Generic Immunity Requirements, Part 2: Industrial.

3. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.

4. FCC Part 15, Subpart B.

5. IEC8528 part 4. Control Systems for Generator Sets

6. IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.

7. UL508. The entire control system of the generator set shall be UL508 listed and labeled.

8. UL1236 –Battery Chargers.

D. The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.3 ACCEPTABLE MANUFACTURERS

A. Cummins Power Generation.

B. Holt.

PART 2 - PRODUCTS

2.1 GENERATOR SET

A. Ratings

1. The generator set shall operate at 1800 rpm and at a voltage of: 120/208 Volts AC, Three phase, 4-wire, 60 hertz.

2. The generator set shall be rated at 350kW, 438 kVA at 0.80 PF, standby rating, based on site conditions of : Altitude 1500 ft., ambient temperatures up to 125 degrees F.

3. The generator set rating shall be based on emergency/standby service.

B. Performance

1. Voltage regulation shall be plus or minus 0.5 percent for any constant load between no load and rated load. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5 percent.

2. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.5%.

3. The diesel engine-generator set shall accept a single step load of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.

4. Motor starting capability shall be a minimum of 1750 kVA. The generator set shall be capable of recovering to a minimum of 90% of rated no load voltage following the application of the specified kVA load at near zero power factor applied to the generator set. Maximum voltage dip on application of this load, considering both alternator performance and engine speed changes shall not exceed 25%.

5. The alternator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic, and no 3rd order harmonics or their multiples. Telephone influence factor shall be less than 40.

6. The generator set shall be certified by the engine manufacturer to be suitable for use at the installed location and rating, and shall meet all applicable exhaust emission requirements at the time of commissioning.

C. Construction

1. The engine-generator set shall be mounted on a heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails.

2. All switches, lamps, and meters in the control system shall be oil-tight and dust-tight. All active control components shall be installed within a UL/NEMA 3R enclosure. There shall be no exposed points in the control (with the door open) that operate in excess of 50 volts.

D. Connections

1. The generator set load connections shall be composed of silver or tin plated copper bus bars, drilled to accept mechanical or compression terminations of the number and type as shown on the drawings. Sufficient lug space shall be provided for use with cables of the number and size as shown on the drawings.

2. Power connections to auxiliary devices shall be made at the devices, with required protection located at a wall-mounted common distribution panel.

3. Generator set control interfaces to other system components shall be made on a permanently labeled terminal block assembly. Labels describing connection point functions shall be provided.

2.2 ENGINE AND ENGINE EQUIPMENT

The engine shall be diesel, 4 cycle, radiator and fan cooled. Minimum displacement shall be 912 cubic inches, with 6 cylinders. The horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories. Two cycle engines are not acceptable. Engine accessories and features shall include:

A. An electronic governor system shall provide automatic isochronous frequency regulation. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate and excitation as appropriate to the state of the generator set. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed. The governing system shall include a programmable warm up at idle and cooldown at idle function. While operating in idle state, the control system shall disable the alternator excitation system.

B. Skid-mounted radiator and cooling system rated for full load operation in 122 degrees F (50 degrees C) ambient as measured at the alternator air inlet. Radiator fan shall be suitable for use in a system with 0.5 in H_2O restriction. Radiator shall be sized based on a core temperature that is 20F higher than the rated operation temperature, or prototype tested to verify cooling performance of the engine/radiator/fan operation in a controlled environment. Radiator shall be provided with a duct adapter flange. The equipment manufacturer shall fill the cooling system with a 50/50-ethylene glycol/water mixture prior to shipping. Rotating parts shall be guarded against accidental contact.

C. Electric starter(s) capable of three complete cranking cycles without overheating.

D. Positive displacement, mechanical, full pressure, lubrication oil pump.

E. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.

F. An engine driven, mechanical, positive displacement fuel pump. Fuel filter with replaceable spin-on canister element. Fuel cooler, suitable for operation of the generator set at full rated load in the ambient temperature specified shall be provided if required for operation due to the design of the engine and the installation.

G. Replaceable dry element air cleaner with restriction indicator.

H. Flexible supply and return fuel lines.

I. Engine mounted battery charging alternator, 40-ampere minimum, and solid-state voltage regulator.

J. Coolant heater

1. Engine mounted, thermostatically controlled, coolant heater(s) for each engine. Heater voltage shall be as shown on the project drawings. The coolant heater shall be UL499 listed and labeled.

2. The coolant heater shall be installed on the engine with silicone hose connections. Steel tubing shall be used for connections into the engine coolant system wherever

the length of pipe run exceeds 12 inches. The coolant heater installation shall be specifically designed to provide proper venting of the system. The coolant heaters shall provisions to isolate the heater for replacement of the heater element without draining the coolant from the generator set. The quick disconnect/automatic sealing couplers shall allow the heater element to be replaced without draining the engine cooling system or significant coolant loss.

3. The coolant heater shall be provided with a DC thermostat, installed at the engine thermostat housing. An AC power connection box shall be provided for a single AC power connection to the coolant heater system.

4. The coolant heater(s) shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 104F (40C) in a 40F (4C) ambient, in compliance with NFPA110 requirements, or the temperature required for starting and load pickup requirements of this specification.

K. Provide vibration isolators, spring/pad type, quantity as recommended by the generator set manufacturer. Isolators shall include seismic restraints if required by site location.

L. Starting and Control Batteries shall be calcium/lead antimony type, 24 volt DC, sized as recommended by the engine manufacturer, complete with battery cables and connectors. The batteries shall be capable of a minimum of three complete 15-second cranking cycles at 40F ambient temperature when fully charged.

M. Provide exhaust silencer(s) for each engine of size and type as recommended by the generator set manufacturer and approved by the engine manufacturer. The mufflers shall be critical grade. Exhaust system shall be installed according to the engine manufacturer's recommendations and applicable codes and standards.

N. Provide a minimum 10 amp battery charger for each generator set battery bank. Generator sets incorporating two battery banks shall be provided with two chargers connected together and operating in parallel, with alarm output(s) connected in parallel. The charger(s) shall include the following capabilities:

1. Chargers shall be UL 1236-BBHH listed and CSA or CUL certified for use in emergency applications.

2. The charger shall be compliant with UL991 requirements for vibration resistance.

3. The charger shall comply with the requirements of EN61000-4-5 for voltage surge resistance; EN50082-2 for immunity; EN61000-4-2 for ESD; EN61000-4-3 for radiated immunity; ANSI/IEEE C62.41 category B and IN61000-4-4 for electrically fast transient; EN61000-4-6 for conducted emissions; and FCC Part 15 Class A for radiated emissions.

4. The charger shall be capable of charging a fully discharged battery without damage to the charger. It shall be capable of returning a fully discharged battery to fully charged condition within 24 hours. The charger shall be UL-labeled with the maximum battery amp-hour rating that can be recharged within 24 hours. The label shall indicate that the charger is suitable for charging of 200AH batteries per NFPA requirements.

5. The charger shall incorporate a 4-state charging algorithm, to provide trickle charge rate to restore fully discharged batteries, a bulk charge rate to provide fastest possible recharge after normal discharge, an absorption state to return the battery to 100 percent of charge, and a float stage to maintain a fully charge battery and supply battery loads when the generator set is not operating. In addition, the charger shall include an equalization timer. Charge rates shall be temperature compensated based on the temperature directly sensed at the battery.

6. The DC output voltage regulation shall be within plus or minus 1%. The DC output ripple current shall not exceed 1 amp at rated output current level.

7. The charger shall include the following features:

   (a) two line alphanumeric display with programming keys to allow display of DC output ammeter and voltmeters (5% accuracy or better), display alarm messages, and perform programming;

   (b) LED indicating lamp(s) to indicating normal charging condition (green), equalize charge state (amber), and fault condition (red);

   (c) AC input overcurrent, over voltage, and undervoltage protection;

   (d) DC output overcurrent protection;

   (e) Alarm output relay

   (f) Corrosion resistant aluminum enclosure

2.3 AC GENERATOR

A. The AC generator shall be; synchronous, four pole, 2/3 pitch, revolving field, drip-proof construction, single prelubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system and shall be UL1446 listed. Actual temperature rise measured by resistance method at full load shall not exceed 105 degrees Centigrade.

B. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.

C. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single phase or three phase fault at approximately 300% of rated current for not more than 10 seconds.

D. The subtransient reactance of the alternator shall not exceed 15 percent, based on the standby rating of the generator set.

2.4 GENERATOR SET CONTROL. The generator set shall be provided with a microprocessor-based control system that is designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this specification.

The control shall be mounted on the generator set, or may be mounted in a free-standing panel next to the generator set if adequate space and accessibility is available. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.

The generator set mounted control shall include the following features and functions:

A. Control Switches

1. Mode Select Switch. The mode select switch shall initiate the following control modes. When in the RUN or MANUAL position the generator set shall start, and accelerate to rated speed and voltage as directed by the operator. A separate push-button to initiate starting is acceptable. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.

2. EMERGENCY STOP switch. Switch shall be Red "mushroom-head" push-button. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.

3. RESET switch. The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.

4. PANEL LAMP switch. Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is depressed, or after the switch is depressed a second time.

B. Generator Set AC Output Metering. The generator set shall be provided with a metering set including the following features and functions:

1. Digital metering set, 1% accuracy, to indicate generator RMS voltage and current, frequency, output current, output KW, KW-hours, and power factor. Generator output voltage shall be available in line-to-line and line-to-neutral voltages, and shall display all three-phase voltages (line to neutral or line to line) simultaneously.

2. Analog voltmeter, ammeter, frequency meter, power factor meter, and kilowatt (KW) meter. Voltmeter and ammeter shall display all three phases. Meter scales shall be color coded in the following fashion: green shall indicate normal operating condition, amber shall indicate operation in ranges that indicate potential failure, and red shall indicate failure impending. Metering accuracy shall be within 1% at rated output. Both analog and digital metering are required.

3. The control system shall monitor the total load on the generator set, and maintain data logs of total operating hours at specific load levels ranging from 0 to 110% of rated load, in 10% increments. The control shall display hours of operation at less than 30% load and total hours of operation at more than 90% of rated load.

4. The control system shall log total number of operating hours, total kWH, and total control on hours, as well as total values since reset.

C. Generator Set Alarm and Status Display.

1. The generator set control shall include LED alarm and status indication lamps. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. Functions indicated by the lamps shall include:

   - The control shall include five configurable alarm-indicating lamps. The lamps shall be field adjustable for any status, warning, or shutdown function monitored by the genset. They shall also be configurable for color, and control action (status, warning, or shutdown).
   - The control shall include green lamps to indicate that the generator set is running at rated frequency and voltage, and that a remote start signal has been received at the generator set. The running signal shall be based on actual sensed voltage and frequency on the output terminals of the generator set.
   - The control shall include a flashing red lamp to indicate that the control is not in automatic state, and red common shutdown lamp.
   - The control shall include an amber common warning indication lamp.

2. The generator set control shall indicate the existence of the warning and shutdown conditions on the control panel. All conditions indicated below for warning shall be field-configurable for shutdown. Conditions required to be annunciated shall include:

   low oil pressure (warning)
   low oil pressure (shutdown)
   oil pressure sender failure (warning)
   low coolant temperature (warning)
   high coolant temperature (warning)
   high coolant temperature (shutdown)
   high oil temperature (warning)
   engine temperature sender failure (warning)
   low coolant level (warning)
   fail to crank (shutdown)
   fail to start/overcrank (shutdown)
   overspeed (shutdown)
   low DC voltage (warning)
   high DC voltage (warning)
   weak battery (warning)
   low fuel-daytank (warning)
   high AC voltage (shutdown)
   low AC voltage (shutdown)
   under frequency (shutdown)
   over current (warning)
   over current (shutdown)
   short circuit (shutdown)
   over load (warning)
   emergency stop (shutdown)
   (4) configurable conditions

3. Provisions shall be made for indication of four customer-specified alarm or shutdown conditions. Labeling of the customer-specified alarm or shutdown conditions shall be of the same type and quality as the above-specified conditions. The non-automatic indicating lamp shall be red, and shall flash to indicate that the generator set is not able to automatically respond to a command to start from a remote location.

D. Engine Status Monitoring.

1. The following information shall be available from a digital status panel on the generator set control :

engine oil pressure (psi or kPA)
engine coolant temperature (degrees F or C)
engine oil temperature (degrees F or C)
engine speed (rpm)
number of hours of operation (hours)
number of start attempts
battery voltage (DC volts)

2. The control system shall also incorporate a data logging and display provision to allow logging of the last 10 warning or shutdown indications on the generator set, as well as total time of operation at various loads, as a percent of the standby rating of the generator set.

E. Engine Control Functions.

1. The control system provided shall include a cycle cranking system, which allows for user selected crank time, rest time, and # of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each, with 15-second rest period between cranking periods.

2. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled.

3. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting.

4. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.

5. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature which is capable of discriminating between failed sender or wiring components, and an actual failure conditions.

F. Alternator Control Functions:

1. The generator set shall include a full wave rectified automatic digital voltage regulation system that is matched and prototype tested by the engine manufacturer

with the governing system provided. It shall be immune from misoperation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase line to neutral RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The system shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below an adjustable frequency threshold. Torque matching characteristic shall be adjustable for roll-off frequency and rate, and be capable of being curve-matched to the engine torque curve with adjustments in the field. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off. Adjustments shall be broad range, and made via digital raise-lower switches, with an alphanumeric LED readout to indicate setting level. Rotary potentiometers for system adjustments are not acceptable.

2. A microprocessor-based protection device shall be provided to individually monitor all phases of the output current of the generator set and initiate an alarm (over current warning) when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The device shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (over current shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445.

3. A microprocessor-based protection device shall be provided to monitor all phases of the output current for short circuit conditions. The control/protection system shall monitor the current level and voltage. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (short circuit shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445.

4. Controls shall be provided to monitor the KW load on the generator set, and initiate an alarm condition (over load) when total load on the generator set exceeds the generator set rating for in excess of 5 seconds. Controls shall include a load shed control, to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.

5. A microprocessor-based AC over/under voltage monitoring system that responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds. The system shall monitor individual phases and be connected line to neutral on 3-phase 4-wire generator sets, and for systems that are solidly grounded.

G. Other Control Functions

1. A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is less than 25VDC or more than 32 VDC. During engine cranking (starter engaged), the low voltage limit shall be disabled, and DC voltage shall be monitored as load is applied to the battery, to detect impending battery failure or deteriorated battery condition.

H. Control Interfaces for Remote Monitoring:

1. The control system shall provide four programmable output relays. These relay outputs shall be configurable for any alarm, shutdown, or status condition monitored by the control. The relays shall be configured to indicate: (1) generator set operating at rated voltage and frequency, (2) common warning, (3) common shutdown, (4) load shed command.

2. A fused 10 amp switched 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit whenever the generator set is running.

3. A fused 10 amp 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit at all times from the engine starting/control batteries.

4. The control shall be provided with a direct serial communication link for the LonWorks communication network interface as described elsewhere in this specification and shown on the drawings.

2.5 OTHER EQUIPMENT TO BE PROVIDED WITH THE GENERATOR SET

A. Provide and install a 20-light LED type remote alarm annunciator with horn, located in a location that can be conveniently monitored by facility personnel. Locate remote annunciator panel in the building engineer's office. The remote annunciator shall provide all the audible and visual alarms called for by NFPA Standard 110 for level 1 systems for the local generator control panel. Spare lamps shall be provided to allow future addition of other alarm and status functions to the annunciator. Provisions for labeling of the annunciator in a fashion consistent with the specified functions shall be provided. Alarm silence and lamp test switch(es) shall be provided. LED lamps shall be replaceable, and indicating lamp color shall be capable of changes needed for specific application requirements. Alarm horn shall be switchable for all annunciation points. Alarm horn (when switched on) shall sound for first fault, and all subsequent faults, regardless of whether first fault has been cleared, in compliance with NFPA110 3-5.6.2. The interconnecting wiring between the annunciator and other system components shall be monitored and failure of the interconnection between components shall be displayed on the annunciator panel.

B. The annunciator shall include the following alarm labels, audible annunciation features, and lamp colors:

Condition	Lamp Color	Audible Alarm
Normal Power (to Loads)	Green	No
Genset Supplying Load	Amber	No
Genset Running	Green	No
Not in Auto	Red (Flashing)	Yes
High Battery Voltage	Red	Yes
Low Battery Voltage	Red	Yes
Charger AC Failure	Red	Yes
Fail to Start	Red	Yes
Low Engine Temperature	Amber	Yes
Pre-High Engine Temperature	Amber	Yes
High Engine Temperature	Red	Yes

Pre-Low Oil Pressure	Amber	Yes
Low Oil Pressure	Red	Yes
Overspeed	Red	Yes
Low Coolant Level	Amber	Yes
Low Fuel Level	Amber	Yes
Network OK	Green	Yes
(4) Spares	Configurable	Configurable

Low battery voltage lamp shall also be lighted for low cranking voltage or weak battery alarm.

C. The generator set shall be provided with a mounted main line circuit breaker, sized to carry the rated output current of the generator set. The circuit breaker shall incorporate an electronic trip unit that operates to protect the alternator under all overcurrent conditions, or a thermal-magnetic trip with other overcurrent protection devices that positively protect the alternator under overcurrent conditions. The supplier shall submit time overcurrent characteristic curves and thermal damage curve for the alternator, demonstrating the effectiveness of the protection provided.

D. Outdoor Weather-Protective Enclosure

1. The generator set shall be provided with an outdoor enclosure, with the entire package listed under UL2200. The package shall comply with the requirements of the National Electrical Code for all wiring materials and component spacing. The total assembly of generator set, enclosure, and sub-base fuel tank (when used) shall be designed to be lifted into place using spreader bars. Housing shall provide ample airflow for generator set operation at rated load in an ambient temperature of 125°F. The housing shall have hinged access doors as required to maintain easy access for all operating and service functions. All doors shall be lockable, and include retainers to hold the door open during service. Enclosure roof shall be cambered to prevent rainwater accumulation. Openings shall be screened to limit access of rodents into the enclosure. All electrical power and control interconnections shall be made within the perimeter of the enclosure.

2. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturers standard color using a two step electrocoating paint process, or equal meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted. The painting process shall result in a coating that meets the following requirements:

   Primer thickness, 0.5-2.0 mils. Top coat thickness, 0.8-1.2 mils.
   Gloss, per ASTM D523-89, 80% plus or minus 5%. Gloss retention after one year shall exceed 50%.
   Crosshatch adhesion, per ASTM D3359-93, 4B-5B.
   Impact resistance, per ASTM D2794-93, 120-160 inch-pounds.
   Salt Spray, per ASTM B117-90, 1000+ hours.
   Humidity, per ASTM D2247-92, 1000+ hours.
   Water Soak, per ASTM D2247-92, 1000+ hours.

3. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed

to minimize marring of the painted surface when removed for normal installation or service work.

4. Enclosure shall be constructed of minimum 12 gauge steel for framework and 14 gauge steel for panels. All hardware and hinges shall be stainless steel.

5. A factory-mounted exhaust silencer shall be installed inside the enclosure. The exhaust shall exit the enclosure through a rain collar and terminate with a rain cap. Exhaust connections to the generator set shall be through seamless flexible connections.

E. Load Bank – Provide radiator mounted load bank rated at 50% of the generator capacity for manual operation. Load bank shall be provided with load dump signal to remove load from the generator when a remote start command is issued. Load bank shall be supplied by Avtron or Simplex.

F. Provide a sub-base fuel tank for the generator set. Refer to drawings for capacity. The sub-base fuel tank shall be UL142 listed and labeled. Installation shall be in compliance to NFPA37. The fuel tank shall be a double-walled, steel construction and include the following features:

1. Emergency tank and basin vents.

2. Mechanical level gauge.

3. Fuel supply and return lines, connected to generator set with flexible fuel lines as recommended by the engine manufacturer and in compliance to UL2200 and NFPA 37 requirements.

4. Leak detection provisions, wired to the generator set control for local and remote alarm indication.

5. High and low level float switches to indicate fuel level. Wire switches to generator control for local and remote indication of fuel level.

6. Basin drain.

7. Integral lifting provisions.

PART 3 - OPERATION

3.1 SEQUENCE OF OPERATION

A. Generator set shall start on receipt of a start signal from remote equipment. The start signal shall be via hardwired connection to the generator set control.

B. The generator set shall complete a time delay start period as programmed into the control.

C. The generator set control shall initiate the starting sequence for the generator set. The starting sequence shall include the following functions:

D. The control system shall verify that the engine is rotating when the starter is signaled to operate. If the engine does not rotate after two attempts, the control system shall shut down and lock out the generator set, and indicate “fail to crank” shutdown.

E. The engine shall fire and accelerate as quickly as practical to start disconnect speed. If the engine does not start, it shall complete a cycle cranking process as described elsewhere in this specification. If the engine has not started by the completion of the cycle cranking sequence, it shall be shut down and locked out, and the control system shall indicate “fail to start”.

F. The engine shall accelerate to rated speed and the alternator to rated voltage. Excitation shall be disabled until the engine has exceeded programmed idle speed, and regulated to prevent over voltage conditions and oscillation as the engine accelerates and the alternator builds to rated voltage.

G. On reaching rated speed and voltage, the generator set shall operate as dictated by the control system in isochronous state.

H. When all start signals have been removed from the generator set, it shall complete a time delay stop sequence. The duration of the time delay stop period shall be adjustable by the operator.

I. On completion of the time delay stop period, the generator set control shall switch off the excitation system and shall shut down.

J. Any start signal received after the time stop sequence has begun shall immediately terminate the stopping sequence and return the generator set to isochronous operation.

PART 4 - OTHER REQUIREMENTS

4.1 SUBMITTALS

A. Within 10 days after award of contract, provide six sets of the following information for review:

- Manufacturer’s product literature and performance data, sufficient to verify compliance to specification requirements.
- A paragraph by paragraph specification compliance statement, describing the differences between the specified and the proposed equipment.
- Manufacturer's certification of prototype testing.
- Manufacturer's published warranty documents.
- Shop drawings showing plan and elevation views with certified overall dimensions, as well as wiring interconnection details.
- Interconnection wiring diagrams showing all external connections required; with field wiring terminals marked in a consistent point-to-point manner.
- Manufacturer's installation instructions.

4.2 FACTORY TESTING

A. The generator set manufacturer shall perform a complete operational test on the generator set prior to shipping from the factory. A certified test report shall be provided. Equipment supplied shall be fully tested at the factory for function and performance.

B. Factory testing may be witnessed by the owner and consulting engineer. Costs for travel expenses will be the responsibility of the owner and consulting engineer. Supplier is responsible to provide two weeks notice for testing.

C. Generator set factory tests on the equipment shall be performed at rated load and rated power factor. Generator sets that have not been factory tested at rated power factor will not be acceptable. Tests shall include: 2 Hour run at full load, maximum power, voltage regulation, transient and steady-state governing, single step load pickup, and function of safety shutdowns.

4.3 INSTALLATION

A. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

B. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.

C. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer’s instructions and seismic requirements of the site.

D. Equipment shall be initially started and operated by representatives of the manufacturer.

E. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.

4.4 ON-SITE ACCEPTANCE TEST:

A. The complete installation shall be tested for compliance with the specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests.

B. Installation acceptance tests to be conducted on-site shall include a "cold start" test, a four hour full load test, and a one step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test, if necessary.

C. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system. Coordinate timing and obtain approval for start of test with site personnel.

4.5 TRAINING

A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to 5 persons. Training date shall be coordinated with the facility owner.

4.6 SERVICE AND SUPPORT

A. The manufacturer of the generator set shall maintain service parts inventory at a central location which is accessible to the service location 24 hours per day, 365 days per year.

B. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.

C. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

4.7 WARRANTY

A. The generator set and associated equipment shall be warranted for a period of not less than 5 years from the date of commissioning against defects in materials and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

END OF SECTION 26 32 13.13

SECTION 26 36 23 - AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Section specifies furnishing and installation of automatic transfer switches to automatically transfer between the normal and emergency power sources.

B. Route one one-inch empty conduit from each automatic transfer switch to emergency generator control panel.

1.2 RELATED WORK

A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for automatic transfer.

1. Section 26 00 00 - Basic Electrical Requirements

2. Section 26 05 33 – Raceways, Conduit, and Boxes

3. Section 26 05 19 – Cable Wire and Connectors 600V

4. Section 26 05 53 – Electrical Identification

5. Section 26 05 26 – Grounding

6. Section 26 32 13.13 – Emergency Electrical Power Supply

1.3 REFERENCE STANDARDS

A. The materials and installation shall conform to the minimum requirements and latest revisions of the following codes, standards and regulations wherein they apply:

1. IEEE C37.2 – Electrical Power System Device Function Numbers and Contact Designations

2. NEMA ICS 1 – General Requirements for Industrial Control and Systems

3. NEMA ICS 6 – Industrial Control and System Enclosure

4. NEMA ICS 10, Part 1 – Electromagnetic AC Transfer Switch Equipment

5. NFPA 70 – National electrical Code

6. UL 1008 – Transfer Switch Equipment

7. NFPA 110 – Standard for Emergency and Standby Power Systems

8. IEEE 446 – Recommended Practice for Emergency and Standby Power Systems

1.4 SUBMITTALS

A. Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical Requirements, and Division 01 for submittal requirement.

1. Descriptive product literature, to include, but not limited to:

(a) Rated current, voltage and frequency

(b) Number of poles

(c) Symmetrical rms amperes withstand current at rated voltage

(d) Physical dimensions, to include drawout clearances and working clearances

(e) NEMA enclosure type

(f) Itemized list of accessories

(g) UL 1008 3-cycle close and withstand rating

2. Plan, elevation, side, and front view arrangement drawings, including overall dimension, weights, clearances for installation, drawout of removable components, and working clearances, as well as mounting or anchoring requirements and conduit entrance locations.

3. Schematic diagram (show wiring and only those components which are part of switch).

4. Provide wire diagram prior to shipping. Show all factory wiring on wiring diagram and clearly indicate all wiring and connections to remote devices which are to be made in the field.

1.5 PRODUCT DELIVERY AND STORAGE

A. Deliver unit to the project site, protected from the weather and damage due to shipping and handling. Cover all piping connections.

B. Store unit in a clean and dry space and protected from weather.

1.6 QUALITY ASSURANCE

A. Commissioning of a system or systems specified in this section is part of the construction process. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Owner's Representative and the Commissioning Agent. Project Closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. ASCO

B. Russelectric

C. Cummins

D. Other manufacturers equal in design and function will be considered upon A/E approval following substitution procedure in Section 26 00 00 and Division 01 for substitution requirement.

2.2 RATINGS

A. The transfer switches shall be 208/120 volt, 4-pole, 65 KAIC minimum.

B. The transfer switches shall be 100 percent equipment rated for continuous duty as shown on the Drawings and shall conform to the applicable requirements of UL 1008 for emergency system total load. The automatic transfer switches shall be fully rated to protect all types of loads, inductive and resistive, from loss of continuity of power without de-rating.

C. All pilot devices and relays shall be of the industrial type with self-cleaning contacts and rated 10 amperes.

2.3 CONSTRUCTION

A. The transfer switches shall consist of completely enclosed contact assemblies and a separate control logic panel. The transfer switch shall be open-transition. The contact assemblies shall be operated by a non-fused motor operator or stored energy mechanism and be energized only momentarily during transfer, providing inherently double throw switching action. Control power for all transfer operations shall be derived from the line side of the source to which the load is being transferred.

B. Transfer switches shall be capable of being operated manually under full load conditions. Manual operation shall be accomplished via a permanently affixed manual operator or integrally mounted pushbutton operators located on the face of the transfer switch assemblies. Removable manual operating handles and handles which move in the event that electrical operations should suddenly become energized while performing a manual transfer operation are not acceptable. The manual operator shall provided the same contact-to-contact transfer time as provided under normal automatic operation to prevent possible flashovers from switching the main contacts slowly. In addition, provisions shall be made to allow disengagement of the electrical operator during manual operation.

C. Each transfer switch shall be positively interlocked both mechanically and electrically to prevent simultaneous closing of both sources under either automatic or manual operation. Main contacts shall be mechanically locked in position in both normal and emergency positions. A neutral position shall not be possible under normal electrical operation unless a delayed transition accessory is required for switching highly inductive loads. Each transfer switch shall have a manual neutral position for load circuit maintenance. A transfer switch position indicator shall be visible from the front of the switch to show which source the transfer switch is connected.

D. All three-phase four-wire transfer switches used on system with ground fault equipment shall be true four-pole switched neutral type with fully rated and connected to a common shaft.

The fourth (neutral) pole contacts shall be identical construction as, and operate simultaneously with, the main power contacts. Add-on or overlapping neutral contacts are not acceptable.

E. Transfer switches applied as service entrance switches shall be provided with overcurrent trip units and a service entrance label. An external key-operated selector switch shall be provided to disconnect the power supplies. Indicators shall be provided to show the availability of each source as well as breakers in a tripped or disconnected position. Provide a neutral disconnect link for three-pole solid neutral switches, and a neutral-to-ground main bonding jumper for all switches to meet UL service entrance requirements. Ground fault protection shall be provided for all switches rated 1000 amperes or more in accordance with NEC Article 230.95.

2.4 MICROPROCESSOR-BASED CONTROLLER

A. A microprocessor-based controller shall be separately mounted from the power switching portion of the transfer switch. The two sections shall be connected by control cables with plug-in connectors. The control section shall be capable of being disconnected from the power section for maintenance purposes.

B. The controller shall be rated for an operation temperature range of -20 degree C to +70 degree C, and a storage temperature range of -30 degree C to +85 degree C. The microprocessor-based controller shall be capable of operating with control input power available within the range of 55 percent to 133 percent of nominal voltage indefinitely. Connection to any external battery or to the engine battery is not permissible. The controller shall not in any way be adversely affected by line voltage or frequency fluctuation during the course of transferring heavy electrical loads from one source to another. Adverse effects may include, but are not limited to, an unintended retransfer to the original source.

C. The controller shall be equipped with self diagnostics, which performs periodic checks of the memory, input/output (I/O), and communication circuits, with a watchdog/power fail circuit.

D. The controller shall be accurate to within 1 percent of full-scale value for measured parameter. Voltage and current for all phases shall be sampled simultaneously to assure high accuracy in conditions of low power factor or large waveform distortions.

E. A digital readout shall display each option as it is functioning. Readouts shall display:

1. Three phase voltage with 1 percent accuracy to display all three separate phase-to-phase voltage simultaneously, for both the normal and emergency source.

2. Frequency with 1 percent accuracy to display frequency for both normal and emergency source.

3. Availability of normal source and emergency source.

F. The following metered readings shall also be communicated by the Controller, via local display and serial communication.

1. Current, per phase RMS and neutral

2. Current unbalance %

3. Voltage, phase-to-phase and phase-to-neutral

4. Voltage unbalance %

5. Real power (KW), per phase and 3-phase total

6. Apparent power (KVA), per phase and 3-phase total

7. Reactive power (KVAR), per phase and 3-phase total

8. Power factor, per phase and 3-phase total

9. Frequency

10. Accumulated energy (KWH, KVAH, and KVARH)

G. When timers are functioning, the microprocessor shall display the timer counting down. All set points can be reprogrammed from the front of the switch when the switch is in the program mode. A test push button shall be included as part of the microprocessor.

H. The controller shall be capable of storing records in memory for access either locally or remotely for up to 100 events. The reports shall include date, time and a description of the event, and shall be maintained in a non-volatile memory.

2.5 ACCESSORIES

A. The following logic and options shall be supplied:

1. The logic of the transfer switch shall function via a microprocessor-based controller. The set points shall be field adjustable without use of the special tools. The switch shall have a multi-tap voltage selection plug for ease of voltage adjustment in the field. LED lights shall be included on the exterior of the switch to show:

(a) Normal source available

(b) Emergency source available

(c) Normal source connected

(d) Emergency source connected

(e) Load energized

(f) Position indicators shall be visible from the front of the switch.

2. The switch shall include the following:

(a) Provide a time delay transfer from the normal power source to the emergency power source (0 seconds to 30 minutes). This option does not affect the engine start circuit.

(b) Provide a timer to override a momentary power outage or voltage fluctuation (0 seconds to 120 seconds).

(c) Provide a time delay transfer from the emergency power source to the normal power source (0 seconds to 30 minutes).

(d) Provided a timer to allow the generator to run unloaded after retransfer to the normal power source (0 seconds to 30 minutes).

(e) Provided single-phase under-voltage and under-frequency sensing on the emergency power source. Voltage shall be factory set at 90 percent pickup and 80 percent dropout. Frequency sensing shall be set at 58-hertz pickup and 56-hertz dropout.

(f) Provide a pilot light to indicate that the switch is in the normal position as an integral part of the microprocessor.

(g) Provide a pilot light to indicate that the switch is in emergency position as an integral part of the microprocessor.

(h) Provide a pilot light to indicate that the normal power is available as an integral part of the microprocessor.

(i) Provide a pilot light to indicate that the emergency power is available as an integral part of the microprocessor.

(j) Provide auxiliary relay contacts that are energized when the power is available on the normal source.

(k) Provide auxiliary relay contacts that are energized when the power is available on the emergency source.

B. The following features shall be provided:

1. Time delay normal to emergency, adjustable.

2. Time delay emergency to emergency, adjustable

3. Green pilot light to indicate switch in normal position and red pilot light to indicate switch in emergency position.

4. White pilot lights marked “Normal Source” and “Emergency Source” to indicate that respective source voltages are available.

5. Tripped position indicating lights for both sources.

6. Relay auxiliary contacts (2 NO and 2 NC) to indicate transfer switch position and the availability of each sources.

C. When the alternate source is an engine generator, the following features shall also be provided:

1. Time delay engine start, adjustable.

2. Time delay engine cool off, adjustable.

3. Engine start contact.

4. Frequency/voltage relay for emergency source, frequency adjustable from 45 to 50 Hz and voltage fixed at 90 percent pickup, 70 percent dropout.

5. Four-position selector switch permitting four (4) modes of transfer switch operation: TEST (simulates normal power outage), AUTO (standard automatic operation), OFF (de-energizes control relays and opens the engine start circuit for maintenance purpose), ENGINE START (retains transfer switch in normal position and initiates a testing of the engine start circuit). Furnish white pilot light for OFF indication.

D. Provide engine generator exerciser (selectable load no-load transfer).

2.6 COMMUNICATIONS

A. Where shown on the Drawings, provided in the transfer switch a microprocessor-based unit capable of communicating phase and ground current, peak demand, present demand, energy consumption, contact status, and mode of trip. The transfer switch shall respond to open and close commends from a master control unit via a non-proprietary communication network.

B. Provide communications capability to monitor the normal and emergency switch position and normal and emergency source availability. Where shown on the Drawings, provided additional communications capability to bypass time delays during transfer or retransfer, and to initiate engine start for no-load or load testing of the transfer switch from a remote master computer.

2.7 WIRING TERMINATIONS

A. Terminal blocks shall conform to NEMA ICS 4. Terminal facilities shall be arranged for entrance of external conductors from the top or bottom of the enclosure. The main transfer switch terminals shall be suitable for the termination of conductors shown on the plans.

2.8 SEQUENCE OF OPERATION

A. The transfer switch shall automatically transfer its load circuits to an emergency or alternate power supply upon failure of its normal or preferred source.

B. Upon loss of phase-to-phase voltage of the normal source to 80 percent of nominal, and after a time delay, adjustable from 0.5 to 15 seconds, to override momentary dips and/or outages, a 10-ampere, 30-Vdc contact shall close to initiate starting of the emergency or standby source power plant. Transfer to the alternate source shall take place immediately upon attainment of 90 percent of rated voltage and frequency of that source. For switches not involving engine generator sets as power plants, transfer shall occur after an adjustable time delay of 1 to 60 seconds to override momentary dips and outages.

C. When the normal source has been restored to 90 percent of rated voltage, and after a time delay, adjustable from 0 seconds to 30 minutes, the load shall be retransferred to the normal source.

D. A time delay, adjustable from 0 seconds to 30 minutes, shall delay shutdown of the emergency or standard power source after retransfer to allow the generator to run unloaded for cool-down, after which the generator shall be automatically shut down.

E. If the emergency or standby power should fail while carrying the load, transfer to the normal power supply shall be made instantaneously upon restoration of the normal source to satisfactory conditions.

2.9 ENCLOSURE AND FINISH

A. Each transfer switch shall be provided in enclosure suitable for locations as indicated on the drawings and as indicated on Drawings.

B. NEMA 1, 12 or 3R enclosure shall be painted with the manufacturer's standard painting procedures to ensure suitability for environmental conditions as referenced in the planes. Color shall be light gray ANSI 61. NEMA 4 or 4X shall be stainless steel, non-painted.

PART 3 - EXECUTION

3.1 PRODUCT HANDLING AND VISUAL INSPECTION

A. Handle unit carefully to avoid damage to material components, enclosure and finish. Use only lifting and brackets provided for that purpose. Unit shall be instead prior to installation for damage. Damaged units shall be rejected and not be installed on project.

3.2 FOUNDATION PAD

A. Install automatic transfer switches on a concrete house keeping pad with manufacturer's instruction.

B. Coordinate conduit stub-up locations with Structural Engineer prior to placing conduit and farms for foundation pad.

3.3 INSTALLATION

A. Install the automatic transfer and bypass/isolation switch as shown on the drawings. Installation shall follow manufacturer's installation procedures and be in accordance with NEC.

B. Coordinate controller functions with packaged engine generator controls. Coordinate with metal clad medium voltage switchgear or low voltage metal-enclosed switchgear, which are designed for emergency power distribution. The entire system shall be demonstrated functional as a whole.

C. Coordinate interfaces with other life safety and/or building control systems. Furnish and install all required raceways between systems.

D. Route one 1" E.C. with pull wire from each transfer switch to building fire alarm control panel.

E. Route one 1" E.C. with pull wire from each transfer switch serving elevators to elevator controller.

3.4 TOUCHUP PAINTING

A. Restore any marred surfaces to factory finish.

3.5 FIELD TESTING

A. Test the switches with the packaged engine generator set in operating condition. Demonstrate to the Owner that the automatic transfer switches perform all required functions.

B. The manufacturer's representative(s) shell be on site for testing and start-up the systems.

C. Contractors' tests shall be scheduled and documented in accordance with the commissioning requirements.

D. System verification testing is part of the Commissioning Process. Verification testing shall be performed by the contractor and witnessed and documented by the Commissioning Agent.

3.6 TRAINING

A. Provide on-site training for Owner's designated personnel in the construction, operation, maintenance, troubleshooting and repair of the automatic transfer switches.

B. Formal training for the operation and maintenance shall be provided by factory trained and certified personnel.

C. The training shall consist of a minimum of 8-hour training sessions or per Owner's direction.

D. The timing of the training shall coincide with the schedule for the manufacturer's representative(s) to be on site for testing and start-up.

E. The specific training shall be provided at a location designated and provided by the Owner for a minimum of 10 personnel selected by the Owner.

F. A training program shall be submitted with material, instructor's qualification, and proposed schedule, a minimum 60 days prior to the proposed training. The Owner reserves the right of approval of any training course, material, instructor and schedule.

G. The training program shall consist of, but not limited, instruction in the following subjects:

1. Review of the applicable one-line drawings, wiring diagrams, and schematic for the automatic transfer switches.

2. Review of the factory record shop drawings and placement of the various components.

3. Review of Operation and Maintenance manuals.

4. Instruction in manufacturer's published procedures for operation, maintenance, troubleshooting, and safety. Instruction shall include all modes of equipment operation and alignment.

5. Review of maintenance procedures for removal and placement of major components, and removal and replacement of renewable parts, as applicable.

6. Discuss the maintenance timetable and procedures to be followed in an ongoing maintenance program.

7. Provide binders to participants complete with copies of drawings and other course material covered.

H. Training of the Owner's operation and maintenance personnel is required in cooperation with the Owner's Representative. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. The instruction shall be scheduled in coordination with the Owner's Representative after submission and approval of formal training plans.

I. A minimum of 12 bound copies of raining material shall be provided at the time of training, with four additional copies submitted at the time of substantial completion included in the Owners manuals.

END OF SECTION 26 36 23

SECTION 26 43 13 - SURGE PROTECTIVE DEVICES
INTEGRATED UNITS
LOW VOLTAGE AC SURGE PROTECTION FOR ELECTRICAL DISTRIBUTION SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

The Contractor shall furnish and install the integrated Surge Protective Device (SPD) equipment having the electrical characteristics, ratings, and modifications as specified herein. To maximize performance and reliability and to obtain the lowest possible let-through voltages, the ac surge protection shall be integrated into electrical distribution equipment such as switchgear, switchboards, panelboards, busway (integrated within bus plug), or motor control centers (MCC) by the electrical switchgear manufacturer. Externally mounted SPD devices are allowed. Refer to related sections for surge requirements in:

1.2 RELATED SECTIONS

A. Section 26 24 13 – Switchboards – 600 Volt and Below

B. Section 26 24 16 – Panelboards

1.3 REFERENCES

A. SPD units and all components shall be designed, manufactured, and tested in accordance with the latest applicable standards

1. ANSI/UL 1449 4th Edition or later

2. ANSI/UL 1283 5th Edition or later (Type 2 applications)

3. IEEE C62.41.1

4. IEEE C62.41.2

5. IEEE C62.43-2005

6. IEEE C62.45-2002

7. IEEE C62.48-2005

8. IEEE C62.62-2010

9. UL 96A

10. NFPA 780

1.4 SUBMITTALS – For Review/Approval

A. The following information shall be submitted to the Engineer:

1. Provide verification that the SPD complies with the required ANSI/UL 1449 4th Edition or later listing by Underwriters Laboratories (UL). Compliance may be in the form of a file number that can be verified on UL's website **www.ul.org**, the website should contain the following information at a minimum: model number, SPD Type, system voltage, phases, modes of protection, Voltage Protection Rating (VPR), and Nominal Discharge Current I_n.

B. Where applicable the following additional information shall be submitted to the engineer:

1. Descriptive bulletins

2. Product sheets

1.5 SUBMITTALS – FOR CONSTRUCTION

A. The following information shall be submitted for record purposes:

1. Final as-built drawings and information for items listed in Section 1.04 and shall incorporate all changes made during the manufacturing process

1.6 QUALIFICATIONS

A. The manufacturer of the electrical distribution equipment shall be the manufacturer of the SPD within the listed electrical distribution equipment.

B. For the equipment specified herein, the manufacturer shall be ISO 14001 and ISO 9001 or 9002 certified.

C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of twenty-five (25) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

D. The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU and have a visible label showing compliance.

E. The SPD shall be UL 1449 current edition listed, 20 kA I_n Type 1 or Type 2 for use in UL 96A systems.

1.7 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of manufacturer's instructions shall be included with the equipment at time of shipment.

1.8 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided with each SPD shipped.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Eaton

B. Square 'D'

C. General Electric

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features, and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

2.2 VOLTAGE SURGE SUPPRESSION – GENERAL

A. Electrical Requirements

1. Unit Operating Voltage – Refer to drawings for operating voltage and unit configuration.

2. Maximum Continuous Operating Voltage (MCOV) – The MCOV shall not be less than 115% of the nominal system operating voltage.

3. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards. End of life mode to be open circuit. Unit with end of life short-circuit mode are not acceptable.

4. Unit shall operate without the need for an external overcurrent protection device (OCPD), and be listed by UL as such. Unit must not require external OCPD or replaceable internal OCPD for the UL Listing.

5. Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

	Protection Modes			
Configuration	L-N	L-G	L-L	N-G
Wye	●	●	●	●
Delta	N/A	●	●	N/A
Single Split Phase	●	●	●	●
High Leg Delta	●	●	●	●

6. Nominal Discharge Current (I_n) – All SPDs applied to the distribution system shall have a 20kA I_n rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an I_n less than 20kA shall be rejected.

7. ANSI/UL 1449 4th Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 4th Edition VPR for the device shall not exceed the following:

Modes	208Y/120	480Y/277	600Y/347
L-N; L-G; N-G	700	1200	1500
L-L	1200	2000	3000

B. SPD Design

1. Maintenance Free Design – The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable single-mode modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.

2. Balanced Suppression Platform – The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating replaceable SPD modules shall not be accepted.

3. Electrical Noise Filter – Each Type 2 unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be up to 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method. Products unable able to meet this specification shall not be accepted.

   (a) Type 2 units with filtering shall conform to UL 1283 5th Edition

   (b) Type 1 units shall not contain filtering or have a UL 1283 5th Edition Listing

4. Internal Connections – No plug-in component modules or printed circuit boards shall be used as surge current conductors. All internal components shall be soldered, hardwired with connections utilizing low impedance conductors.

5. Monitoring Diagnostics – Each SPD shall provide the following integral monitoring options:

   (a) Protection Status Indicators - Each unit shall have a green / red solid-state indicator light that reports the status of the protection on each phase.

      (1) For wye configured units, the indicator lights must report the status of all protection elements and circuitry in the L-N and L-G modes. Wye configured units shall also contain an additional green / red solid-state indicator light that reports the status of the protection elements and circuitry in the N-G mode. SPDs that indicate only the status of the L-N and L-G modes shall not be accepted.

      (2) For delta configured units, the indicator lights must report the status of all protection elements and circuitry in the L-G and L-L modes.

(3) The absence of a green light and the presence of a red light shall indicate that damage has occurred on the respective phase or mode. All protection status indicators must indicate the actual status of the protection on each phase or mode. If power is removed from any one phase, the indicator lights must continue to indicate the status of the protection on all other phases and protection modes. Diagnostics packages that simply indicate whether power is present on a particular phase shall not be accepted.

(b) Remote Status Monitor (optional) – The SPD must include Form C dry contacts (one NO and one NC) for remote annunciation of its status. Both the NO and NC contacts shall change state under any fault condition.

(c) Audible Alarm and Silence Button (optional) – The SPD shall contain an audible alarm that will be activated under any fault condition. There shall also be an audible alarm silence button used to silence the audible alarm after it has been activated.

(d) Surge Counter – The SPD shall be equipped with an LCD display that indicates to the user how many surges have occurred at the location. The surge counter shall trigger each time a surge event with a peak current magnitude of a minimum of 50 ± 20A occurs. A reset pushbutton shall also be standard, allowing the surge counter to be zeroed. The reset button shall contain a mechanism to prevent accidental resetting of the counter via a single, short-duration button press. In order to prevent accidental resetting, the surge counter reset button shall be depressed for a minimum of 2 seconds in order to clear the surge count total.

(1) The ongoing surge count shall be stored in non-volatile memory. If power to the SPD is completely interrupted, the ongoing count indicated on the surge counter's display prior to the interruption shall be stored in non-volatile memory and displayed after power is restored. The surge counter's memory shall not require a backup battery in order to achieve this functionality.

6. Thermal MOV Protection

(a) The unit shall contain thermally protected MOVs. These self-protected MOVs shall have a thermal protection element integrated with the MOV and a mechanical disconnect with arc quenching capabilities in order to achieve overcurrent protection of the MOV. The thermal protection assembly shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.

7. Fully Integrated Component Design – All of the SPD's components and diagnostics shall be contained within one discrete assembly. The use of plug in single-mode modules that must be ganged together in order to achieve higher surge current ratings or other functionality shall not be accepted.

8. Safety Requirements

(a) The SPD shall minimize potential arc flash hazards by containing no single-mode plug in user serviceable / replaceable parts and shall not require periodic maintenance. SPDs containing items such as replaceable single-mode plug in modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.

(b) SPDs designed to interface with the electrical assembly via conductors shall require no user contact with the inside of the unit. Such units shall have any required conductors be factory installed.

2.3 SYSTEM APPLICATION

A. The SPD applications covered under this section include distribution and branch panel locations, busway, motor control centers (MCC), switchgear, and switchboard assemblies. All SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C, B, and A environments.

B. Surge Current Capacity – The minimum surge current capacity the device is capable of withstanding shall be as shown in the following table:

Minimum surge current capacity based on ANSI / IEEE C62.41 location category			
Category	Application	Per Phase	Per Mode
C	Service Entrance Locations (Switchboards, Switchgear, MCC, Main Entrance)	250 kA	125 kA
B	High Exposure Roof Top Locations (Distribution Panelboards)	160 kA	80 kA
A	Branch Locations (Panelboards, MCCs, Busway)	120 kA	60 kA

2.4 LIGHTING AND DISTRIBUTION PANELBOARD REQUIREMENTS

A. The SPD application covered under this section includes lighting and distribution panelboards. The SPD units shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category B environments.

1. The SPD shall not limit the use of through-feed lugs, sub-feed lugs, and sub-feed breaker options.

2. SPDs shall be installed immediately following the load side of the main breaker. SPDs installed in main lug only panelboards shall be installed immediately following the incoming main lugs.

3. The panelboard shall be capable of re-energizing upon removal of the SPD.

4. The SPD shall be integral to the panelboard and connected directly to the bus. Alternately, an integral SPD can be connected to a circuit breaker for disconnecting purposes, in the case a disconnect is required.

5. The SPD shall be included and mounted within the panelboard by the manufacturer of the panelboard.

6. The SPD shall be of the same manufacturer as the panelboard.

7. The complete panelboard including the SPD shall be UL67 listed.

2.5 SWITCHGEAR, SWITCHBOARD, MCC AND BUSWAY REQUIREMENTS

A. The SPD application covered under this section is for switchgear, switchboard, MCC, and busway locations. Service entrance located SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C environments.

B. The SPD shall be of the same manufacturer as the switchgear, switchboard, MCC, or busway

C. The SPD shall be factory installed integral to the switchgear, switchboard, MCC, and/or bus plug at the assembly plant by the original equipment manufacturer

D. Locate the SPD on the load side of the main disconnect device, as close as possible to the phase conductors and the ground/neutral bar.

E. The SPD shall be connected through a disconnect (30A circuit breaker). The disconnect shall be located in immediate proximity to the SPD. Connection shall be made via bus, conductors, or other connections originating in the SPD and shall be kept as short as possible.

F. The SPD shall be integral to switchgear, switchboard, MCC, and/or bus plug as a factory standardized design.

G. All monitoring and diagnostic features shall be visible from the front of the equipment.

2.6 SERVICE ENTRANCE REQUIREMENTS

A. Service entrance located SPDs shall be tested and designed for applications within ANSI/IEEE C62.41 Category C environments.

PART 3 - EXECUTION

3.1 EXAMINATION

3.2 FACTORY TESTING

A. Standard factory tests shall be performed on the equipment under this section. All tests shall be in accordance with the latest version of NEMA, IEEE, and UL standards.

3.3 INSTALLATION

A. The installation of the SPD shall be factory installed integral to the distribution equipment. The Contractor shall install all distribution equipment per the manufacturer's recommendations, applicable electrical codes and the contract drawings.

3.4 WARRANTY

A. The manufacturer shall provide a ten (10) year warranty (15 year warranty with registration) that covers replacement of the complete unit, including lightning, from the date of shipment against any SPD part failure when installed in compliance with manufacturer's written instructions and any applicable national or local electrical code.

END OF SECTION 26 43 13

SECTION 271010 – TELECOMMUNICATION INFRASTRUCTURE CABLING SYSTEM – PUSHABLE OPTICAL FIBER

PART 1 GENERAL

1.1 QUALITY ASSURANCE

A. Within this specification, “Owner” shall refer to the San Antonio Housing Authority, “System Installer” shall refer to the company or firm hired by the Owner to design and document the telecommunications infrastructure cabling system, and “Cabling Contractor” shall refer to the company selected by the Owner or general contractor, through the appropriate proposal and/or bid process, to provide installation of the telecommunications cabling system in accordance with the project specifications.

B. An acceptable Cabling Contractor for the installation of the equipment within these specifications must have personnel with the experience, training, skill, and certification to install a complete and working telecommunications cabling system as described within.

C. Cabling Contractor personnel selected to install any equipment proposed under these specifications must have demonstrable experience and training on the specific equipment to be furnished and installed. The Cabling Contractor shall furnish acceptable evidence of manufacturer's training and experience of having participated in a minimum of three (3) similar system installations.

D. During the installation of the cabling system, the Owner and/or their representative will conduct periodic inspections to verify that the Project and installation is proceeding according to the letter and intent of this specification. The Cabling Contractor will promptly correct any deficiencies found and documented in Site Visit Reports at no additional expense to the Owner and with no negative impact to the project schedule.

1.2 SCOPE OF WORK (SOW)

A. The Cabling Contractor shall provide and install all required materials and install telecommunications infrastructure cable systems to provide network-attached communications for the building. The Cabling Contractor shall be responsible for accurately determining the required quantities for all cable, termination hardware, supporting systems, and all ancillary materials required for a complete and working telecommunications infrastructure system as described in the project documents.

B. Intra-building cable required to support network connectivity shall be installed within the plenum space, in conduit, duct and cable support accessories such as cable tray, cable ladder, surface mounted raceway.

C. The Cabling Contractor shall furnish and install FIBER OPTIC cables which meet or exceed the electrical performance criteria as published within the TIA/EIA 568 standards documents, and be factory sweep tested and certified. Quantities of cables and terminations shall be per the Outlet Configuration and Types, specified herein, and as shown on the Drawings. Horizontal cables shall be homerun to the nearest IDF unless specifically indicated otherwise on the floorplans. Faceplates shall be marked with system designators and cable identifiers. Cables shall be installed, terminated, tested, labeled, and documented as part of the Cabling Contractor’s SOW.

D. Grounding and bonding for all equipment racks, cabinets, enclosures, termination hardware and related telecommunications equipment shall be furnished and installed by the Cabling Contractor.

E. Cabling Contractor shall install firestopping at all fire rated walls, floors, or other fire rated systems penetrated for utilization by the telecommunications systems.

F. The Cabling Contractor shall label and test the entire telecommunications cabling system as required for the acceptance of each individual component and the complete telecommunication cabling system. The Cabling Contractor is responsible for ensuring that the cable and equipment being installed in the system is without flaw and that no damage to the cable or equipment occurred in shipment or installation. The Cabling Contractor shall replace any defective cables or equipment prior to completion with no additional cost to the owner and in such a time frame that it does not affect the project schedule.

G. The Cabling Contractor shall correct, in a timely manner, any installation deficiencies or unacceptable equipment uncovered by the Owner's, System Designer's, or manufacturer’s quality assurance inspection. If necessary or required, a re-examination of any portion of the installation shall be performed.

H. It is the intent of this specification to describe a level of quality for products and workmanship but not to describe all of the technical requirements essential to the functioning of a cabling system, nor to set forth those requirements adequately covered by applicable codes, industry standards, and accepted telecommunications trade practices. The selected Cabling Contractor is expected to be familiar with all applicable codes, industry standards, and accepted telecommunications trade practices as well as their execution to the benefit of the project and the project Owner.

I. In the case of a building renovation, all unused cabling shall be removed from accessible areas as defined by the locally adopted version of the National Electrical Code. Unused cabling required to remain shall be clearly and obviously labeled as being for future use.

1.3 CONTRACT DRAWINGS

A. The intent of the drawings is to establish the type of system and functions, but not to set forth each item essential to the functioning of the system. The drawings are generally diagrammatic and show approximate location and extent of the work. In case of doubt of work intended, it is the responsibility of the Cabling Contractor to request instructions from the Owner.

B. Cabling Contractor shall review all drawings before commencing work. Where discrepancies occur, Cabling Contractor shall immediately notify the Owner and request clarification.

C. Contractor shall review the project plan set and project manual to verify his understanding of the project requirements and coordination with other disciplines and trades.

1.4 REFERENCE STANDARDS

A. The latest published edition of the following codes, standards, and references shall be adhered to throughout the project. Where any specified element is in conflict with a reference listed below, the more stringent requirement shall apply.

B. The codes and standards set forth minimum requirements which may be exceeded by the Cabling Contractor if, in Contractor's judgment and with Owner's approval, superior or more economical designs or materials are available for successful and continuous operation of the equipment as required by this specification.

1. Code of Federal Regulations, Title 29, Chapter XVII, Part 1910 (OSHA).
2. ASTM E814, and UL 1479 concerning the assembly and installation of fire stop systems.
3. UL 467 Concerning Bonding and Grounding Equipment.
4. CCITT - International Telegraph and Telephone Consultative Committee V-Series and X-Series.
5. TIA-568-C.0 Generic Telecommunications Cabling for Customer Premises
6. TIA-568-C.1 Commercial Building Telecommunication Cabling Standards – Part 1 General Requirements (2008)
7. TIA-568-C.3 Optical Fiber Cabling Components Standard (2009)
8. TIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces - (October 2004)
9. TIA-598-C Optical Fiber Cable Color Coding - (January 2005)
10. TIA/EIA-606-A Administration Standard for Commercial Telecommunications Infrastructure - (May 2002)
11. ANSI J-STD-607-A Commercial Building Grounding and Bonding Requirements for Telecommunications - (October 2002)
12. TIA-758-A Customer-owned Outside Plant Telecommunications Infrastructure Standard - (August 2004)
13. TIA-598-C Optical Fiber Cable Color Coding - (January 2005)
14. TIA-526-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant – OFSTP-7 - (February 2002)
15. TIA-526-14-A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant – OFSTP-14 - (August 1998)
16. IEEE 802.4 Broadband Applications and 802.7 Broadband Specifications Standard.
17. NFPA 70 National Electrical Code with revisions and additions as dictated by the local municipality having jurisdiction.
18. ANSI C80.3 Specification for Zinc-coated Electrical Metallic Tubing.
19. ANSI/UL 797 Electrical Metallic Tubing.
20. NEMA VE1 Cable Tray Systems.

21. FCC Rules and Regulations, Part 68.
22. All local codes (i.e., City of San Antonio Fire Code, City of San Antonio Electric Code, City of San Antonio Mechanical Code, etc.)
23. Basic Building Code (BOCA).
24. Uniform Building Code (ICBO).
25. Standard Building Code (SSBC).
26. NFPA 101 - Life Safety Code.
27. NFPA 258 - Standard Test Method for Measuring Smoke Generated by Solid Materials.

1.5 PRODUCT REQUIREMENTS

A. Materials and equipment furnished must be new products of manufacturers regularly engaged in the production of such products.

B. Products must be UL listed where a UL test procedure is applicable.

1.6 RELATED WORK

A. Applicable sections of project General and Supplemental Conditions and Electrical Systems plans and specifications are to be referred and adhered to during the installation of telecommunications cabling, including:

1. General Requirements.
2. Basic Requirements, Materials, and Methods.
3. Raceways.
4. Cable Tray.
5. Wiring Devices.
6. Wall Boxes.
7. Cabinets.
8. Supporting Devices.

1.7 PRE-PROJECT SUBMITTALS

A. Three (3) bound sets of Pre-Project Submittals, divided into sections as described below and with the product cut-sheet portion following the order of the Products section of this Specification, shall be provided by the Cabling Contractor to the Architect Pre-Project Submittals are due no later than 30 days after notice of award has been issued or as required by the specific project schedule.

B. Prior to the purchase of products, Cabling Contractor shall prepare and submit the following deliverables for review and acceptance by the Architect and Owner. Products purchased prior to review and acceptance of the Pre-Project Submittals are subject to rejection by the Owner

or Designer and shall be replaced with approved products at no cost to the Owner and with no delay in the project schedule.

1. Provide product cut-sheet and shop drawing submittals. Manufacturers cut sheets or brochures of all products, systems, or assemblies to be provided for the project may be original or photocopied. Cut sheets shall include complete dimensions, material descriptions, color choices, and shall be highlighted or otherwise identified where more than one product or part number appears on the cut sheet. Shop drawings shall be submitted showing panels, workstations, faceplates, labeling strips detailing all nomenclature, engraving, finish, and color. Cabling Contractor outlet, cable, and connecting hardware labeling schemes shall comply with the TIA/EIA-606 Standard, UL 969.
2. Provide test procedures including a list of test equipment to be used for cable testing, and sample test result formats.
3. Sketches or cut sheets of UL Listed firestop systems shall be provided to reflect the actual installation conditions of the project.
4. Cabling Contractor prepared schedule of activities to be followed throughout the project. The schedule shall minimally describe project start date, date upon which telecommunications pathways shall be completed, date upon which telecommunications spaces are to be prepared, estimated time to install inter-building cables, estimated time to install riser cables, estimated time to install horizontal cables, estimated time to terminate cables, estimated time and date to test and label all cabling and workstation outlets, and estimated date of delivery of Post Project Completion Deliverables.
5. A listing of information required by the Cabling Contractor from the Owner and when the information is needed to ensure timely completion of the project.
6. Cabling Contractor shall provide written confirmation that the project jobsite has been inspected, that all related drawings and specifications have been reviewed, and that the Cabling Contractor possesses a thorough understanding of the project requirements and schedule.

C. Pre-Project submittals will be reviewed by the Architect for general compliance with the intent of the drawings and specifications. Completeness of the submittal, rejection in part or whole, acceptance, or acceptance with comment shall not relieve the Cabling Contractor of providing a complete and working system as described on the drawings, within the specifications, or can be reasonably expected based upon accepted industry standards and practices.

1.8 POST PROJECT DELIVERABLES

A. Test Results

1. Test results shall be performed, documented, and submitted as specified within the Testing Portion of Section 3.0 - EXECUTION herein.
2. Cabling Contractor shall include all factory provided test results for cabling purchased for the project.

B. Record Drawings

1. Contractor shall maintain one set of drawings on site to continually maintain an accurate record of the as-constructed work. The mark-up drawings shall accurately indicate location of equipment, pull-boxes, conduits, cable types and labeling based upon as-built conditions.

2. Upon completion of the project, Cabling Contractor shall provide drawings depicting the cabling system as installed. The original telecommunications drawings shall be provided for use as a basis for creating Record Drawings. Record Drawings shall minimally include all revisions to, or deviations from the original drawings as well as final dimensions, cable routes, cable and outlet identification, allocation of used and quantity of spare pairs and strands, and remaining capacity of cable pathways.

3. The Owner and System Designer will review an initial set of the Record Drawings. Comments will be provided to the Cabling Contractor in cases where revisions to the Record Drawings are required to ensure accuracy and completeness. The Cabling Contractor shall respond to the comments and revise the Record Drawings accordingly.

4. Upon acceptance of the Record Drawings as final, Cabling Contractor shall provide the Owner the original field marked “red-line” drawings and with a read/write Compact Disk (CD) containing Auto-Cad Release 2007 or later .dwg formatted As-Built drawings which shall identify/label all cabling, equipment, outlets, and cabling pathways as marked in the field for the completed project.

   Cabling Contractor shall plot and laminate both the cabling floorplans and Riser Diagrams for mounting within the respective serving IDF Room(s).

5. Manufacturer’s warranty and certification documents describing the duration of all warranties as well as procedures for notification of cabling system failures and associated remedies.

1.9 ACCEPTANCE AND GUARANTEE

A. In addition to guarantee of equipment by manufacturer, the Contractor shall also guarantee such equipment, which shall include tests, adjustments and/or replacements of defective equipment, Materials, and workmanship for a period of one (1) year from date of substantial completion.

B. The guarantee shall be written included as part of the project manual. Defects appearing within one year shall be repaired by the Contractor without cost to the Owner.

C. The cabling system shall be accepted as being complete and working at no time prior to resolution of all punch list items and receipt of all Post Project Completion Deliverables.

D. Manufacturer and installer provided warranty and certification shall commence upon Owners acceptance and functional use of the cabling system.

E. All post project deliverables are due within 30 days of issuance of certificate of substantial completion.

PART 2 - PRODUCTS

2.1 FIBER OPTIC CABLE

A. General Requirements

1. All finished fibers must be color-coded by the manufacturer for identification. The fibers shall be connectorized utilizing field-installed terminations or spliced pigtails. The nominal connector loss using either termination method shall not be greater than 0.40 dB per mated pair.

2. The fiber cable shall be able to withstand a short-term tensile load of 440 N (99 lbf.) and a long-term tensile load of 132 N (38 lbf.) with maximum elongation of less than 0.5% and no breakage of fibers.

3. The minimum static or no load (0-180 lb.) bending radius for the cable shall be no greater than 10 times the outside diameter of the cable. Cables shall be able to withstand being flexed at their minimum static bending radius +/- 90 degrees for at least 20 cycles at 20-40 cycles per minute at 20 degrees C. The minimum dynamic or loaded (181-600 lb.) bending radius shall be no greater than 20 times the outside diameter of the cable.

4. The cable shall be able to withstand twisting of +/-360 degrees over a length of 2 meters for at least 10 cycles at 10 cycles per minute. The cable shall be able to withstand storage and operating temperatures of -40 to +70 degrees C. The cable shall withstand a compressive force of 600 N/cm without breakage, and there shall be no attenuation increase after the force is removed.

5. The cable shall be able to withstand storage and operating temperatures of -40 to +70 degrees C.

6. The number of fibers supplied in each cable shall be the number of fibers required per the contract drawings. The cable structure shall be such that the fibers are grouped for easy handling.

7. The cable shall contain appropriate strength members to satisfy the above mechanical and environmental specifications. The core shall consist of loose tubes around a central dielectric strength member. The cable jacket shall be medium density polyethylene or similar and provide suitable moisture resistance for installation in underground ducts. The cable sheath shall be of a non-armored non-metallic material.

8. Acceptable product:

b. Clearfield “FieldSmart” Modular Fiber Management Platform (Basis of Design)

c. Approved equivalent.

B. Building Service

1. Fiber Pigtail - 12 Fiber 1x12pushable MPO Female to pigtail

2. Direct Bury Microduct - 14/10mm, orange oversheathed toneable, w/ pull string

3. Exposed Microduct - Indoor Plenum Type Non-toneable

B. Main Distribution Frame (MDF)

1. Clearfield FxDS Panel – 19 and 23 inch mounting, 11 inch / 24 cassette Capacity Chassis, front load, loaded with no fiber pigtails in Clearview patch and Splice Cassettes. Front and Rear Protection and slack basket included.

2. Patch and Splice – Clearview Blue Cassette, MPO (male) to SC/APC, MPO Rear Access and SC/APC Front access adapters, Single mode,

B. Intra-building Backbone Fiber Optic Cable

1. Fiber optic cables shall be OFS All Wave Flex and Fiber or equivalent.

2. Intra-building fiber construction shall be single mode with a core/cladding size of 900um in a composite armored cable. Contractor shall furnish and install the appropriate fan out or breakout materials as required and dictated by the application and fiber optic cable type. Fiber Size 200um

3. Minimum Performance for Terminated Single mode Connectors shall be:

b. SC Ferrule Ceramic Type, Minimum Ret. Loss 65 db, Maximum Initial Loss of 0.20 db

4. Bend Insensitive, Meeting G.657 A2, fiber protects optical signal requirements with minimal to zero attenuation

C. Independent Distribution Frame (IDF)

1. Breakout – FieldSmart MPO SM Cassette, 2 High, SC/APC, 24 ports standard density

2. Fiber Optic Patch Cords:

a. Duplex fiber optic patch cables shall be factory assembled and tested. Patch cables shall be manufactured using fiber optic cable of quality equal to, or better than the specifications listed above for fiber optic cable. Connectors shall be as specified elsewhere in this section.

b. Fiber Optic Patch Cord length shall be determined by the final installed configuration of network electronics, fiber optic termination panels, and wire management hardware. Patch cord length shall be equal to the minimum factory produced length that will allow cross connection and interconnection to be accomplished by the owner without hindrance while allowing minimum bend radius and adequate strain relief to be maintained at all times.

c. Fiber optic patch cord quantity to be delivered shall be as dictated by the Owner.

d. The same manufacturer selected to provide fiber optic riser cable shall manufacture the fiber optic patch cables.

e. Acceptable product:

i. Clearfield FiberShield, single mode, 24 fiber 1x24 MPO Female to 1/24 pushable MPO Female

ii. Approved equivalent.

2.2 CABLING CONNECTIVITY, TERMINATION, CABLE MANAGEMENT, AND EQUIPMENT SUPPORT

A. Equipment Racks and Cabinets

1. Racks shall be black aluminum Standard Equipment Racks with EIA 23-inch rails,

   Secure to wall with ladder racking.

2. Acceptable Manufacturers:

   a. Chatsworth Products Industries (CPI)

   b. Cooper/B-Line

   c. APC

   d. Approved equivalent.

E. Patch Panels

1. Wall-mounted modular patch panels shall be provided and installed within the IDF room as indicated on the project plans. Patch panels shall be NEMA 4 rated combo plate providing 24-port SC/APC terminations.

2. Acceptable Product:

   a. Clearfield Fieldsmart
   b. Approved equivalent

G. Wall-mounted Outlets

1. Construction: Outlets shall be of modular component design. Each outlet shall consist of a modular faceplate, Leviton single port outlet locations, installed on a 2”x 4" outlet box with snap-in modular jack inserts for the termination of the horizontal cables. Modular jack inserts shall be:

   a. Acceptable Products
      1) Blank module covers
      2) Approved Equivalent

2. Coordinate final outlet locations with owner. Match plate cover color approved for new work, Reference Electrical Drawings.

H. Fiber Optic Distribution Centers / Termination Housings

1. Fiber Optic Distribution Panel shall be self-contained, 19 and 23-inch rack-mountable unit suitable for the termination, splicing, and distribution of fiber optic cables. Each unit shall consist of a cabinet and a suitable number of splice trays and connectors to terminate the specified number of fiber strands.

2. The cabinet shall consist of a factory painted steel / aluminum casing and contain the necessary hardware to allow rack mounting.

3. Compliant to Telcordia GR-449

4. Acceptable Products:
   a. Clearfield Fieldsmart FxDS Tie Panel.
   b. Approved equivalent.

J. Fiber Optic Connectors

1. Fiber optic connectors shall be small form factor (SC APC-type) for single mode and multi-mode fiber optic cables. Connectors shall have an insertion loss of not greater than 0.3 dB per connector.

2. Loose tube fibers shall be terminated using spliced pigtails or directly connectorized with the addition of fan-out tubing or per the Manufacturer's recommended method of termination.

3. The connector shall be rated by the Manufacturer to withstand at least 1,000 couplings with a variance in insertion loss within 0.25 dB.

4. The connector shall enclose the outermost coating of the single fiber strand and be able to be mated or unmated without using any tool. The connector shall be field installable.

5. Acceptable Products:
   a. Clearfield Fieldsmart
   b. Corning
   c. Approved equivalent

K. Firestop Material

1. Fire stopping shall be a material, or combination of materials, installed to retain the integrity of time-rated construction by maintaining an effective barrier against the spread of flame, smoke, and gases. It shall be used in specific locations as follows:

2. Fire stopping materials shall be asbestos free and capable of maintaining an effective barrier against flame, smoke, and gasses in compliance with requirements of ASTM E 814, and UL 1479. Only listed firestopping material acceptable to the City of San Antonio Fire Marshal shall be used within each of the following conditions:

   a. Duct, cables, conduit, piping, and cable tray penetrations through floor slab and through time-rated partitions or fire walls.
   b. Openings between floor slab and curtain walls, including inside hollow curtain walls at the floor slab.
   c. Penetrations of vertical service shafts.
   d. Openings and penetrations in time-rated partitions of fire walls containing fire doors.
   e. Locations where specifically shown on the drawings or where specified in other sections of the project manual.

f. The rating of the installed firestop system shall in no case less than the rating of the time-rated floor or wall assembly.

3. Description.

a. Elastomeric silicone materials by Dow Corning.

b. Elastomeric, intumescent materials by 3M Brand Fire Barrier.

c. Asbestos-free, semi-refractory fiber material by Fibrex.

4. Acceptable Products.

a. Manufacturers acceptable contingent upon products' compliance with the specifications and City of San Antonio requirements:

1) 3M Brand Caulk CP-25.

2) 3M Brand Putty 303.

3) 3M Brand Wrap/Strip FS-195.

4) 3M Brand Composite Strip CS-195.

5) 3M Brand Penetrating Sealing Systems 7900 Series.

6) Dow Corning Fire Stop Foam, liquid component Part A (black) and liquid component Part B (off-white).

7) Dow Corning Fire Stop Sealant.

8) Fibrex Safing Insulation.

b. Damming Materials permitted are those products compatible with the above materials as certified by the manufacturer in their respective published data.

2.3 LABELING PRODUCTS

A. Label all applicable cables and components with a self-laminating vinyl industrial grade marking system. Labels shall be machine/electronically produced; hand written labels will not be accepted. Size used shall be in accordance with the cable or component to be marked. Font shall be no smaller that 12pt in any case. Cables shall be labeled identically at both ends.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. Furnish all labor, materials, equipment, tools, utilities, and services necessary for the proper execution and completion of a standards-compliant Telecommunications Cabling System, regardless if specifically enumerated in this specification

B. Acquire all required permits and give notice to all agencies requiring advance notification and comply with all regulations specified by all governing agencies having jurisdiction over the performance of the work.

C. Coordinate with Owner's representative to insure that any interference or interruptions of Owner's operations are anticipated and scheduled.

3.2 INSTALLATION METHODS

A. General

1. Install an integrated cabling system infrastructure as detailed by the contract drawings, details, and specifications. Where specific cable layout and locations are detailed it is the contractor's responsibility to install as specified or provide complete information justifying alternatives before installation.

2. Use the maximum possible bending radius on all cables during installation. Minimum-bending radius of the cable per the manufacturer's specifications shall always be maintained.

3. All cables shall be continuously lubricated during the pulling-in process. Maximum pulling tensions specified by the cable manufacturers shall not be exceeded. Monitor cable-pulling tension with a mechanical tension-meter.

4. Use tools and equipment specifically designed for the purpose. The contractor shall implement installation practices that insure the highest quality installation. Contractor shall make all cutting, splicing, pulling and termination of cables using equipment specifically designed for that purpose.

5. Install hook and loop tie wraps using a tension controlling cutting device to prevent over-tightening. Tie wraps and other securing hardware shall be rated as required for the installation environment (i.e.; tie wraps will be approved for use in a plenum area when installed in a return air space).

6. Fill cable tray or conduit with cables with the following guidelines:

   a. Where cable trays or conduits are stacked, fill the top raceway to its maximum fill ratio first and then move to the next raceway below it and so on.

   b. Where multiple conduits are being used, fill one conduit to its maximum fill ratio before going onto the next conduit. Wherever possible, leave as many spare conduits available as possible.

   c. The maximum fill ratios for typical raceway supporting communications cabling are as follows:

      1) Ladder type cable tray 50% 2) Solid bottom cable tray 40% 3) EMT type conduit 40%.

   d. All spare conduits or conduits filled with less than the maximum allowed fill ratio shall have a pull string installed and left for future pulling in of cable. Clearly label as "pulling line" indicating opposite end location.

7. Install the telecommunication cabling system as detailed in the contract drawings in the location and layout shown.

8. Install cable trays in accordance with NEC Article 318 and manufacturers' recommendations.
9. Install connectors in conformance with manufacturer recommended stripping and crimping procedures. Use special tools designed for this purpose.
10. Label all cables at both ends. The label shall be permanent. Labels shall be typed (not handwritten) and individual number strips are unacceptable. All cable labeling shall include numeric designation, source, destination, and cable type.
11. All boxes and outlet plates shall be installed neatly and square with floor and walls.
12. Installations shall conform strictly with the TIA/EIA Telecommunications Building Wiring Standards to ensure a quality system that meets the transmission rate criteria.

B. Fiber Optic Cable Installation

1. The fiber optics raceway system must be continuous between pull boxes and junction boxes. Raceway components and inner duct must enter and be secured to all endpoint enclosures.
2. The fiber optics raceway system shall be routed with largest bend radius possible. Bends in the fiber optics raceway system shall be accomplished with large radius pre-formed ells. Field bending shall be in accordance with NEC minimum radii requirements. Use only equipment specifically designed for the material and size involved.
3. The entire fiber optics raceway system shall be complete and the raceway interior cleaned prior to the installation of the fiber optics cables.
4. Securely fasten the fiber optics raceway to the cable tray, or walls when routed inside buildings, using clamps and clips designed for this purpose.
5. Provide a nylon or polyethylene pulling line in all fiber optics raceways. Clearly label as "pulling line", indicating opposite end location.
6. Openings around fiber optics raceway penetrations shall maintain the fire resistance rating required. See NEC 300-21.
7. All fiber optics cables are to be run as efficiently as possible, minimizing the amount of cable required.
8. All fiber optics cables shall be continuously lubricated during the pulling-in process. The maximum pulling tensions specified by the cable manufacturers shall not be exceeded. Monitor cable pulling tension with a mechanical tension meter.
9. Fiber optics cables passing through pull boxes shall be neatly arranged to afford maximum clearance between the several cable types within the box.
10. Label all fiber optic cables at both ends. The label shall be permanent. Labels shall be typed (not handwritten) and individual number strips are unacceptable. All cable labeling shall include numeric designation, source, destination, and cable type as per the drawings or shall minimally meet the labeling requirements of TIA/EIA 606 – Administration Standard for Commercial Telecommunications Infrastructure.

11. Fiber optics raceways shall be clearly marked at each pull box indicating type and number of cables within.

C. Firestopping

1. Clean surfaces to be in contact with firestopping materials of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting of the required firestop system.
2. Install fire stopping materials as indicated, in accordance with manufacturers instructions.
3. Seal all holes or voids made by penetrations to ensure an effective smoke barrier.
4. Unless protected from possible loading or traffic, install firestopping materials in floors having void openings of 4 inches or more to support the same floor load requirements.
5. Examine fire stopped areas to ensure proper installation prior to concealing or enclosing firestopped areas.
6. Areas of work shall remain accessible until inspection (and approval) by the applicable code authorities.

3.3 CABLE AND RACEWAY MARKING

A. Provide legible and indelible marking on all cables during installation.

B. Enclosed raceways shall be clearly marked at each pull box indicating type and number of cables within.

3.4 GROUNDING

A. Cabling Contractor shall provide and place specified copper ground bars, and cables to provide a common single-point termination of all ground conductors for the telecommunications cabling system bonded to the Building Electrical Service Entrance ground in accordance with ANSI-J-STD-607-A.

B. All equipment racks, cabinets, enclosures, and equipment within each IDF shall be connected to the grounding system using #6AWG insulated copper conductor per the manufacturer's instruction.. Manufactured connectors, bonding straps, and/or ground lugs, designed for the purpose of securely bonding each busbar, rack, cabinet; section of cable runway and other required telecommunications appurtenances to the facility grounding system shall be utilized.

C. Ground wire shall be placed within cable tray and runway to avoid sharp bends and areas where the cable may be damaged in the course of reconfiguring termination equipment, ongoing maintenance, or traffic within the space. Cable runway or ladder rack sections shall be bonded together utilizing a copper bonding jumper securely attached to each section utilizing a star washer or other similar device to insure electrical continuity exists between the metal surfaces.

3.5 TESTING

A. Testing and Measurement Equipment

1. The Cabling Contractor shall provide all tools and test equipment required for testing. Test equipment will be maintained in an accurate calibration and will display the dates of the last calibration and next scheduled calibration. Test equipment shall be fully charged prior to each day's testing. Test instrument shall be Level-III compliant.

B. Reports

1. Test results shall document each installed cable for pass/fail, problems encountered in the case of a failure, and the procedure required to result in a passing test. Test reports shall be submitted in hardcopy and electronic format. Hand-written test reports are not acceptable. All test documents shall be dated and signed by the personnel performing the testing.

2. Hardcopy reports shall be submitted in labeled 3 ring binders with an attached affidavit verifying passing execution of all tests. Hardcopy summary reports shall contain the following information on each row of the report: circuit ID, test specification used, length, date of test, and pass/fail result.

3. Electronic reports shall be submitted on CD format. If proprietary "reader" software is required, disk or CD shall contain the necessary software required to view the results. If the results are delivered in a standard format like Excel, Access, CSV, .pdf files, etc. then software to read these files need not be provided. Electronic reports must be accompanied by a Certificate signed by an authorized representative of the Contractor warranting the truth and accuracy of the electronic report. Certificate must reference traceable circuit numbers that match the electronic record.

4. The Cabling Contractor shall provide (2) copies of the complete test report to the Owner within one (1) week of completion of the testing.

C. Fiber Optic Cable

1. Pre-Installation Testing. The Contractor shall ensure the integrity and serviceability of all new cable prior to installation. This assurance may be provided by using vendor verification documents, testing, or other methods selected by the Cabling Contractor. As a minimum for the fiber optic cable, the Contractor must supply evidence of verification for attenuation and bandwidth parameters.

2. In-Progress Testing. Standard tests for correct fiber identification and termination shall be performed during the installation to ensure proper installation and cable placement. Owner may, at their discretion, perform tests in addition to those specified herein if there is any reason to question the condition of the material as furnished or installed. All testing accomplished shall be documented by the party conducting the test. These test results shall be submitted to Owner.

3. Final Testing. A final test of the working installed fiber optic system shall be performed to demonstrate the acceptability of the project as installed. Testing shall be performed in accordance with a test plan supplied by the Cabling Contractor and approved by Owner. The Contractor shall furnish all labor, equipment, and instruments required to conduct the test. Any defective workmanship or material shall be corrected by the Cabling

Contractor and re-tested. As a minimum, final testing for the fiber optic cable system, including spare cable, shall verify the conformance of attenuation, length, and bandwidth parameters with the performance specifications and meet or surpass all related portions of ANSI/TIA/EIA-568B.3.

4. An optical Light Source and Power Meter such as Corning Optical Meter/Source Model LTK-400 or approved equivalent shall be employed for the testing of signal strength and optical connectivity.

5. The Contractor shall be responsible for recording all test results and shall submit copies of these test results for review prior to acceptance.

6. Testing Procedures

    a. On short links of less than 330 feet, continuity of each fiber shall be verified by inserting a measured light source at one end of the fiber and measuring the intensity of light using a power meter at the opposite end of the fiber.

    b. An end-to-end (including all connectors, filers, and jumpers) attenuation test shall be performed on all fiber strands by comparing the optical power at the input of a fiber with the output. This shall be accomplished by Insertion Loss Testing using a "one jumper reference" to include the connector losses. Testing shall be in accordance with EIA-455-53.

    c. The Contractor shall calculate the theoretical loss using installed cable lengths, compare and contrast this loss with the actual measured loss for each fiber, and submit these test results and comparisons to the Owner for review.

    d. If the actual loss exceeds the theoretical loss then the fiber shall be considered to have failed the acceptance criteria. Contractor shall, at the Owner’s direction, perform one of the following based on the requirements of the system and project schedules:

        1) Re-test to insure accurate readings from the first test. Both results shall be shown in the test results with the remedy performed resulting in acceptable value.

        2) Properly isolate the fiber from use in the system. Under no circumstances shall the remaining quantity of fibers be less than the specified amount.

        3) Replace the defective fiber optic cable.

END OF SECTION – 271000

SECTION 28 31 00.03 - FIRE ALARM SYSTEM

1. PART 1 - General

1.1. Related documents

- Drawings and general provisions of the contract apply to this section.
- The work covered by this section is to be coordinated with related work as specified elsewhere in the specifications. Requirements of the following sections apply:

Division 01 General Requirements

Division 07 Thermal and Moisture Protection, Section 078413 Penetration Firestopping

Division 08 Openings, Section 087100 Door Hardware
Division 14 Conveying Equipment, Section 14 28 16 Elevator Controls

Division 21 Fire Suppression, Section 21 13 00 Fire-Suppression Sprinkler Systems

Division 21 Fire Suppression, Section 21 30 00 Fire pumps

Division 23 Heating Ventilating and Air Conditioning, Section 23 09 93 Sequence of Operations for HVAC Controls

Division 25 Integrated Automation, Section 25 98 00 Integrated Automation Control Sequences for Electronic Safety and Security Systems

Division 26 Electrical, Section 26 00 00 Electrical General Provisions

1.2. Summary

1.2.1. Fire

Provide all permits, labor, equipment, materials and services to furnish and install a fully tested functional, UL Listed, code compliant, intelligent addressable networked fire alarm, emergency communications and active smoke control system including but not limited to all initiation and notification appliances, all raceways and wiring, connection to a central monitoring station.

The system supplied under this specification shall utilize modular low voltage design with direct wired, node to node, peer-to-peer network communications. The system shall utilize independently addressed, fire detection devices, input/output control modules, audio amplifiers, telephone communications and notification appliances as described in this specification. Network panels shall contain the required user interfaces for all functions. All equipment shall be new and the current products of a single manufacturer, actively engaged in the manufacturing and sale of digital fire detection devices for over ten years.

Also included are system wiring, raceways, pull boxes, terminal cabinets, mounting boxes, and any accessories and miscellaneous items required for a code compliant system.

The system drawings show the intended of coverage and suggested device locations. Final device quantity, location, and AHJ approval are the responsibility of the contractor.

The final system shall be complete, tested, and ready for operation as described elsewhere in this specification, before owner acceptance.

Strict conformance to this specification is required to ensure that the installed and programmed system will function as designed, is compatible with existing systems, and will accommodate the future requirements and operations of the building owner. All specified operational features must be met without exception.

1.2.2. Related Work - Fire

A. The Contractor shall coordinate work in this Section with all related trades. Work and/or equipment provided in other Sections and related to the fire alarm system shall include, but not be limited to:

1. Sprinkler waterflow and supervisory switches shall be furnished and installed by the fire protection contractor, but wired and connected by the electrical contractor. Modification of existing sprinkler devices to accommodate monitoring by the new fire alarm system shall be the responsibility of the fire alarm system installing contractor.

2. Duct smoke detectors shall be furnished, wired and connected by the electrical contractor. The HVAC contractor shall furnish necessary duct opening to install the duct smoke detectors.

3. New air handling and smoke exhaust system fan control circuits and status contacts to be furnished by the HVAC control equipment.

4. Elevator recall control circuits to be provided by the elevator control equipment. Modifications to the existing elevator controls to accommodate ANSI A17.1 shunt trip activation shall be provided by the elevator controls contractor. Any shunt trip circuit breakers and related wiring required for ANSI A17.1 compliance shall be provided by the electrical contractor (see power riser for more details).

5. Dry pipe/deluge sprinkler system release valve control circuits and supervision contacts shall be provided by the dry pipe/deluge sprinkler system control equipment.

6. Kitchen hood extinguishing systems status monitoring.

7. Fire pumps (manual, automatic and special service) status monitoring.
   a. Pump failure (fail to start) indication
   b. Pump running indication
   c. Phase reversal indication

8. Emergency generator status monitoring
   a. Running indication
   b. Fail to start indication

9. Existing IP network interface
   a. Coordinate with the owner’s IT department for interconnection between the owner’s existing TCP/IP network and the TCP/IP network equipment supplied under this contract.

1.3. References

1.3.1. Codes-General

All work and materials shall conform to all applicable federal, state and local codes and regulations governing the installation. If there is a conflict between the referenced standards, federal, state or local codes, and this specification, it is the bidder's responsibility to immediately bring the conflict to the attention of the engineer for resolution. National standards shall prevail unless local codes are more stringent.

The bidder shall not attempt to resolve conflicts directly with the local authorities unless specifically authorized by the engineer.

1.3.2. Fire Code

The equipment and installation shall comply with the provisions of the following codes and standards unless the authority having jurisdiction has adopted an earlier version:

National Fire Protection Association (NFPA)

NFPA 70 - 2011 *National Electric Code®*
NFPA 72 - 2010 *National Fire Alarm Code®*
NFPA 90A - 2012 *Installation of Air-Conditioning and Ventilating Systems*
NFPA 92A - 2009 *Smoke-Control Systems Utilizing Barriers and Pressure Differences*
NFPA 92B - 2009 *Smoke Management Systems in Malls, Atria, and Large Areas*
NFPA 101- 2012 *Life Safety Code®*

Underwriter's Laboratories, Inc

UL 864 - Control Units for Fire Protective Signaling Systems.
UL 268 - Smoke Detectors for Fire Protective Signaling Systems.
UL 268A - Smoke Detectors for Duct Applications.
UL 217 - Single and Multiple Station Smoke Alarms
UL 521 - Heat Detectors for Fire Protective Signaling Systems.
UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.
UL 464 - Audible Signaling Appliances.
UL 38 - Manually Actuated Signaling Boxes for Use with Fire-Protective Signaling Systems
UL 346 - Waterflow Indicators for Fire Protective Signaling Systems.
UL 1971 - Signaling Devices for the Hearing-Impaired.
UL-1480 - Speakers for Fire Alarm, Emergency, and Commercial and Professional Use
UL 1481 - Power Supplies for Fire Protective Signaling Systems.
UL 1711 - Amplifiers for Fire Protective Signaling Systems.
UL 1635 - Digital Alarm Communicator System Units
UL-1638 - Signaling Appliances - Private Mode Emergency and General Utility Signaling

International Code Council

International Building Code
International Fire Code
International Mechanical Code

Federal Codes and Regulations

Americans with Disabilities Act (ADA)

Electrical Industries Association

EIA-232-D: Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange
EIA-485: Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems

1.3.3. Definitions and Abbreviations

ACU: Autonomous Control Unit.
ADA: Americans with Disabilities Act.
AFF: Above Finished Floor.
AHJ: Authority Having Jurisdiction.
Approved: Unless otherwise stated, materials, equipment or submittals approved by the Authority or AHJ.
Circuit: Wire path from a group of devices or appliances to a control panel or transponder.
CCS: Central Control Station.
CPU: The central computer of a multiplex fire alarm or voice command control system.
ECS: Emergency Communication System.
FACP: Fire Alarm Control Panel.
FCC: Fire Command Center.
FM: FM Global (Factory Mutual)
FSCP: Firefighter's Smoke Control Panel.
HPSA: High Power Speaker Array.
HVAC: Heating Ventilating and Air Conditioning.
IDC: Initiating Device Circuit.
LCD: Liquid Crystal Display.
LED: Light Emitting Diode.
LOC: Local Operating Console.
MN: Mass Notification.
MNEC: Mass Notification Emergency Communications.
NAC: Notification Appliance Circuit.
NFPA: National Fire Protection Association.
NICET: National Institute for Certification in Engineering Technologies
NRTL: Nationally Recognized Testing Laboratory
PTR: Printer.
RCP: Remote Control Panel
SLC: Signaling Line Circuit.
Style 1: As defined by NFPA 72, Class B.
Style 4: As defined by NFPA 72, Class B.
Style 6: As defined by NFPA 72, Class A.
Style 7: As defined by NFPA 72, Class A.
Style B: As defined in NFPA 72, Class B.
Style D: As defined in NFPA 72, Class A.
Style Y: As defined in NFPA 72, Class B.
UL or ULI: Underwriters Laboratories, Inc.
UL Listed: Materials or equipment listed and included in the most recent edition of the UL Fire Protection Equipment Directory.
Zone: Combination of one or more circuits or devices in a defined building area, i.e. 3 speaker circuits on a floor combined to form a single zone.

1.4. System Description - Fire

1.4.1. General Fire and ECS

The system supplied under this specification shall be a new UL Listed modular fire alarm network that uses independently addressed fire detection devices, input/output control modules, amplifiers and speakers. System provided shall be EST 3.

The network shall utilize token ring, peer-to-peer communications. The network shall consist of a main panel and remote control panels. To enhance survivability, each panel shall be an equal, active functional member of the network, capable of making all local decisions and initiating network tasks for other panels. In the event of a panel failure or communications failure between panels, panels shall be capable of forming sub-networks and remain operational between communicating panels. Master/slave system configurations shall not be considered as equal.

The system shall be fully field programmable such that virtually any combination of system output functions may be correlated to any type of input event(s). Inputs may be combined using Boolean logic, be time dependent or under manual control, as defined by required system operation. All software operations are to be stored in a non-volatile programmable memory within the fire alarm control panels. There shall be no limit, other than maximum system capacity, as to the number of addressable devices which may be in alarm simultaneously.

Addressable smoke detector sensitivity settings for both pre-alarm and alarm activation shall be automatically individually configurable for both daytime and nighttime operation. Addressable smoke detectors shall be UL listed for automatic sensitivity testing.

Ease of maintenance shall be facilitated by the use of panel based and PC based system diagnostics.

1. The system shall automatically test smoke detector sensitivity, eliminating the need for manual sensitivity testing.
2. Ground fault detection and annunciation shall be by individual module address for supervised input and output devices.
3. System test operation shall be configurable by individual addressable devices, and not disable entire circuits.
4. The system shall be capable of generating a graphical map of connected all addressable devices to aide in circuit troubleshooting.
5. Placement supervision of addressable devices shall couple a device’s location (not its address) to the programmed system response.

The system shall provide a one-way multi-channel emergency communication sub-system for the distribution of emergency messages to facility occupants.

The system shall support CO and security detection devices with appropriate independent annunciation and signal processing.

System panels and annunciators shall utilize configurable message routing and selective event messaging to direct event information only to the required system displays and printers as determined by the event type and location.

The existing Simplex 4100ES fire alarm shall be removed and discarded and new control panels, power supplies, audio/visual indicating appliances (All wiring shall be replaced with new) and related equipment shall be installed as specified.

1.4.2. Fire Alarm Performance

1.4.2.1. General Requirements

A. Comply with the provisions of NFPA 72 and the operational requirements of this specification.

B. The system shall identify all off normal conditions and log each condition into the system as an event.

a. The system shall automatically display on the control panel Liquid Crystal Display (LCD) the first (oldest) event of the highest priority by type. The event priority shall be alarm, supervisory, trouble, and monitor.
b. The system shall utilize four event queues, and shall not require event acknowledgment by the system operator. Labeled, color coded indicators shall be provided for each type of event queue: alarm - red, supervisory - yellow, trouble - yellow, monitor - yellow. When an unseen event exists for a given type, the indicator shall be lit.
c. For each event, the display shall include the current time, the total number of events, the type of event, the time the event occurred and up to a 42 character custom user description.
d. The user shall be able to review each event queue by simply selecting scrolling keys (up-down) for the event type.
e. New alarm, supervisory, or trouble events shall sound a distinct, silenceable audible signal at the control panel.
f. The LCD shall show the number of active alarm, supervisory, trouble and monitor events
g. The LCD shall show the system time and the number of active and disabled points in the system.
h. Specific input/output devices shall operate in accordance with the alarm, supervisory, trouble, monitor sections that follow and the input/output matrix.

C. All critical systems, sub-systems and circuits shall be monitored for integrity. System faults shall be annunciated.

D. Strobes shall be synchronized on each floor.

E. Batteries shall be sized to support the system for 24 Hrs. of standby operation followed by 15 minutes of alarm operation at the end of the 24 Hour period.

F. Off premises reporting of the loss of AC mains power to any system component shall be automatically delayed for a period of time acceptable to the AHJ to reduce traffic at the central monitoring station due to wide-area power failures.

G. The system shall provide configurable service groups to facilitate “one man” testing of the system based on the physical layout of the building. Each service group shall be capable of supporting any combination of system devices, independent of the circuit on which they are installed. Systems that disable entire circuits, circuits serving multiple floors or fire zones for testing shall not be considered as equal. Activated devices on a service group shall be capable of initiating alternative system test responses to facilitate system maintenance and minimizing occupant disturbances while in test mode.

H. Event processing and display shall be prioritized as follows:
a. Fire alarms
b. Supervisory events
c. Trouble events
d. Monitor events

1.4.2.2. Alarm Operation - ECS

The following representative tasks should be customized for each project. As an alternative to descriptive text, the use of a functional input/output matrix may provide additional detail.

Upon the **alarm activation** of any area smoke detector, heat detector, manual pull station, sprinkler waterflow the following functions shall automatically occur:

The system shall remain in the alarm mode until all initiating devices are reset and the fire alarm panel is manually reset and restored to normal.
The internal audible device shall sound at the control panel or command center.
Display the alarm event on the graphical workstation.
The LCD Display shall indicate all applicable information associated with the alarm condition including: zone, device type, device location and time/date.
All system activity/events shall be documented on the system printer and logged into system history.
Any remote or local annunciator LCD/LED's associated with the alarm zone shall be illuminated.

The following audio messages and actions shall occur simultaneously:
An evacuation message shall be sounded on fire floors (zones) immediately above and below (adjacent to) the fire floor (zone) general alarm evacuation. It is the intent of this message to advise occupants hearing this message that they are near danger and should leave the building via the stairs (nearest exit) immediately.

Activate visual strobes on the fire floors (zones) immediately above and below (adjacent to) the fire floor (zone) general alarm evacuation. The visual strobe shall continue to flash until the system has been reset. The visual strobe shall stop operating when the "Alarm Silence" is pressed.
An alert message shall be sounded on the remainder of building. It is the intent of this message to advise occupants to prepare for evacuation if necessary.

An instructional message shall be sounded in the stairwells instructing occupants to move carefully and quickly down the stairs to exit the building and to exit to a safe floor if you encounter smoke in the stairwell.

An instructional message shall be sounded in the elevator cabs. It is the intent of this message to advise elevator occupants that an emergency exists, the elevator has been directed to the ground floor, and that occupants should quickly exit the building.
An instructional message shall be sounded in the lobby. It is the intent of this message to advise lobby occupants to leave the lobby and clear the area for arriving firefighters.

An instructional message shall be sounded in the concourses connected to the building's lobby. It is the intent of this message to prevent new entries into the lobby by advising occupants not to attempt to enter the lobby of the affected building.

Provide selective paging to each individual floor (zone). In addition to the message/channels detailed above, a dedicated page channel shall be capable of simultaneously providing live voice instructions without interrupting any of the messages listed above shall be provided.

The notification appliance dedicated to sprinkler system water flow alarm shall not be silenced while the sprinkler system is flowing at a rate of flow equal to a single head.

Transmit signal to the building automation system.
Transmit signal to the central monitoring station with point identification.
Activate emergency shutdown for the following equipment:
All automatic events programmed to the alarm point shall be executed and the associated outputs activated.

1. Activation of elevator lobby or elevator equipment room smoke detectors shall initiate recall of the bank of elevators to the 1st floor and lockout the elevator controls. Activation of the first floor elevator lobby smoke detector shall recall shall be to an alternate floor, and lockout the elevator controls.
2. Activation of heat detectors in elevator shafts and machine rooms shall activate the elevator power shunt trip circuit breaker.

All stairwell/exit doors shall unlock throughout the building.
All self-closing fire/smoke doors held open shall be released.

1.4.2.3. Supervisory Operation
<The following representative tasks should be customized for each project>

Upon **supervisory activation** of any sprinkler valve supervisory switch, duct smoke detector, guest unit smoke detector, fire pump off-normal, elevator shunt trip supervision, the following functions shall automatically occur:
The internal supervisory event audible device shall sound at the control panel.
Display the event on the graphical workstation and display a pictorial image.
The LCD display shall indicate all applicable information associated with the supervisory condition including; zone, device type, device location and time/date.
All system activity/events shall be documented on the system printer and logged to system history.
Any remote or local annunciator LCD/LED's associated with the supervisory zone shall be illuminated.
Transmit signal to the central monitoring station with point identification.

Activated Guest Unit smoke detectors shall be displayed individually at the fire alarm control unit and remote annunciator as a supervisory events. Activation of a Guest Unit smoke detector shall not sound the general fire alarm, but shall sound an audible alarm within the Guest Unit at all audible detector bases.

1.4.2.4. Trouble Operation
The following representative tasks should be customized for each project

Upon activation of a **trouble condition** or signal from any device or internal system integrity monitoring function on the system, the following functions shall automatically occur:

The internal panel audible device shall sound at the control panel.
Display the event on the graphical workstation and display a pictorial image.
The LCD keypad display shall indicate all applicable information associated with the trouble condition including; zone, device type, device location and time/date.

Trouble conditions that have been restored to normal shall be automatically removed from the trouble display queue and not require operator intervention. This feature shall be software selectable and shall not prevent the logging of trouble events to the historical file.

All system activity/events shall be documented on the system printer and logged to system history.

Any remote or local annunciator LCD/LED's associated with the trouble zone shall be illuminated.

Transmit a trouble signal to the central monitoring station with point identification.

1.5. Quality Assurance

1.5.1. Qualifications of Supplier

The Fire Alarm System shall be provided by Beckwith Electronic Engineering Co. 210-699-6441 contact Chad Partee.

The system supplier shall have a minimum of 10 years of experience in distribution and service of the proposed equipment brand.

The supplier shall have successfully designed and installed similar system fire detection, evacuation voice and visual signaling control components on a previous project of comparable scope, size and complexity.

The supplier shall have in-house engineering and project management capability consistent with the requirements of this project.

The supplier shall employ qualified and manufacturer certified system designers to perform the detailed engineering design, system calculations, for all the system equipment and programming.

The supplier shall produce all panel and equipment drawings, submittals, and operating manuals, as detailed elsewhere in this specification.

The supplier shall be responsible for providing qualified on site representative(s) for coordination of system installation, and final system testing and commissioning in accordance with these specifications.

1.5.2. Qualifications of Installer

Before commencing work, submit evidence showing that the equipment installer has successfully installed systems of the similar scope, type and design as specified.

The contractor/installer shall be responsible for retaining qualified and authorized representative(s) of the system manufacturer (The Supplier) specified for detailed system design and documentation, coordination of system installation requirements, and final system testing and commissioning in accordance with these specifications.

The contractor/installer shall employ on staff a minimum of one NICET level III technician or a professional engineer, registered in the State of the installation.

Contractors unable to comply with the provisions of Qualification of Installers shall present proof of engaging the services of a subcontractor qualified to furnish the required services.

1.6. Submittals

1.6.1. Submittal General

A. The contractor shall not purchase any equipment for the specified system until the owner has approved the project submittals in their entirety and has returned them to the contractor.

B. Approved submittals allow the contractor to proceed with the installation and shall not be construed to mean that the contractor has satisfied the requirements of these specifications.

C. Each submittal shall include a detailed list of variations that the submittal may have from the requirements of the contract documents.

D. The contractor shall provide specific notation on each shop drawing, sample, data sheet, installation manual, etc. submitted for review and approval, of each variation.

E. Any conflicts in the contract documents and/or with Authority Having Jurisdiction (AHJ) requirements shall be submitted to the owner in writing 7 days prior to bid.

F. Submittals shall be approved by authorities having jurisdiction prior to submitting them to the Architect.

1.6.3. Product Data

System components proposed in this specification shall be UL listed to operate together as a system. The supplier shall provide evidence, with his submittal, of listings of all proposed equipment and combinations of equipment.

For each product submitted provide the following information:

1. Manufacturer's catalog data, to include material description, agency approvals, operating characteristics, electrical characteristics, dimensions, mounting requirements and accessories.

   Product data sheets for system components shall be highlighted to indicate the specific products, features, or functions required to meet this specification.

   Alternate or as-equal products submitted under this contract shall provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.

2. Manufacturer's product installation sheets: A copy of the documentation that is required to be shipped with all listed products by UL.

1.6.4. Design Calculations

Battery Capacity

Provide battery capacity calculations for each power supply that uses batteries for secondary power. Identify all loads. Identify any loads shed during alarm operation. Use the manufacturer's recommended methods and/or forms.

24 VDC Notification Appliance Circuits

For each 24VDC NAC, provide worst case voltage drop calculations. The load shall be treated as a lump sum at the end of the circuit. *Worst case power supply terminal voltage shall include all applicable internal power supply losses.* Using 85% of nominal circuit voltage (20.4VDC) shall not be accepted as lowest terminal voltage without manufacturer's published documentation stating there are no internal losses in the power supply.

Audio (Speaker) Notification Appliance Circuits - Interior

The system shall be designed for interior building audibility level of 15 dBA-fast over ambient condition and intelligibility. Intelligibility shall be designed to maintain Common Intelligibility Standard (CIS) rating of 0.7 or Sound Transmission Index of 0.5 in all areas designated on the drawings to have intelligible audio.

Provide dB loss calculations for all audio (speaker) notification appliance circuits. Circuits shall be designed for no more than 0.5 db loss based on lump-sum load method.

All areas required to meet intelligibility requirements shall be modeled in a recognized computer modeling program such as EASE by Renkus-Hienz. All modeling output data shall be part of the submittal.

High Power Speaker Arrays - Exterior

HPSAs shall be designed for an audibility level of 15 dBA-fast over ambient condition and intelligibility. Intelligibility shall be designed to maintain Common Intelligibility Standard (CIS) rating of 0.7 or Sound Transmission Index of 0.5 in outdoor areas during normal weather conditions. Intelligibility may be less than 0.7 CIS in areas of the zone if it can be determined that a voice signal is being broadcast and an individual could walk less than 164 feet to find a location in the zone with at least 0.7 CIS. Values of 0.65 through 0.74 shall be rounded to 0.7.

Fiber Optic Circuits

Provide optical fiber loss (budget) calculations per segment of optical fiber. Fiber loss per segment shall not exceed 80% of equipment manufacturer's permitted loss.

1.6.5. Shop Drawings

Submit for approval three (3) sets of shop drawings to the consulting engineer for review and comment. Drawings shall be either D-size or E-size blue line drawings and of a sufficient resolution to be completely read. Drawing sets shall be bound. Additional copies may be required at no additional cost to the project.

Contained in the title block of each drawing shall be symbol legends with device counts, wire tag legends, circuit schedules for all addressable and notification appliance circuits, the project name/address, and a drawing description which corresponds to that indicated in the drawing index on the coversheet drawing. A section of each drawing title block shall be reserved for revision numbers and notes.

Shop drawings shall meet the following requirements:

1. Shop drawings shall be prepared by persons with the following qualifications:
    a. Trained and certified by the manufacturer of the submitted equipment in fire-alarm system design.
    b. NICET-certified fire-alarm technician, Level <II or III or IV> minimum or <INSERT STATE> registered Professional Engineer.
2. **Coversheet** with project name, address and drawing index.
3. **General notes** drawing with peripheral device backbox size information, part numbers, device mounting height information, and the names, addresses, point of contact, and telephone numbers of all contract project team members.
4. Provide device **floor plans** for all areas served by the fire alarm system. <Utilize the CAD Files provided by the consulting engineer in the preparation of the floor plans.> Floor plans shall indicate accurate locations for all control and peripheral devices. Drawings shall be NO LESS THAN 1/8-INCH SCALE. If individual floors need to be segmented to accommodate the 1/8"

scale requirements, KEY PLANS and BREAK-LINES shall be provided on the plans in an orderly and professional manner.

- All addressable devices shall be shown. Coordinate the device address with the same device shown on the riser diagram.
- Identify all notification appliances with a circuit and item number. Coordinate the circuit and item number with the same device shown on the riser diagram.
- Show all raceways, marked for size, conductor count with type and size, showing the percentage of allowable National Electric Code fill used.
- Areas required to meet intelligibility requirements shall be clearly identified. Wide area mass notification system plot drawings shall identify all project areas that must meet intelligibility requirements as well as environmentally sensitive areas on or off of the project site where system output shall be minimized.

5. Device **riser diagram**, which individually depict all control panels, annunciators, addressable devices, and notification appliances. Shall include a specific, proposed device description above each addressable device. Shall include a specific, discrete device address that corresponds to addresses shown on the floor plans. Drawings shall provide wire specifications, and wire identification for all conductors depicted on the riser diagram. All circuits shall have identifiers that shall correspond with those required on the control panel and floor plan drawings. End-of-line resistors (and values) shall be depicted.

6. **Control panel drawing**(s) shall show internal component placement and all internal and field terminations. Provide details indicating where conduit connections shall be made to avoid conflicts with internally mounted batteries. For each additional fire alarm panel, a separate drawing which clearly indicated the panel designation, service and location of the control enclosure.

7. Provide typical **device wiring diagrams** that show all system components, and the respective field wiring. Wire type, gauge, and jacket shall be indicated. When an addressable module is used in multiple configurations for monitoring or controlling equipment, provide a drawing for each application. End-of-line resistors (and values) shall be shown.

8. Provide a fire alarm system **function matrix** that illustrates alarm input/out events in association with initiation devices. Matrix summary shall include system supervisory and trouble output functions.

9. **System Calculations** as detailed elsewhere in this specification.

Upon receipt of approved drawings from the Authority Having Jurisdiction, the supplier shall immediately forward two sets of drawings to the owner. These drawings shall either be stamped approved or a copy of the letter stating approval shall be included.

1.6.6. Closeout

Two (2) copies of the following documents shall be delivered to the building owner's representative at the time of system acceptance.

Project specific operating and maintenance manuals covering the system as installed. The manuals shall contain a description of the system architecture, inputs, notification signaling, auxiliary functions, annunciation, sequence of operations, expansion capability, application considerations and limitations. A generic instruction and operation manual shall not be acceptable.

Technical literature (manufacturer's data sheets and installation manuals/instructions) for all parts of the system, including control panels, smoke detectors, batteries, manual stations, alarm notification appliances, power supplies, and remote alarm transmission means.

Software and Firmware Operational Documentation:

THE END-USER SHALL RETAIN COMPLETE RIGHTS AND OWNERSHIP TO ALL SITE-SPECIFIC SOFTWARE RUNNING IN THE SYSTEM. The fire alarm equipment supplier shall provide hard and soft copies of the software database to the end-user at the end of the warranty period. The database provided shall be useable by any authorized and certified distributor of the product line, and shall include all applicable passwords necessary for total and unrestricted use and modification of the database.

Drawings

Provide “As Built” drawings of record of all the shop drawings used in the installation of the system.

Refer to the Submittals - Shop Drawings section of this specification for drawing requirements.

Record of Completion

System supplier and contractor shall provide a certified test report to verify that the system and all components functioned properly and as intended.

A filled out Record of Completion similar to NFPA 72, 2007 edition figure 4.5.2.1 shall be provided.

Warranty

Provide copies of the warranty documentation as detailed in the Warranty section of this specification.

Service Organization

Provide the name, address and telephone of the authorized factory representative.

Training

Conduct the required training as detailed in the Startup and Commissioning - Training section of this specification.

1.7. Handling

1.7.1. Delivery and Storage

Receiving

The Contractor shall be responsible for all receiving, handling, and storage of his materials at the job site.

Overnight storage of materials is limited to the assigned storage area. Materials brought to the work area shall be installed the same day, or returned to the assigned storage area unless previously approved by the Owner.

The Contractor shall remove rubbish and debris resulting from his work on a daily basis. Rubbish not removed by the Contractor will be removed by the Owner and back-charged to the Contractor.

1.8. Warranty

1.8.1. Installation Workmanship and Parts

The contractor shall warranty the installation and workmanship for one (1) year and all parts for thirty-six (36) months from date of final acceptance. A copy of the manufacturer's warranty shall be provided with closeout documentation and included with the operation and installation manuals. The full cost of maintenance, labor and materials required to correct any defect during the warranty period shall be included in the submittal bid.

During the warranty period, each year the contractor shall perform detector sensitivity testing and provide a report to the owner. If the system is UL Listed to perform automatic detector sensitivity testing without manual intervention, and if a detector falls outside of sensitivity window the system automatically indicates a devices trouble, then this requirement shall be waived. Documentation from UL shall be provided as proof of automatic sensitivity testing operation.

The system supplier shall maintain a service organization with adequate spare parts stock within 75 miles of the installation. Provide a telephone response to owner's questions within 4 hours and on-site assistance within 24 hours.

Permit the owner's fire alarm technicians to perform temporary bypasses and emergency repairs on the system without voiding the warranty.

1.9. Startup and Commissioning

1.9.1. Test and Inspection - Fire

A. Testing, general

1. In addition to tests required in this section, the contractor shall perform all electrical and mechanical tests required by the equipment manufacturer, the architect and the authority having jurisdiction.

2. The contractor shall perform all testing in occupied facilities at times of day that present the lowest impact and disruption to business and activities. Coordinate all testing in occupied buildings with the building owner's representative to assure that fire alarm system testing does not interrupt operations. This may require extensive after hours work to perform such testing.>

3. All equipment, instruments, tools and labor required to conduct the system tests shall be provided by the installing contractor. At a minimum, the following equipment shall be made available testing:

    a. Ladders and scaffolds as required to reach all installed equipment.

    b. Meters for reading voltage, current and resistance.

    c. Two-way communication devices

    d. Simulated smoke, heat-producing devices for heat detectors, extension poles for introducing smoke into detectors, as needed.

    e. Manufacturer's instruments to measure air flow through duct smoke detectors.

    f. Decibel meter.

g. Status and diagnostic software and PC.

B. All testing shall utilize a written acceptance test plan for testing the system components and operation in accordance with NFPA 72 and this specification. The contractor shall be responsible for the performance of the acceptance test plan, demonstrating the function of the system and verifying the correct operation of all system components, circuits, and system programming.

1. The systems operation matrix created by the equipment supplier shall be used to identify each alarm input and verify all associated output functions.

C. The system test plan shall include but not be limited to the following:

1. Visually inspect all wiring.

2. Verify the absence of unwanted voltages between circuit conductors and ground. The tests shall be accomplished at the preliminary test with results available at the final acceptance test.

3. System wiring shall be tested to demonstrate correct system response for the following conditions:

a. Open, shorted and grounded signal line circuits.

b. Open, shorted and grounded notification appliance circuits.

D. System indications shall be demonstrated as follows:

1. Correct message content for each alarm input at all system displays.
2. Correct annunciator light for each alarm input at each graphic display.
3. Correct history logging for all system activity.
4. Correct sensitivity for all smoke detection devices. The use of system generated sensitivity reports is acceptable in meeting this requirement.
   a. Correct signals sent to the Central Monitoring Station.

5. Notification appliances shall be demonstrated as follows:

a. All alarm notification appliances actuate as programmed

b. Audibility and visibility at required levels. Measure sound levels at 5 ft. above finished floor with the room doors closed.

c. For 24VDC NACS, measure and record the voltage at the most remote appliance on each notification appliance circuit, while operating.

6. System control functions shall be demonstrated as follows:

a. In accordance with the system operation matrix.

7. System off premises reporting functions shall be demonstrated as follows:

a. Correct information received for each alarm and trouble event

8. Secondary power supply (battery) capacity capabilities shall be demonstrated as follows:

a. System battery voltages and charging currents shall be measured and recorded at the fire alarm control panels.

b. System primary power shall be disconnected for <24 hours>. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period of <5 minutes>.

c. System primary power shall be restored for forty-eight (48) hours.

d. System battery voltages and charging currents shall again be measured and recorded at the fire alarm control panels.

9. Verify the "As Built" record drawings are accurate.

Preliminary Testing

Conduct preliminary tests to ensure that all devices and circuits are functioning properly. Tests shall meet the requirements of the written test plan. Correct any deficiencies, omissions or anomalies and retest the affected devices to assure proper function per the specification.

Acceptance Testing

1. A final acceptance test shall not be scheduled until the system manuals are provided to and approved by the owner and the following are provided at the job site:
(1) "As Built" record drawings of the system as actually installed
(2) A copy of the system operation matrix.

2. The acceptance inspector shall use the system "As Built" record drawings in combination with the system operation matrix and the written acceptance test plan during the testing to verify system operation.

3. Should the system not perform to the above criteria it shall not be accepted and the contractor shall correct all deficiencies and shall re-test the system at contractor's expense in the presence of the architect using the same test criteria.

4. The building owner's representative shall witness the final tests.

5. The central monitoring station and/or fire department shall be notified before final test in accordance with local requirements.

6. Operate every installed device to verify proper operation and correct annunciation at control panel.

7. Open signaling line circuits and notification appliance circuits in at least 2 locations to verify presence of supervision.

Test Reports

A "Fire Alarm System Record of Completion" per the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in shall be prepared by the Contractor. Submit three (3) copies to the Architect. The report shall include, but not be limited to:

A list of all equipment installed and wired.

Certification that all equipment is properly installed and functions and conforms with these specifications.

Sensitivity settings for each ionization and photoelectric detector as measured in place with the HVAC system operating.

Technician's name, certificate number and date.

1.9.2. Training

The system supplier shall schedule and present a minimum of eight (8) hours of formal site specific instruction for the building owner, detailing the proper operation and maintenance of the installed system.

The instruction shall be presented in an organized and professional manner by a person factory trained in the operation and maintenance of the equipment and who is also thoroughly familiar with the installation.

The instruction shall cover the schedule of maintenance required by NFPA 72 and any additional maintenance recommended by the system manufacturer.

Copies of all training aids, presentations, etc. shall be left with the owner.

1.10. Maintenance

1.10.1. Spare Parts

The contractor shall furnish the following extra material that matches the products installed. Spares shall be packaged with protective covering for storage and identified with labels describing contents.

Automatic detection devices - Two (2) percent of the installed quantity of each type, no less than one piece.

Manual fire alarm stations - Two (2) percent of the installed quantity of each type, no less than one piece..

Audible and visible devices - One (1) percent of the installed quantity of each type, but no less than two (2) devices.

Keys - A minimum of three (3) sets of keys shall be provided and appropriately identified.

2. Part 2 - Products

2.1. Acceptable Manufacturers

A. The manufacturer of the system equipment shall be regularly involved in the design, manufacture, and distribution of the products specified in this document. These processes shall be monitored under a quality assurance program that meets ISO 9000/9001 requirements.

B. The catalog numbers used are those of EDWARDS, a UTC Company or equal, and constitute the type and quality of equipment to be furnished. For a list of EDWARDS authorized fire alarm vendors, contact: edwardsmarketing@fs.utc.com.

C. If equipment of another manufacturer is to be submitted for approval as equal, the contractor shall, at the time of bid, list all exceptions taken to these specifications, all variances from these Specifications and all substitutions of operating capabilities or equipment called for in these specifications and forward said list to the engineer. Any such exceptions, variances or substitutions not listed at the time of bid and are subsequently identified in the submittal, shall be grounds for immediate disapproval without comment. Final determination of compliance with these specifications shall rest with the engineer, who, at his discretion, may require proof of performance.

D. Alternate product submissions shall provide proof of no less than three (3) factory authorized and certified manufacturer's distributors within 50 miles of the project job site. These distributors shall provide installation support, shall have a service organization capable of 24 hour emergency call service and SHALL HAVE BEEN CONTRACTED AND DELIVERED NO LESS THAN FIVE (5) SIMILIAR PROJECTS USING THE SUBMITTED PRODUCT OVER THE PAST YEAR. Alternate submissions without the required references shall be rejected.

E. Alternate product submissions based upon use of a product line considered proprietary in its distribution, design, application software, or ongoing maintenance and repair shall not acceptable. Proof of a product's non-proprietary nature shall be the burden of the contractor at the time of bid, and shall be in the form of written documentation. The determination of a product's compliance to this requirement shall be exclusively that of the engineer.

   All products used shall be of a single manufacturer. All products shall be listed by the manufacturer for their intended purpose. Submission of notification appliances, auxiliary relays, or documentation from other than a single manufacturer shall not be acceptable and will be grounds for immediate disapproval without comment.

F. Approved Products: All panels and peripheral devices shall be of the standard product of single manufacturer and shall display the manufacturer's name of each component. The catalog numbers specified under this section are those of EDWARDS, a UTC Company, and shall constitute the type, product quality, material and desired operating features.

2.2. Fire Alarm Panel

2.2.1. General - Fire

Overview

All materials, equipment, accessories, devices and other facilities and appurtenances covered by these specifications or noted on the drawings shall be new, best suited for the intended use and shall conform to applicable and recognized standards for their use, and supplied by a single manufacturer. Should any equipment provided under this specification be supplied by a different manufacturer, that equipment shall be recognized compatible by BOTH manufacturers and listed as such as required by Underwriters' Laboratories.

The fire alarm control panel(s) shall be a multi-processor based networked system designed specifically for fire, one-way and two-way emergency audio communications, and guard patrol applications. The control panel shall be listed and approved for the application standard(s) as listed in the References section of this specification.

The control panel shall include all required hardware, software and site specific system programming to provide a complete and operational system. The control panel(s) shall be designed such that interactions between any applications can be configured, and modified using software provided by the manufacturer.

The control panel(s) operational priority shall assure that life safety takes precedence among the activities coordinated by the control panel.

The operating controls shall be located in a dead-front steel enclosure behind a locked door with viewing window. All control modules shall be labeled, and all zone locations shall be identified. All panel modules shall be placement supervised for and signal a trouble if damaged or removed.

System Features

Each control panel shall include the following capabilities:

Supervision of the system electronics, wiring, detection devices and software
Up to 2500 analog/addressable input/output points
Network connections with up to 63 other control panels and annunciators.
Support multiple dialers (DACTs) and modems
Two communication ports
An internal audible signal with different patterns to distinguish between alarm, supervisory, trouble and monitor events
Support multiple 24 VDC and Audio NACs
User configurable switches and LED indicators to support auxiliary functions
Log up to 1740 chronological events
The ability to download all applications and firmware from the configuration computer at a single location on the fire network
A real-time clock for time stamps and timed event control
Electronic addressing of intelligent addressable devices
Provide an independent hardware watchdog to supervise software and CPU operation
"Dry" alarm, trouble and supervisory relay contacts
Control panel modules shall plug in to a chassis assembly for ease of maintenance
Field wiring shall connect to the panel using removable connectors

User Oriented Features

Each control panel shall include the following user oriented features:

An LCD user interface control/display that shall annunciate and control system functions.
Provide discreet system control switches for reset, alarm silence, panel silence, drill switch, previous message switch, next message switch and details.
A "lamp test" feature shall verify operation of all visual indicators on the panel.
An authorized user shall have the ability to operate or modify system functions including system time, date, passwords, holiday dates, restart the system and clear control panel event history file.
An authorized user shall have the ability to disable/enable devices, zones, actions, timers and sequences.
An authorized user shall have the ability to activate/restore outputs, actions, sequences, and simulate detector smoke levels.
An authorized user shall have the ability to enter time and date, reconfigure an external port for download programming, initiate programming and change passwords.

An authorized user shall have the ability to test the functions of the installed system.
Service groups shall facilitate one-man walk testing. Service/test groups shall be capable of being configured with any combination of addressable devices, independent of SLC wiring. It shall be possible to program alternate device responses when the device's service group is active. Devices not in an active service group shall process all events normally.

Provide internal system diagnostics and maintenance user interface controls to display/report the power, communication, and general status of specific panel components, detectors, and modules.

SLC loop controller diagnostics shall identify common alarm, trouble, ground fault, Class A fault, and map faults. Map faults include wire changes, device type changes by location, device additions/deletions and conventional open, short, and ground conditions. Ground faults on the supervised circuit wiring of remote addressable modules shall be identified by device address.

An authorized user shall have the ability to generate a report history for alarm, supervisory, monitor, trouble, smoke verification, watchdog, and restore activity.

System reports shall provide detailed description of the status of system parameters for corrective action or for preventative maintenance programs. Reports shall be displayed by the operator interface or capable of being printed on a printer.

An authorized user shall have the ability to display/report the condition of addressable analog detectors. Reports shall include device address, device type, percent obscuration, and maintenance indication. The maintenance indication shall provide the user with a measure of contamination of a device upon which cleaning decisions can be made.

Programmability

A Windows-based Configuration Utility (CU) shall be used to create the site-specific system programming. The utility shall facilitate programming of any input point to any output point. The utility shall allow customization of fundamental system operations using initiating events to start actions, timers, sequences and logical algorithms.

- Zoning of initiation devices.
- Initiation of events by time of day, day of week, day of year.
- Initiation of events by matrix groups (X-Y coordinate relationships) for releasing systems.
- Initiation of events using OR, AND, NOT and counting functions.
- Prioritizing system events.
- Programmable activation of detector sounder bases by detector, groups of bases, or all bases.
- Directing selected device messages to specific panel annunciators
- Detector sensitivity selection by time of day
- Support of 256 Central Monitoring Station accounts and directing selected device messages to any one of ten Central Monitoring Stations.

The configuration utility shall time and date stamp all changes to the site-specific program, and shall facilitate program versioning and shall store all previous program version data. The utility shall provide a compare feature to identify the differences between different versions of the site-specific program.

The configuration utility shall be capable of generating reports which detail the configurations of all fire alarm panels, addressable devices and their configuration settings including generating electrical maps of the addressable device SLCs.

The configuration utility shall support the use of bar code readers to expedite electronic addressing and custom programming functions.

Please refer to the *General, System Description Section* for this project's site-specific system operating requirements.

The fire alarm control panel shall be an EDWARDS 3-CPU3 and support components in an appropriately sized enclosure.

2.2.2. Power Supply

System power supply(s) shall be a high efficiency switched mode design providing multiple supervised power limited 24 VDC output circuits as required by the panel and external loads fed by the panel. Initial power supply loading shall not exceed 80% of power supply capacity in order to allow for future system expansion.

Each system power supply shall be individually supervised. Power supply trouble signals shall identify the specific supply and the nature of the trouble condition.

It shall be possible to parallel system power supplies to increase capacity or to provide redundant operation.

Upon failure of normal (AC) power, the affected portion(s) of the system shall automatically switch over to secondary power without losing any system functionality.

All system power supplies shall be capable of recharging their associated batteries, from a fully discharged condition to a capacity sufficient to allow the system to perform consistent with the requirements of this section, in 48 hours maximum.

All standby batteries shall be continuously monitored by the power supply. The power supply shall be able to perform an automatic load test of batteries and indicate a trouble condition if the batteries fall outside a predetermined range. Power supplies shall incorporate the ability to adjust the charge rate of batteries based on ambient temperatures. The power supply shall automatically disconnect the battery before low voltage damages the battery. Low battery and disconnection of battery power supply conditions shall immediately annunciated as battery trouble and identify the specific power supply(s) affected.

Batteries shall utilize sealed lead acid chemistry. Initial battery capacity shall provide 125% of calculated capacity requirements in order to allow for future system expansion.

All AC power connections shall be to the building's designated emergency electrical power circuit and shall meet the requirements of NFPA 70 and NFPA 72. The power circuit disconnect means shall be clearly labeled FIRE ALARM CIRCUIT CONTROL and shall have a red marking. The location of the circuit disconnect shall be labeled permanently inside the each control panel the disconnect serves.

The power supply shall be an EDWARDS 3-PPS/M series.

2.2.3. User Interface

2.2.3.1. Panel LCD and Common Controls

The system shall be designed and equipped to receive, monitor, and annunciate signals from devices and circuits installed throughout the facility.

Each fire alarm control panel (system node) shall be capable of supporting a backlit LCD display. The display on each system node shall be configurable to *display* the status of any and/or all combinations of all alarm, supervisory, trouble, monitor, or service group event messages on the network. Each LCD display on the system shall be capable of being programmed to allow *control* functions of any combination of nodes on the entire network. The system shall support both 168 character and 960 character LCD displays on the same network.

The LCD display shall provide separate alarm, trouble, supervisory, and monitor event queues of to minimize operator confusion. Receipt of alarm, trouble, and supervisory signals shall activate integral audible devices at the control panel(s) and at each remote annunciation device. The integral audible devices shall produce a sound output upon activation of not less than 85 dBA at 10 feet.

The LCD display shall contain the following system status indicators:

- System Power Indicator
- System Test Indicator
- System CPU Fail Indicator
- Ground Fault Indicator
- Disabled Points Indicator
- System Normal Indicator
- System Common Alarm Indicator
- System Common Trouble Indicator
- System Common Supervisory Indicator
- System Common Monitor Event Indicator

The LCD display shall contain the following system switch/indicators:

- System Reset Switch with Indicator
- System Alarm Silence Switch with Indicator
- System Panel Silence Switch with Indicator
- Drill Switch with Indicator
- Alarm Acknowledge Switch with Indicator
- Trouble Acknowledge Switch with Indicator
- Supervisory Acknowledge Switch with Indicator
- Monitor Acknowledge Switch with Indicator

The LCD display shall contain the following system function switches

- System Event Message Queue Scroll Switch.
- Event Details Switch (provides an additional 2000 character message about the device highlighted by the operator.)
- Command Menu Switch
- 10-Digit Keypad with Enter and Backspace switches

168 Character Backlit Liquid Crystal Text Display

The user interface shall provide a backlit LCD that will allow custom event messages of up to 42 characters. The interface shall provide a minimum of eight lines by 21 characters and provide the emergency user hands free viewing of the first and last highest priority events. The last highest priority event shall always display and update automatically. Events shall be automatically placed in one of four easy to access queues. It shall be possible to scroll through and view specific alarm, trouble, supervisory and monitor events separately. Having to scroll through a mixed list of event types shall not be considered as equal. The total number of active and disabled events by type shall be displayed. Visual indication shall be provided of any event type that has not been acknowledged or viewed. It shall be possible to customize the designation of all user interface LEDs and Switches for local language requirements.

Instructional text messages shall support a maximum of 2,000 characters each.

The system 168 character LCD display shall be an EDWARDS model 3-LCD.

2.2.3.2. LEDs and Switches

A modular series of switches and LED indicators shall be available to customize the fire alarm control panel operation in accordance with this specification. All LED and switch functions shall be software programmable. Switches shall be configurable for momentary, maintained, toggle, or "exclusive or" operation as required by the application. LEDs shall be configurable for slow flash, fast flash or steady operation. LED/Switch modules shall be capable of mounting in any available fire panel module position. All LED/Switch modules shall be supervised. LEDs shall be available in a variety of colors to facilitate identification from a distance. The LED/Switch modules shall provide ample room for custom function text labels under a protective membrane.

The LED/Switch modules shall be EDWARDS 3-24x series, 3-12xx series, and 3-6/3S1xxx series devices.

2.2.3.3. Audio Annunciation and Control

Provide a master one-way emergency audio control unit as part of the main fire alarm control panel. The emergency audio control shall contain a paging microphone and shall be capable of generating and delivering multi-channel audio messages simultaneously over copper and/or fiber media to remote parts of the facility.

All audio messages and live pages shall originate at the one-way audio control unit. The one-way audio control unit shall store up to 32 minutes of pre-recorded audio messages digitally as WAV files. These messages shall be automatically directed to various areas in a facility under program control. The unit shall have the capacity to store up to 200 individual audio messages and to simultaneously play back seven (7) different messages in addition to live page message.

During non-alarm conditions, the control unit shall continuously distribute a default audio message to all amplifiers, providing total audio path supervision. To enhance system survivability, each remote FACP cabinet containing an amplifier shall play the default audio message in the event of a fire AND a control network system failure.

The one-way emergency audio control shall provide control switches to direct live paging messages as follows:

- "All Call" to direct the page messages to all areas in the facility, overriding all other messages and tones.
- "Page to Evacuation Area" to direct the message to the evacuation area(s), overriding all other messages and tones.
- "Page to Alert Area" to direct page messages to the area(s) receiving the alert message and tones, overriding all other messages and tones.
- "Page to Balance Building" to direct page messages to the areas) in the facility NOT receiving either the evacuation area or alert area messages.
- "Page by Phone" switch to select the firefighter's telephone system as the paging source.

The system shall automatically deliver a preannounce tone of 1000 Hz for three seconds when the emergency operator presses the microphone PTT key. A 'ready to page' LED shall flash during the preannounce phase, and turn steady when the system is ready for the user's page delivery. The system shall include a page deactivation timer which activates for 3 seconds when the emergency user release the microphone talk key. Should the user subsequently press the microphone key during the deactivation period a page can be delivered immediately. Should the timer complete its cycle the system shall automatically restore emergency signaling and any subsequent paging will be preceded by the pre-announce tone. A VU display shall indicate voice level to the emergency operator.

The one-way audio control unit shall be capable of supporting up to 64 remote microphone inputs and a line level audio input.

The fire alarm control panels shall support remote cabinets with zoned amplifiers to receive, amplify and distribute messages through speakers over supervised circuits.

The master one-way emergency audio control unit shall be an EDWARDS 3-ASU.

2.2.3.5. Remote Microphone
Remote Microphone

Remote microphones shall be included as indicated on the drawings.

The remote microphone shall facilitate live page announcements over the ACU/FACP system from locations distant from the ACU/FACP. It shall be possible to connect up to 63 remote microphones to an ACU/FACP.

The remote microphone shall feature a Push-to-Talk switch; local and remote page active LEDs, and a trouble LED.

The remote microphone shall operate on filtered-regulated 24 VDC power derived from the panel power supply. Power shall be supplied directly from the ACU/FACP or listed auxiliary power supply, ensuring a reliable and monitored power source.

The remote microphone shall be an EDWARDS 3-REMIC series.

2.2.3.6. Reports
The system shall provide the operator with system reports that give detailed description of the status of system parameters for corrective action, or for preventative maintenance programs. The system shall provide these reports via the main LCD, and shall be capable of being printed on any system printer.

The system shall provide a report that gives a sensitivity listing of all detectors that have less than 80% environmental compensation remaining. The system shall provide a report that provides a sensitivity (% Obscuration per foot) listing of any particular detector.

When addressable CO detectors are installed, performing a “sensitivity” check from the panel shall report the approximate number months of sensor life remaining.

The system shall provide a report that gives a listing of the sensitivity of all of the detectors on any given panel in the system, or any given analog/addressable device loop within any given panel.

The system shall provide a report that gives a chronological listing of at least the last 1000 system events.

The system shall provide a listing of all of the firmware revision listings for all of the installed components in the system.

2.2.4. Signaling Line Circuits

2.2.4.1. Fire Network Wiring
The network inter panel wiring shall be Class B. The network media shall be copper except where fiber optic cable is specified on the drawings.

The system supplied under this specification shall utilize node to node, direct wired peer-to-peer network operations. The system shall utilize independently addressed, smoke detectors, heat detectors and input/output modules as described in this specification. The peer-to-peer network shall contain multiple nodes consisting of the command center, main controller, remote control panels, LCD/LED annunciation nodes, and workstations. Each node is an equal, active functional node of the network, which is capable of making all local decisions and generating network tasks to other nodes in the event of node failure or communications failure between nodes.

When a network is wired in a Class B configuration, a single break or short on the network wiring isolates the system into two groups of panels. Each group continues to function as a peer-to-peer network working with their combined databases. When wired using a Class A configuration, a single break or short on the network wiring causes the system to isolate the fault, and network communication continues uninterrupted, without any loss of function. Should multiple wiring faults occur, the network re-configures into many sub-networks and continues to respond to alarm events from every panel that can transmit and receive network messages.

The copper network interface shall be an EDWARDS 3-RS485 series.

2.2.4.2. EST3 System

The signaling line circuit connecting panels/nodes to intelligent addressable devices including, detectors, monitor modules, control modules, isolation modules, intrusion detection modules and notification circuit modules shall be Class B (style 4). All signaling line circuits shall be supervised and power limited.

When the addressable devices on a signaling line circuit cover more than one designated fire/smoke compartment, a wire-to-wire short on the circuit shall not affect the operation of the addressable devices in other fire/smoke compartments.

Each SLC shall support 125 addressable detector addresses and 125 module addresses. The SLC shall support 100% of all addressable devices in alarm and provide support for a 100% compliment of detector isolator bases. Initial circuit loading shall not exceed 80% in order to allow for future system expansion.

T-taps (branching) shall be permitted on Class B circuits. Where possible, the devices installed at the end of each branch should be easily accessible for troubleshooting, e.g. a pull station at normal mounting height.

The addressable device SLC module shall be UL Listed for use with code compliant, electrically sound existing wiring.

Each intelligent addressable device shall transmit information about its location with respect to other devices on the circuit. This information shall be used to create an “As-Built” wiring diagram as well as provide enhanced supervision of a device’s physical location. The device message and programmed system output function shall be associated with the device’s location on the SLC circuit location and not a device address.

The SLC module shall allow replacement of “same type” devices without the need to address and reload the “location” parameters on replacement device.

The SLC/Panels shall notify the user when programmed devices are detected on the SLC circuit. The SLC/Panels shall notify the user when the wrong device type is installed at a location configured for a different device type on the SLC circuit.

Should an SLC Controller CPU fail to communicate, the SLC circuit shall go into the stand-alone mode. The circuit shall be capable of producing a loop alarm if an alarm type device becomes active during stand-alone mode to enhance system integrity.

The addressable device signaling line circuit module shall be an EDWARDS 3-SDDC1 series.

2.2.5. Notification Appliance Circuits

2.2.5.1. Notification Appliance Circuits

General

All notification circuits shall be supervised and power limited. Non-power limited circuits are not acceptable. All notification appliance circuits shall be Class B (Style "Y").
Initial circuit loading shall not exceed 80% in order to allow for future system expansion.

24 VDC Notification Appliance circuits

Notification appliance circuits shall have a minimum circuit output rating of 2 amps @ 24 VDC

24VDC NACs shall be polarized and provide both strobe synchronization and a horn silence signals on a single pair of wires.

Audio Notification Appliance Circuits

Audio notification appliance circuits shall be polarized and have a minimum circuit output rating of 50 watts @ 25V audio, and 35 watts @ 70V audio.

2.2.5.2. Audio Amplifiers

Each audio power amplifier shall have integral audio signal de-multiplexers, allowing the amplifier to select any one of eight digitized audio channels as directed by system programming.

Audio amplifiers shall be power limited and protected from short circuits conditions on the audio circuit wiring. Each amplifier output shall provide a selectable 25/70 Vrms output, suitable for connection to emergency speakers.

To enhance system survivability in the event of a total loss of audio data communications, all amplifiers shall default to the local “EVAC” tone generator channel. If the local panel has an alarm condition, then all amplifiers will sound the EVAC message on their speaker circuits. In the event of a loss of the fully digitized, multiplexed audio riser data, the audio amplifiers shall automatically default to an internally generated alarm tone which shall sound a 3-3-3 temporal pattern.

<Provide a standby audio amplifier that shall automatically sense the failure of a primary amplifier, and automatically program themselves to select and de-multiplex the same audio information channel of the failed primary amplifier, and fully replace the function of the failed amplifier.>

Amplifiers shall also include a 24 VDC notification appliance circuit rated at 24Vdc @ 3.5A for connection of visible (strobe) appliances. This circuit shall be fully programmable.

Provide as minimum, one twenty (20) watt audio amplifier per paging zone. Initial amplifier loading shall not exceed 80% in order to allow for future system expansion. Calculations shall assume each speaker is connected at one (1) watt.

Audio amplifiers shall be EDWARDS 3-ZA series devices.

2.2.6. Initiating Device Circuits

2.2.6.1. Initiating Device Circuits
Conventional (2-wire) initiating device circuits monitoring manual fire alarm stations, smoke and heat detectors, waterflow switches, valve supervisory switches, fire pump functions, and air pressure supervisory switches shall be <Class A (Style "D" or "E")> < Class B (Style "A" or "B").>

Initiating device circuits monitoring magnetic security contacts, motion detectors, duress station, glass break and intrusion type devices shall be Class B (Style "A" or "B").

Initiating device circuits shall be configurable for latched or non-latched operation and configurable to initiate alarm, supervisory or monitor events.

End-of-line resistors for conventional initiating device circuits shall be covered with insulated tubing, terminated with ring lugs and display a UL label.

2.2.7. Off Premises Communications

2.2.7.1. DACT
The system shall provide off premises communications capability using a Digital Alarm Communications Transmitter (DACT) for sending system events to multiple Central Monitoring Station (CMS) receivers over conventional telephone lines.

The system shall provide the CMS(s) with point identification of system events using 4/2, Contact ID ID (SIA DC-05) or SIA DCS protocols.

The dialer shall support up to 255 individual accounts and to send account information to eight (8) different receivers, each having a primary and secondary telephone access number. System events shall be capable of being directed to one or more receivers depending on event type or location as specified by the system design.

In the event of a fire alarm panel CPU failure during a fire alarm condition, the DACT degrade mode shall transmit a general fire alarm signal to the CMS.

The owner shall arrange for two (2) dedicated loop-start phone lines to be terminated using two RJ31X jacks within 5 ft of the main fire alarm control panel.

The DACT shall be an EDWARDS 3-MODCOM.

2.3. Remote Booster Power Supply

2.3.1. Remote Booster Power Supply
Install Remote NAC Power Supplies (boosters) at the locations shown on the drawings, as required, to minimize NAC voltage drops. Remote NAC power supplies shall be treated as peripheral NAC devices and shall not be considered fire alarm control units.

The NAC power supplies shall be fully enclosed in a surface mounted steel enclosure with hinged door and cylinder lock, and finished in red enamel. Door keys shall be the identical to FACP enclosure keys. The enclosure shall have factory installed mounting brackets for additional UL listed fire alarm equipment within its cabinet. Enclosures shall be sized to allow ample space for interconnection of all

components and field wiring, and up to 10AH batteries. The enclosure shall have provisions for an optional tamper switch. All FACP addressable control modules required to initiate the required NAC power supply output functions shall be installed within the NAC power supply enclosure

Remote NAC power supply *input* circuits shall be configurable as Class B supervised inputs or for connection to any 6 to 45 VDC initiation source.

Remote booster power supplies shall provide four (4) synchronized Class B supervised or two (2) Class A, power limited, 24VDC filtered and regulated Notification Appliance Circuits (NACs). Each NAC output shall be configurable as a continuous 24Vdc auxiliary power output circuit. The booster power supply shall be capable of a total output of <6> 10 amps.

The power supply NACs shall be configurable to operate independently at any one of the following rates: continuous synchronized, or 3-3-3 temporal. It shall be possible to configure the NACs to follow the main FACP NAC or activate from intelligent addressable synchronized modules. All visible <audible> NACs within the facility shall be synchronized.

Upon failure of primary AC power, the remote power supply shall automatically switch over to secondary battery power without losing any system functions. It shall be possible to delay reporting of an AC power failure for up to 6 hours. All standby batteries shall be continuously monitored by the power supply. Low battery and disconnection of battery power supply conditions shall immediately annunciated as locally as battery trouble. All power supply trouble conditions (DC power failure, ground faults, low batteries, and IDC/NAC circuit faults) shall identify the specific remote power supply affected at the main FACP. All power supply trouble conditions except loss of AC power shall report immediately. Interconnecting NAC Booster power supplies in a manner which prevents identification of an individual power supply trouble shall not be considered as an equal.

The remote booster power supply shall be capable of recharging up to 24AH batteries to 70% capacity in 24 hours maximum. Batteries provided shall be sized to meet the same power supply performance requirements as the main FACP, as detailed elsewhere in this specification.

All AC power connections shall be to the building's designated dedicated emergency electrical power circuit. The power circuit disconnect means shall be clearly labeled FIRE ALARM CIRCUIT CONTROL and shall have a red marking. The location of the circuit disconnect shall be labeled permanently inside the each remote NAC power supply the disconnect serves.

The remote NAC power supplies shall be EDWARDS model BPS/APS series devices.

2.5. Peripheral Components

2.5.1. Addressable

2.5.1.1. Detectors

2.5.1.1.1. General

General Requirements for Intelligent Addressable Heat, Smoke and CO Detectors

Each detector shall contain an integral microprocessor which shall determine if the device is normal, in alarm, or has an internal trouble. The microprocessor’s non-volatile memory shall permanently store the detector’s serial number, device type and system address. It shall be possible

to address each intelligent device without the use of switches. Devices requiring switches for addressing shall not be considered as equal. Memory shall automatically be updated with the hours of operation, last maintenance date, number of alarms and troubles, time of last alarm, and analog signal patterns for each sensing element just before the last alarm.

Each detector shall be capable of identifying up to 32 diagnostic codes. This information shall be available for system maintenance. The diagnostic code shall be stored at the detector.

Each addressable detector on the Signaling Line Circuit (SLC) shall transmit information regarding its location with respect to other intelligent devices on the signaling line circuit to the control panel, creating an "As-Built" circuit map. The circuit mapping function shall provide location supervision of all intelligent devices on the signaling line circuit. An intelligent detector's programmed system response functions shall be associated with the detector's actual *location* on the signaling line circuit and *not with the detector's address*. After system commissioning, detectors improperly installed in the wrong location shall function according to the mapped programmed response for its *location* on the circuit, not its detector's address.

A status indicator shall be provided on each detector. Flashing green shall indicate normal operation; flashing RED shall indicate the alarm state. The indicator shall be visible from any direction.

The system shall allow for changing of detector types for service replacement purposes without the need to reprogram the system. The replacement detector type shall automatically continue to operate with the same programmed sensitivity levels and functions as the detector it replaced, without the need for reprogramming. System shall display an off-normal condition until the proper detector type is installed or a change in the device type profile has been made.

Detectors shall be rated for operation in the following environment unless specifically noted:

- Temperature: 32°F to 120°F (0°C to 49°C)
- Humidity: 0-93% RH, non-condensing

Detectors with addressing components in the base shall not be considered as equal.

The intelligent detectors shall be EDWARDS Signature Series devices.

Please refer to the *General, System Description* Section for site-specific detector operating requirements.

2.5.1.1.2. Duct Mounting Plate

Where addressable smoke detectors are directly mounted on a low velocity ducts up to 3 ft (0.91m) high x 3 ft (0.91m) wide, provide factory mounting plate assemblies to facilitate mounting the detectors. The mounting plate shall be code gauge steel with corrosion resistant red enamel finish. The detector mounting plate shall support an addressable detector along with a standard, relay or isolator detector mounting base.

The detector mounting plate shall be an EDWARDS SIGA-DMP.

2.5.1.1.3. Standard Base

Provide standard detector bases suitable for mounting on either North American 1-gang, 3½ or 4 inch octagon box and 4 inch square box, European BESA or 1-gang box.

The bases shall utilize a twist-lock design and provide screw terminals for all field wiring connections.

The base shall contain no active electronics and support all Signature series detector types.

The base shall be capable of supporting a Remote Alarm LED Indicator. Provide remote LED alarm indicators where shown on the plans.

Removal of the respective detector shall not affect communications with other detectors.

The standard addressable detector base shall be an EDWARDS SIGA-SB or SB4.

The remote LED indicator shall be an EDWARDS SIGA-LED

2.5.1.1.5. Sounder Base

Provide audible detector mounting bases suitable for mounting on a North American 1-gang, 3½ or 4 inch octagon box and 4 inch square box, or European BESA or 1-gang box; at the locations shown on the drawings.

The bases shall utilize a twist-lock design and provide screw terminals for all field wiring connections.

Removal of the respective detector shall not affect communications with other detectors.

The audible base shall support all detector types and shall be capable of single or group operation.

The audible base shall emit a temporal 3-3-3 fire alarm tone when smoke or heat has been detected. The audible base shall emit a temporal 4-4-4-4 CO alarm tone when CO has been detected. The outputs shall be configurable for low or high output by moving a reversible jumper. The system shall be UL2017 listed for dual signaling for this purpose.

The audible bases shall provide a UL-268 reverberant room sound output of 90.8 dBA at 10ft (3m) for temporal 3-3-3 fire alarm and 84.1 dBA at 10 ft.(3m) for temporal 4-4-4-4 CO alarm.

The detector sounder base shall be an EDWARDS SIGA-AB4GT.

2.5.1.2. Manual Stations

2.5.1.2.1. Single Action Two Stage

Provide addressable single action, two stage fire alarm stations at the locations shown on the drawings.

The manual station shall be suitable for mounting on North American 2 ½ (64mm) deep 1-gang boxes and 1 ½ (38mm) deep 4 square boxes with 1-gang covers. If indicated as surface mounted, provide manufacturer's surface back box.

The fire alarm station shall be of metal construction, shall be finished in red with silver "PULL IN CASE OF FIRE" lettering, shall show visible indication of operation and incorporate an internal toggle switch for first stage alarm and key switch for second stage alarm.

The manual pull station will have an addressable module integral to the unit.

Manual pull stations that initiated an alarm condition when opening the unit are not acceptable.

The addressable single action two stage manual fire alarm station shall be an EDWARDS SIGA-270P

2.5.1.2.2. Guards

Provide manual pull station guards at the locations shown on the drawings.

The guard shall consist of a factory-fabricated clear polycarbonate enclosure, hinged at the top. Lifting the cover shall provide access to the manual pull station and activate an integral battery powered audible horn intended to discourage false alarms.

The manual pull station guards shall EDWARDS STI-1000 Series.

2.5.1.3. Modules

2.5.1.3.1. General

Intelligent addressable multifunction modules shall be provided at the locations shown on the drawings to provide the specific system input and output functions described by the operation section and functional matrix found elsewhere in this specification.

The operation of multifunction modules shall be software configurable at the site to meet operational conditions, and may be changed at any time by download changes from the control panel. The intelligent multifunction modules shall utilize electronic addressing. Modules using rotary or DIP switches, memory chips and / or jumpers for addressing shall not be considered as equal.

Each intelligent multifunction module on the Signaling Line Circuit (SLC) shall transmit information regarding its location with respect to other intelligent devices on the signaling line circuit to the control panel, creating an "As-Built" circuit map. The circuit mapping function shall provide location supervision of all intelligent devices on the signaling line circuit. An intelligent device's programmed system response functions shall be associated with the device's actual *location* on the signaling line circuit and *not with the device's address*. After system commissioning, devices improperly installed in the wrong location shall function according to the mapped programmed response for its *location* on the circuit, not its device address.

All input /output status decisions shall be made by the microprocessor within the module. Communications with a control panel shall not be required in order for the module to identify off-normal input/output conditions. Modules with supervised input or output circuits shall be capable of identifying ground fault conditions down to the module address level.

Each module shall be equipped with two (2) diagnostic indicators; a green LED to confirm communications and a red LED to display active status. LEDs shall be visible through the finished cover plate. The module shall be capable of storing a unique serial number and up to 24 diagnostic codes, hours of operation, number of alarms and troubles, and time of last alarm in its memory which can be retrieved for troubleshooting.

Modules shall be rated for operation in the following environment:

- Temperature: 32°F to 120°F (0°C to 49°C)
- Humidity: 0-93% RH, non-condensing

Where multiple modules are mounted in close proximity to each other, plug-in modular versions of the modules and motherboards shall be available to minimize field wiring and facilitate troubleshooting.

The addressable multifunction modules shall EDWARDS Signature Series devices.

Please refer to the *General, System Description Section* for site-specific module operating requirements.

2.5.1.3.2. One Input Monitor
Provide addressable single input multifunction modules at the locations shown on the drawings.

The module shall be suitable for mounting on North American 2½" (64mm) deep 1-gang boxes and 1½" (38mm) deep 4" square boxes with 1-gang covers.

Each module shall provide one (1) supervised Class B input circuit configurable as one of the following "personalities."
1. Normally-Open Alarm Latching (for alarm initiation applications)
2. Normally-Open Alarm Delayed Latching (for waterflow switch applications)
3. Normally-Open Active Non-Latching (for limit switch and monitor applications)
4. Normally-Open Active Latching (for tamper switch and supervisory applications)

Each module shall identify and report by device address, ground faults and opens associated with its initiating device circuit, to the control panel. Single function modules or without individual ground fault detection identification capability shall not be considered as equal.

The Intelligent Single Input Module shall be an EDWARDS SIGA-CT1.

2.5.1.3.3. Two Input Monitor
Provide addressable dual input multifunction modules at the locations shown on the drawings.

The module shall be suitable for mounting on North American 2½" (64mm) deep 1-gang boxes and 1½" (38mm) deep 4" square boxes with 1-gang covers.

Each module shall provide two (2) supervised Class B input circuit configurable as one of the following "personalities."
1. Normally-Open Alarm Latching (for alarm initiation applications)
2. Normally-Open Alarm Delayed Latching (for waterflow switch applications)
3. Normally-Open Active Non-Latching (for limit switch and monitor applications)
4. Normally-Open Active Latching (for tamper switch and supervisory applications)

Each module shall identify and report by device address, ground faults and opens associated with its initiating device circuits, to the control panel. Single function modules or without individual ground fault detection identification capability shall not be considered as equal.

The Addressable Dual Input Module shall be an EDWARDS SIGA-CT2.

2.5.1.3.4. Notification Circuit
Provide addressable notification appliance circuit modules at the locations shown on the drawings.

The module shall be suitable for mounting in North American 2 ½" (64mm) deep 2-gang boxes and 1 ½" (38mm) deep 4" square boxes with 2-gang covers, or European 100mm square boxes.

The addressable NAC module shall provide one (1) supervised Class B notification appliance circuit.

The NAC control module shall be configurable for the following operations:
- 24 VDC synchronized NAC circuit, 2 amps @ 24 VDC.

- Audio notification circuit 25Vrms @ 50 watts or 70 Vrms @ 35 watts
- Firefighter's Telephone control with ring tone

The addressable notification appliance circuit module shall be an EDWARDS SIGA-CC1(S) or MCC1(S)

2.5.1.3.5. Relay

Provide addressable control relay modules at the locations shown on the drawings.

The module shall be suitable for mounting on a North American 2 ½" (64mm) deep 1-gang box or 1 ½" (38mm) deep 4" square box with 1-gang covers.

The module shall provide one (1) form C dry relay contacts rated at 24Vdc @ 2 amps (pilot duty) to control external appliances or equipment. The position of the relay contact shall be confirmed by the system firmware. The relay coil shall be magnetically latched to reduce wiring and ensure 100% of the relays on the SLC can be energized at same time.

The addressable control relay module shall be an EDWARDS SIGA-CR or MCR.

2.5.1.3.6. Waterflow-Tamper

Provide addressable dual input waterflow / tamper modules at the locations shown on the drawings.

The module shall be suitable for mounting on North American 2½" (64mm) deep 1-gang boxes and 1½" (38mm) deep 4" square boxes with 1-gang covers.

Each module shall provide two (2) supervised Class B input circuit configured as:

1. Normally-Open Alarm Delayed Latching for waterflow switch applications.
2. Normally-Open Active Latching for tamper switch and supervisory applications.

Each module shall identify and report by device address, ground faults and opens associated with its initiating device circuits, to the control panel. Modules or without individual ground fault detection identification capability shall not be considered as equal.

The Addressable Dual Input Module shall an EDWARDS SIGA-WTM.

2.5.1.3.8. Universal Modules

Provide intelligent universal Class A/B multifunction modules at the locations shown on the drawings.

The module shall be suitable for mounting on North American 2½" (64mm) deep 2-gang boxes and 1½" (38mm) deep 4" square boxes with 2-gang covers.

Each universal module shall be configurable as one of the following "personalities."

1. Two (2) supervised Class B Normally-Open Alarm Latching. (for alarm initiation applications)
2. Two (2) supervised Class B Normally-Open Alarm Delayed Latching. (for waterflow switch applications)
3. Two (2) supervised Class B Normally-Open Active Non-Latching. (for limit switch and monitor applications)
4. Two (2) supervised Class B Normally-Open Active Latching. (for tamper switch and supervisory applications)
5. One (1) form "C" dry relay contact rated at 2 amps @ 24 Vdc. (for circuit control applications)

6. One (1) supervised Class A Normally-Open Alarm Latching. . (for alarm initiation applications)
7. One (1) supervised Class A Normally-Open Alarm Delayed Latching. . (for waterflow switch applications)
8. One (1) supervised Class A Normally-Open Active Non-Latching. (for limit switch and monitor applications)
9. One (1) supervised Class A Normally-Open Active Latching. . (for tamper switch and supervisory applications)
10. One (1) supervised Class A 2-wire Smoke Alarm Non-Verified. (for alarm initiation applications)
11. One (1) supervised Class B 2-wire Smoke Alarm Non-Verified. (for alarm initiation applications)
12. One (1) supervised Class A 2-wire Smoke Alarm Verified (for alarm initiation applications)
13. One (1) supervised Class B 2-wire Smoke Alarm Verified(for alarm initiation applications)
14. One (1) supervised Class A Signal Circuit, 24Vdc @ 2A.(for occupant notification applications)
15. One (1) supervised Class B Signal Circuit, 24Vdc @ 2A. .(for occupant notification applications)

Each module shall identify and report ground faults, opens and shorts associated with its supervised input / output circuits, by device address, to the control panel. Single function modules or without individual ground fault detection identification capability shall not be considered as equal.

The Universal Class A/B Module shall an EDWARDS SIGA-UM.

2.5.1.3.9. Suppression System
Provide automatic extinguishing agent release interface modules at the locations shown on the drawings.

The releasing interface shall be UL listed for release of clean extinguishing agents as well as preaction sprinkler and deluge systems.

Each agent release interface shall provide two supervised agent release circuits for connection to agent release solenoid valves, supervised visual and audible pre-release notification appliance circuits, a supervised manual release circuit, and a supervised abort switch circuit. The solenoid release circuits shall be provided with manual disconnect switches for system maintenance.

The interface shall provide all required release and abort timing functions. The automatic discharge delay timer shall be adjustable from 0 to 60 seconds in 10 second increments. The manual discharge delay timer shall be adjustable from 0 to 30 seconds in 10 second increments. The abort delay timer shall be adjustable for 0 or 10 seconds.

The Suppression System Releasing Module shall be an EDWARDS SIGA-REL.

2.5.2. Notification Appliances

2.5.2.1. Low Profile

2.5.2.1.1. Low Frequency Audible Signals
The low-profile wall-mounted low frequency audible/strobe shall be listed to UL 1971 and UL 464 and for fire protective signaling service. The low frequency audible/strobe shall serve as a primary-signaling notification appliance and comply with the Americans with Disabilities Act requirements for visible

signaling appliances, flashing at 1Hz over the strobe lights entire operating voltage range. The strobe light shall have field-selectable candela settings including 15, 30, 75 and 110. The strobe light shall consist of a xenon flash tube.

The low frequency audible shall comply with UL 464, Section 24.3 for Low Frequency Audible Output. Appliances shall have an option to switch between a temporal three-pattern and a non-temporal (continuous) pattern at standard or low audible output levels. The low frequency audible on low frequency audible-only appliances shall be capable of operating on a coded notification appliance circuit.

The low frequency strobe shall operate between 32°F and 120°F and be listed to operate on filtered/regulated as well as full-wave rectified EDWARDS Genesis compatible notification appliance circuits.

Audiles, strobes and Audible/strobes shall all function on one pair of wires. Appliances that require separate wires for strobes and separate wires for audible are not acceptable.

All audible and visible signals on the same notification appliance circuit and in the same operating zone shall be fully synchronized to within 10 milliseconds.

The low frequency Audible strobe shall mount to a standard 4 × 4 × 1½-inch back box or appliance manufacturer provided surface-mount back box.

All notification appliances shall be 100 per cent compatible with EDWARDS Genesis communication and synchronization protocols. The low frequency Audible/strobe appliances shall be EDWARDS G4LF Series.

2.5.2.1.2. Strobes
Provide low profile wall mounted strobes at the locations shown on the drawings.

Low profile strobes shall mount in a North American 1-gang box, and protrude less than 1” from the finished wall. The word FIRE shall be prominently displayed on the housing.

The strobe output shall be switch selectable as required by its application from the following available settings: 15cd, 30cd, 75cd & 110cd. Selected strobe rating shall be visible when the strobe is in its installed position. Amber lens strobes shall be available with outputs of 12/24/60/88cd. Light shall be evenly distributed throughout the required volume using cavity and mask “FullLight” technology to prevent hot spots. Strobes using specular reflectors shall not be considered as equal.

When multiple strobes are installed within view of each other, their outputs shall be synchronized within ten (10) milliseconds of each other for an indefinite period without the need for separate synchronization modules.

Horn and strobe power, horn silencing, and strobe synchronization shall be accomplished over a single pair of wires. In and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.

The strobes shall be EDWARDS Genesis G1 Series.

2.5.2.1.3. Strobes-Weatherproof
Provide low profile weatherproof strobes at the locations shown on the drawings.

The weatherproof strobes shall mount in a North American 4" square 1 ½"deep electrical box for indoor applications and a factory supplied back box for weatherproof applications.

The strobe shall be suitable for wall or ceiling mount and operate in temperatures from -40 to 151 degrees F. The word FIRE shall be prominently displayed on the housing.

The strobe output shall be switch selectable as required by its application from the following available settings:

		Standard Candela Output Strobes				**High Candela Output Strobes**			
		Strobe Switch Position							
Listing	**Location**	**D**	**C**	**B**	**A**	**D**	**C**	**B**	**A**
UL 1971	Indoor	15 cd	29 cd	70 cd	87 cd	102 cd	123 cd	147 cd	161 cd
UL 1638	Outdoor (-35C)	6 cd	12 cd	28 cd	35 cd	41 cd	50 cd	60 cd	65 cd

Selected strobe rating shall be visible when the speaker-strobe is in its installed position

When multiple strobes are installed within view of each other, their outputs shall be synchronized within ten (10) milliseconds of each other for an indefinite period without the need for separate synchronization modules.

Horn and strobe power, horn silencing, and strobe synchronization shall be accomplished over a single pair of wires. In and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.

The weatherproof strobes shall be EDWARDS Genesis WG4 Series.

2.5.2.1.4. Speaker-Wall
Provide low profile wall mounted speakers at the locations shown on the drawings.

The low profile speakers shall mount in a North American 4" x 2 1/8" square electrical box, and protrude less than 1" from the finished wall. The word FIRE shall be prominently displayed on the housing.

The speaker output shall be switch selectable from the following available settings: 2W (90dBA), 1W (87dBA), 1/2W (84dBA), or 1/4W (81dBA) at 10 ft. when measured in reverberation room per UL-464. Frequency response shall be 400 to 4,000Hz. The selected speaker wattage shall be visible when the speaker is in its installed position.

The speaker shall provide in and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.

The low profile wall mounted speakers shall be an EDWARDS Genesis G4 series.

2.5.2.1.5. Speaker-Ceiling
Provide low profile ceiling mounted speaker at the locations shown on the drawings.

Speakers shall mount in a North American 4" x 2 1/8" square electrical box, or a 960A-4RF round flush box, and protrude less than 1.6" from the finished ceiling. The word FIRE shall be prominently displayed

on the housing.

The speaker output shall be switch selectable from the following available settings: 2W (91dBA), 1W (87dBA), 1/2W (84dBA), or 1/4W (80dBA) at 10 ft. when measured in reverberation room per UL-1480. Frequency response shall be 400 to 4,000Hz. The selected speaker wattage shall be visible when the speaker-strobe is in its installed position.

The speaker shall provide in and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.

The low profile ceiling mounted speaker shall be an EDWARDS Genesis GC series.

2.5.2.1.6. Speaker-Weatherproof
Provide low profile weatherproof speakers at the locations shown on the drawings.

The weatherproof speaker shall mount in a North American 4" square 1 ½"deep electrical box for indoor applications without a trim skirt and a and a 4" square 2 1/8"deep electrical box when used with a trim skirt. A factory supplied back box shall be supplied for weatherproof applications.

The speaker shall be suitable for wall or ceiling mount and operate in temperatures from -40 to 151 degrees F. The word FIRE shall be prominently displayed on the housing.

The speaker output shall be switch selectable from the following available settings:

Wattage	Switch Position	25Vrms	70Vrms
2W	T	90.0 dBA	89.7 dBA
1W	X	87.1 dBA	86.9 dBA
½ W	Y	84.0 dBA	83.9 dBA
¼ W	Z	80.8 dBA	80.8 dBA

Output is at 10 ft. when measured in reverberation room per UL-464. Frequency response shall be 400 to 4,000Hz. The selected speaker wattage shall be visible when the speaker-strobe is in its installed position.

The speaker shall provide in and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.

The weatherproof speaker shall be EDWARDS Genesis WG4 Series.

2.5.2.1.7. Speaker-Strobe-Wall
Provide low profile wall mounted speaker-strobes at the locations shown on the drawings.

The low profile speaker-strobes shall mount in a North American 4" x 2 1/8" square electrical box, without trims or extension rings, and protrude less than 1" from the finished wall. The word FIRE shall be prominently displayed on the housing.

The speaker output shall be switch selectable from the following available settings: 2W (90dBA), 1W (87dBA), 1/2W (84dBA), or 1/4W (81dBA) at 10 ft. when measured in reverberation room per UL-464.

Frequency response shall be 400 to 4,000Hz. The selected speaker wattage shall be visible when the speaker-strobe is in its installed position.

The strobe output shall be switch selectable as required by its application from the following available settings: 15cd, 30cd, 75cd & 110cd. Selected strobe rating shall be visible when the speaker-strobe is in its installed position. Amber lens strobes shall be available with outputs of 12/24/60/88cd. Light shall be evenly distributed throughout the required volume using cavity and mask "FullLight" technology to prevent hot spots. Strobes using specular reflectors shall not be considered as equal.

When multiple strobes are installed within view of each other, their outputs shall be synchronized within ten (10) milliseconds of each other for an indefinite period without the need for separate synchronization modules

Horn and strobe power, horn silencing, and strobe synchronization shall be accomplished over a single pair of wires. Both the speaker and strobe elements shall provide in and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.

The low profile wall mounted speaker-strobes shall be an EDWARDS G4 series.

2.5.2.1.8. Speaker-Strobe-Ceiling
Provide low profile ceiling mounted speaker-strobes at the locations shown on the drawings.

Speaker-strobes shall mount in a North American 4" x 2 1/8" square electrical box, or a 960A-4RF round flush box, and protrude less than 1.6" from the finished ceiling. The word FIRE <ALERT> shall be prominently displayed on the housing.

The speaker output shall be switch selectable from the following available settings: 2W (91dBA), 1W (87dBA), 1/2W (84dBA), or 1/4W (80dBA) at 10 ft. when measured in reverberation room per UL-1480. Frequency response shall be 400 to 4,000Hz. The selected speaker wattage shall be visible when the speaker-strobe is in its installed position.

The strobe output shall be switch selectable as required by its application from the following available settings: 15cd, 30cd, 75cd & 95cd or 95cd, 115cd, 150cd, &177cd. Selected strobe rating shall be visible when the speaker-strobe is in its installed position. Amber lens strobes shall be available with outputs of 13/26/65/82cd or 82/100/130/155cd.

When multiple strobes are installed within view of each other, their outputs shall be synchronized within ten (10) milliseconds of each other for an indefinite period without the need for separate synchronization modules

Strobe power and synchronization shall be accomplished over a single pair of wires. Both the speaker and strobe elements shall provide in and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.

The low profile ceiling mounted speaker-strobes shall be an EDWARDS Genesis GC series.

2.5.2.1.9. Speaker-Strobe-Weatherproof
Provide low profile weatherproof speaker-strobes at the locations shown on the drawings.

The weatherproof speaker-strobes shall mount in a North American 4" square 1 ½"deep electrical box for indoor applications without a trim skirt and a and a 4" square 2 1/8"deep electrical box when used with a trim skirt. A factory supplied back box shall be supplied for weatherproof applications.

The speaker-strobe shall be suitable for wall or ceiling mount and operate in temperatures from -40 to 151 degrees F. The word FIRE <ALERT> shall be prominently displayed on the housing.

The speaker output shall be switch selectable from the following available settings:

Wattage	**Switch Position**	**25Vrms**	**70Vrms**
2W	T	90.0 dBA	89.7 dBA
1W	X	87.1 dBA	86.9 dBA
½ W	Y	84.0 dBA	83.9 dBA
¼ W	Z	80.8 dBA	80.8 dBA

Output is at 10 ft. when measured in reverberation room per UL-464. Frequency response shall be 400 to 4,000Hz. The selected speaker wattage shall be visible when the speaker-strobe is in its installed position.

The strobe output shall be switch selectable as required by its application from the following available settings:

		Standard Candela Output Speaker-Strobes				**High Candela Output Speaker-Strobes**			
		Strobe Switch Position							
Listing	**Location**	**D**	**C**	**B**	**A**	**D**	**C**	**B**	**A**
UL 1971	Indoor, Clear lens	15 cd	29 cd	70 cd	87 cd	102 cd	123 cd	147 cd	161 cd
UL 1971	Indoor, Amber lens	13 cd	25 cd	59 cd	62 cd	84 cd	101 cd	125 cd	130 cd
UL 1638	Outdoor, Clear lens	6 cd	12 cd	28 cd	35 cd	41 cd	50 cd	60 cd	65 cd
UL 1638	Outdoor, Amber lens	5 cd	10 cd	24 cd	25 cd	34 cd	41 cd	51 cd	52 cd

Selected strobe rating shall be visible when the speaker-strobe is in its installed position

When multiple strobes are installed within view of each other, their outputs shall be synchronized within ten (10) milliseconds of each other for an indefinite period without the need for separate synchronization modules.

Horn and strobe power, horn silencing, and strobe synchronization shall be accomplished over a single pair of wires. Both the speaker and strobe elements shall provide in and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.

The weatherproof speaker-strobes shall be EDWARDS Genesis WG4 Series.

2.5.2.1.10. Speaker-Strobe 4in

Provide 4" <white> <red> speakers-strobes at the locations shown on the drawings. Speakers shall have a 4" mylar cone, paper cones are not acceptable. The rear of the speakers shall be completely sealed protecting the cone during and after installation. In and out screw terminals shall be provided for wiring. Speakers shall provide 1/4w, 1/2w, 1w, and 2w power taps for use with 25V or 70V systems. At the 2 watt setting, the speaker shall provide an 87 dBA sound output over a frequency range of 400-4000 Hz. when measured in reverberation room per UL-1480. Strobes shall provide synchronized flash. Strobe output shall be determined as required by its specific location and application from a family of 15/75cd, 30cd, & 110cd devices.

The 4" speaker-strobe shall be an EDWARDS 964 series.

2.5.2.1.11. Speaker-Strobe Ceiling 8in

Provide 8" <white> <red> ceiling mounted speaker-strobes at the locations shown on the drawings. In and out screw terminals shall be provided for wiring. Speaker baffles shall be round or square, steel with white finish as required. Provide square surface mount boxes with matching white finish as required. Speakers shall provide 1/2w, 1w, 2w, and 4W power taps for use with 25V or 70V systems. At the 4 watt setting, the speaker shall provide a 94 dBA sound output a frequency of 1000 Hz. when measured in an anechoic chamber at 10 ft. Strobes shall provide synchronized flash outputs. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 75cd, and 110cd devices.

The 8" Speaker-Strobe shall be an EDWARDS 964 series.

2.5.2.1.12. Speaker-Strobe Re-entrant

Provide 4" <white> <red> <surface> <flush> re-entrant speaker-strobes at the locations shown on the drawings. Weatherproof boxes shall be provided for outdoor mounting. Speakers shall provide 2w, 4w, 8w, and 15w power taps for use with 25V or 70V systems. The re-entrant speakers shall utilize a high efficiency compression drivers. Cone type drivers are not acceptable. At the 15 watt setting, the speaker shall provide a 102 dBA sound output over a frequency range of 400-4000 Hz. when measured in reverberation room per UL-1480. Strobes shall provide synchronized flash. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 75cd, & 110cd devices.

The re-entrant speaker-strobes shall be EDWARDS 757 series.

2.5.3. Accessories

2.5.3.1. Magnetic Door Holders

Provide floor mounted or wall mounted fail safe electromagnetic door holders as shown on the drawings.

Holders shall provide approximately 25-lbf nominal holding force when energized. The units shall have an aluminized finish and contain no moving parts. The contact plate shall have an integral nylon swivel to absorb shock and adjust to any door angle.

Flush and semi-flush models shall be designed for concealed wiring applications and shall mount on standard 1-gang electrical box. Floor mounted electromagnet units shall consist of a floor plate, gaskets, and housing. Incoming conduit shall connect directly into floor plate. The housing and gaskets shall mount on the floor plate to form a weatherproof junction box Door holders shall be listed to UL-228.

All holders shall be normally be energized, and a release shall be accomplished by interrupting the circuit.

The electromagnetic door holders shall be EDWARDS 1500 series.

2.5.3.2. Surge Suppression Devices

The system shall utilize the following electrical surge protection devices to prevent damage and nuisance alarms caused by nearby lightning strikes, stray currents, or voltage transients.

On the AC Input of all fire alarm panels, remote power supplies and HPSA sites: Transtector ACO100BWN3, Leviton OEM-120EFI, EFI HWM-120, Ditek DTK-120HW or DTK-120/240 CM. ***AC Surge protectors shall be installed at the electrical panel board feeding the fire alarm equipment***. Excess lead length shall be trimmed. The branch circuit conductor shall be formed into a 5-10 turn 1" diameter tie-wrapped coil just downstream of the suppressor connection.

On each DC fire alarm circuit entering or leaving the building: Transtector TSP8601, Citel American B280 -24V, Edco P264 and P642, Ditek DTKxLVL series, or equal.

DC Surge protectors shall be installed on each required circuit at the point of entry into the building.

2.5.3.3. Inspection Bar Codes

A. Inspection bar codes shall be installed on all initiating devices, addressable modules, annunciators, control panels and power supplies.

B. Inspection bar codes used by the system must utilize Code 3 of 9 or other approved format, and contain a minimum of eight (8) digits that comprise a unique serial identifier within the Web-based Reporting System. There shall be no duplication of device ID numbers. The ID number shall be printed below the bar code for identification purposes.

C. Inspection bar codes shall be limited in size to no more than 2" (5cm) in width, and 3/8" (2 cm), in height and shall include a Mylar® or other protective coating to protect the bar code from fading due to sunlight or exposure.

D. Inspection bar codes shall be installed on each device in such a manner as to require that scanning of the bar code take place no further than 12" from the device during inspection.

3. Part 3 - Execution

3.1. Installation

3.1.1. General

General

A. The entire system shall be installed in a skillful manner in accordance with approved manufacturer's installation manuals, shop drawings and wiring diagrams.

B. All work shall be performed in accordance with the requirements of NFPA 70 and NFPA 72.

C. Coordinate locations of all devices with all other divisions' drawings and specifications.

D. All fire alarm devices shall be accessible for periodic maintenance. Should a device location indicated on the contract drawings not meet this requirement, it shall be the responsibility of the installing contractor to bring it, in writing, to the attention of the Project Engineer.

E. Fasten equipment to structural members of building or metal supports attached to structure, or to concrete surfaces.

F. All systems and system components listed to UL864 Control Units for Fire Protective Signaling Systems maybe installed within a common conduit raceway system, in accordance with the manufacture's recommendations. System(s) or system components not listed to the UL864 standard shall utilize a separate conduit raceway system for each of the sub-systems.

G. No wiring except life safety system circuits and system power supply circuits shall be permitted in the control panel enclosures.

H. Any low-voltage copper wiring that leaves the protection of a building shall be provided with a compatible UL 497B listed transient protection devices where the circuit leaves the building and where it enters the next building.

I. Devices containing end-of-line resistors shall be appropriately labeled. Devices should be labeled such that removal of the device is not required to identify the EOL device.

J. Fiber Optic Cable
   1. Only glass filament cable permitted. Plastic filament fiber optic cables are not acceptable.
   2. ST connectors shall be used at all equipment terminations.

K. Concrete floors shall be X-rayed prior to core drilling on post tension slabs. Verify with engineer on type of slab prior to bid.

3.1.2. Electrical

Electrical

1.01 BOXES, ENCLOSURES AND WIRING DEVICES

A. Boxes shall be installed plumb and firmly in position.

B. Extension rings with blank covers shall be installed on junction boxes where required.

C. Junction boxes served by concealed conduit shall be flush mounted.

D. Fire alarm system junction box covers shall be painted red.

E. Wiring within cabinets, enclosures, boxes, junction boxes and fittings shall be installed in a neat and workmanlike manner, installed parallel with or at right angles to the sides and back of any box, enclosure or cabinet, and routed to allow access for maintenance. All conductors that are terminated, spliced, or otherwise interrupted in any enclosure, cabinet, mounting or junction box shall be connected to terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. Make all connections with approved pressure type terminal

blocks, which are securely mounted. All terminal block screws shall have pressure wire connectors of the self-lifting or box lug type. No more than two conductors shall be installed under one connection. Wire nuts, crimp splices and similar devices shall not be used.

1.02 CONDUCTORS

A. Each conductor shall be identified as shown on the drawings at terminal points. Permanent wire markers shall be located within 2 inches of the wire termination. Marker text shall be visible with protective doors or covers removed.

B. Maintain a consistent color code for fire alarm system conductor functions throughout the installation.

C. All wiring shall be installed in compliance with the National Electric Code, NFPA 70, and the equipment manufacturer's requirements.

Wiring for Signaling Line Circuit and Initiating Device Circuit field wiring shall be solid copper, No. 18 AWG twisted pair conductors at a minimum. Speaker circuits; 16 AWG twisted pair at a minimum. Telephone circuits shall be 18 AWG twisted-shielded pair at a minimum. 24VDC visual and audible Notification Appliance Circuits shall be solid copper No. 14 AWG size conductors at a minimum. The wiring sizes listed herein are minimum sizes. Use larger wire sizes when recommended by the manufacturer, based on system configuration and project specific calculations.

Where shielded wiring is used, the shield shall be grounded at only one point, which shall be in or adjacent to the FACP or other control equipment. Shields shall be continuous, treated as a third conductor, and insulated from ground except as noted.

T-taps (branches) are permitted in Style 4 SLC circuits with interconnections occurring on terminal strips.

Circuits to third-party systems (HVAC, Elevators, fire pumps, etc.) shall terminate in terminal cabinets within three (3) feet of the controllers for those systems.
AC power wiring shall be No. 12 AWG solid copper having insulation rated for 600 volts.

Crimp type spade lugs shall be used for terminations of stranded conductors to binder screws or stud type terminals.

D. All wiring shall be checked and tested to insure that there are no grounds, opens or shorts.

1.03 DEVICES

A. All devices and appliances shall be mounted to or in an approved electrical box.

1.04 Raceways

A. Conduits shall be sized according to the conductors contained therein. Cross sectional area percentage fill for system conduits shall not exceed 40%.

B. Install all conductors in rigid metal conduit or electro-metallic tubing, utilizing compression type fittings and couplings, with a minimum diameter 3/4". The use of flexible metal conduit not exceeding a six (6) foot length shall be permitted for initiating device circuits.

C. All fire alarm conduit systems shall be routed and installed to minimize the potential for physical, mechanical or fire damage, and shall not to interfere with existing building systems, facilities or equipment.

D. Run conduit or tubing concealed in finished areas unless specifically shown otherwise on the drawings. Conduit may be exposed in unfinished mechanical/electrical rooms, and basement levels.

E. All system conduits, junction boxes, pull boxes, terminal cabinets, electrical enclosures and device back box locations shall be readily accessible for inspection, testing, service and maintenance.

1.05 Open cable

A. Power Limited cable, when not installed in UL listed metal conduit or raceway, shall be mechanically protected by building construction features par NFPA 70, Article 760.
   1. Installation shall be in areas not subjected to mechanical injury.
   2. All circuits shall be supported by the building structure. Cable shall be attached by straps or bridal rings to the building structure at intervals not greater than 10 feet. The use of staples is prohibited. Fire alarm wiring shall not be bundled or strapped to existing conduit, pipe or wire in the facility.
   3. Where wiring is installed above drop ceilings, cable shall not be laid on ceiling tiles.
   4. Cable shall not be fastened in a manner that puts tension on the cable.

B. Power Limited Cable shall be FPLP, FPLR or FPL, or permitted substitute.

3.1.3. FA Components

FA Components

1.01 DEVICES

1. All devices and appliances shall be mounted to or in an approved electrical box.

2. All wall mounted *control equipment* shall comply with requirements defined by the International Building Code and Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems (AC-156) using a seismic component importance factor of 1.5.

A. Fire Alarm Control Panels

   a. Mount the enclosure with the top of the cabinet 72” above the finished floor or center the cabinet at 63”, whichever is lower.
   b. Label the fire alarm panels with the room number, electrical panel number and circuit breaker number feeding them.
   c. Paint the handles of the dedicated circuit breakers feeding fire alarm panels red, and install handle locks.
   d. Within the panel, all non-power limited wiring must be properly separated from power limited circuits.

e. Grounds shall comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

B. Remote Annunciator
   a. Mount the panel; with the top of the panel 72" above the finished floor or center the panel at 63", whichever is lower.

C. Remote power supplies and auxiliary fire alarm panels
   a. Locate the panel or cabinet with the top of the panel 72" above the finished floor or center the panel at 63", whichever is lower.
   b. Do not locate these panels above ceilings or where inaccessible by a person standing on the finished floor of the space.
   c. Label the power supplies and auxiliary FACPs with the room number, electrical panel number and circuit breaker number feeding them.
   d. Paint the handles of the dedicated circuit breakers feeding fire alarm panels red, and install handle locks.
   e. Within the panel, all non-power limited wiring must be properly separated from power limited circuits.

D. Manual Pull Stations
   a. Mount stations so that their operating handles are between 42" and 48" above the finished floor.

E. Notification Appliances: Mount assemblies as follows:
   a. All wall mounted audio/visual devices shall be mounted so the entire lens is between 80" and 96" above the finished floor. Where low ceilings exist, devices shall be mounted within 6" of the ceiling.
   b. Each speaker's (horn) output shall be set to the wattage value indicated for its specific location as shown on the drawings.
   c. Each strobe's output shall be set to the candela value indicated for its specific location as shown on the drawings.
   d. Each speaker (horn)-strobe's outputs shall be set to the wattage/candela value indicated for its specific location as shown on the drawings.
   e. Where ceiling height exceeds 30 feet, appliances shall be suspended from the ceiling to a height of 30 feet maximum above the finished floor.
   f. Appliances installed outdoors shall be UL listed for outdoor use.

F. Smoke Detectors:
   b. Smoke and heat detector **heads** shall not be installed until after construction clean-up is completed. Detector **heads** installed prior to construction clean-up shall be cleaned by the manufacturer or replaced.
   c. Detectors located on the wall shall have the top of the detector at least 4" and not more than 12" below the ceiling.
   d. On smooth ceilings, detectors shall not be installed over 30 ft. apart in any direction.
   e. Install smoke detectors no closer than 3 ft. from air handling supply air diffusers or return air openings.
   f. Locate detectors no closer than 12" from any part of a lighting fixture.

G. Duct Smoke Detectors:
   a. Install sampling tubes so they extend the full width of ducts exceeding 36".
   b. Detectors shall be located to facilitate ease of maintenance.
   c. All penetrations near detectors located on/in return ducts shall be sealed to prevent air entry.

H. End-of-Line Resistors
   a. Devices containing end-of-line resistors shall be appropriately labeled.

I. Remote Status and Alarm Indicators:

a. Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

J. CO Detectors
   a. Ceiling mounted CO detectors should be kept 12” from sidewalls.
   b. Wall mounted CO detectors should be at least 48” above the finished floor, but less than 6” from the ceiling.
   c. Locate at least 60” from fuel burning appliances.
   d. Install CO detectors no closer than 3 ft. from air handling supply air diffusers or return air openings.

K. Heat Detectors
   a. Heat detectors shall be installed in strict accordance with their UL listing and the requirements of NFPA 72.
   b. Heat detectors installed in the elevator machinery room to meet ANSI A17.1 requirements for elevator power disconnect, shall be located adjacent to each sprinkler head. Coordinate temperature rating and location with sprinkler rating and location.

L. Addressable Control (relay) Modules
   a. Install the module less than 3 feet from the device controlled.
   b. Orient the device mounting for best maintenance access.
   c. Label all addressable control modules as to their function.
   d. Provide a dedicated 24VDC circuit to feed all auxiliary relays required for inductive loads (auxiliary relays, door holders). Circuits shall be supervised via an end-of-line relay and addressable input module. Auxiliary relays shall not derive their power from the starter or load being controlled.

END OF SECTION 28 31 00.03

SECTION 329200

TURF AND GRASSES

PART 1 - GENERAL

1.1 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

1.2 SUBMITTALS

A. In accordance with the requirements of Section 016100, submit a complete listing of all manufacturers, products, model numbers, and designs proposed for use in the Work of this Section.

B. Maintain two copies of all shop drawings, product data, and samples, manufacturer's specifications, recommendations, installation instructions, and maintenance data at the Project Site.
   1. At Project Closeout, turn over both copies to the Landscape Architect who will transmit one copy to the Owner.

C. Submit only the items listed below to the Landscape Architect for review in accordance with Conditions of the Contract and Division Zero One sections.

D. Product Data: For each type of product indicated.

E. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

   1. Certification of each seed mixture for turfgrass sod, identifying source, including name and telephone number of supplier.

F. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer.

G. Qualification Data: For landscape Installer.

H. Material Test Reports: For existing surface soil and imported topsoil.

I. Planting Schedule: Indicating anticipated planting dates for each type of planting.

J. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of lawns during a calendar year. Submit before expiration of required maintenance periods.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment.
   1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
   1. Report suitability of topsoil for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.4 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in TPI's "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in its "Guideline Specifications to Turfgrass Sodding."

1.5 SCHEDULING

A. Planting Restrictions: Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.6 LAWN MAINTENANCE

A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
   1. Seeded Lawns: **90** days from date of Substantial Completion.
      a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.

B. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
   1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.

C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches.
   1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
   2. Water lawn at a minimum rate of 1 inch per week.

D. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 40 percent of grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
   1. Mow grass 5” to 9”.

E. Lawn Post fertilization: Apply fertilizer after initial mowing and when grass is dry.
   1. Use fertilizer as required based on soils test.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 1 percent weed seed:
   1. Bermuda Seed: Bermuda seed shall be common Bermuda (Cynodon dactylon). The seed rate shall be as recommended by the hydroseed provider.

2.2 TOPSOIL

A. Topsoil: ASTM D 5268,; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.
   1. Topsoil: A quantity of topsoil of sufficient quantity and quality to be utilized for the work shall be secured from an approved, local, off-site location. This soil may be mixed with amendments as required for planting or topsoil. The soil shall be fertile, friable, natural loam containing a liberal amount of humus and shall be capable of sustaining vigorous plant growth. It shall be free of subsoil, brush, litter, objectionable weeds, clods, shale, stones 1" or larger, stumps, roots, or other material harmful to grading, planting, plant growth, or maintenance operations.

      a. Presence of vegetative parts of Bermuda grass, Johnson grass, Nutgrass (Cyperus rotundus), and other hard to eradicate weed or grass will be cause for rejection of topsoil.

b. Under no circumstances, will topsoil be accepted, unless it is free of the aforementioned contaminants. Contractor may use approved means of treating the topsoil to ensure its acceptability. The natural organic content by oven dry weight as measured by the "wet digestion" method shall not be less than 1.5%. The pH of the topsoil shall not exceed 7.8. Sand content shall not exceed 50%, oven dry weight. Soil tests shall be run prior to topsoil sample approval and at Landscape Architect's discretion throughout topsoil installation. Tests shall be done at Contractor's expense, and results will suffice for fertilizer requirements.

c. Topsoil not meeting these requirements will not be accepted.

2.3 INORGANIC SOIL AMENDMENTS

A. Sulfur: shall be commercial floured.

B. Sand: Clean, washed, natural Poteet sharp, red sand or approved equal.

2.4 PLANTING ACCESSORIES

A. Selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application.

2.5 FERTILIZER

A. Commercial fertilizer shall be a complete organic fertilizer, part of the element of which is derived from organic sources. It shall be the type percentages and applied at the rate specified in the soil analysis. All fertilizer must conform to all applicable state fertilizer laws and is to be delivered in original, unopened containers, each bearing the manufacturer's guaranteed analysis, and must be uniform in composition, dry, and free flowing. Any fertilizer that becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted.

1. Fertilizer for ground covers and turf shall be complete fertilizer with nitrogen-phosphorus-potash (NPK) analysis of 10-20-10 with 10% sulphur and 7% iron to be used in all planting areas and precast planters. Fertilizer for trees and shrubs shall be in the form of 21 gram, slow-release tablets with a NPK analysis of 20-10-5.

2.6 MULCHES

A. Mulch: Mulching material shall meet the requirements of Q-P-166e, Class B coarseness classification, horticultural grade, from a source to be approved by the Landscape Architect in advance of delivery, and shall be free of sticks, stones, clay, or other foreign materials. Bark shall be in nuggets of 1" - 1/2" graded coarse size.

2.7 EROSION-CONTROL MATERIALS

A. Erosion-Control Materials: As shown on plans.

2.8 PLANTING SOIL MIX

1. Planting Soil Mix: Mix topsoil with soil amendments as determined from soil testing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding overspray.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 GRASS PREPARATION

A. Limit grass subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches. Remove stones larger than **1 inch** in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.

    a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.

2. Spread planting soil mix to a depth of 5 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

    a. Spread approximately one-half the thickness of planting soil mix over loosened subgrade. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil mix.
    b. Reduce elevation of planting soil to allow for soil thickness of sod.
    c. Hold elevation of sod or seeded areas down 1-1/2” from top of adjacent curbs or paving.

C. Unchanged Subgrades: If lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare surface soil as follows:

1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
2. Loosen surface soil to a depth of at least of 5 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.

3. Remove stones larger than 1 inch in any dimension and sticks, roots, trash, and other extraneous matter.

4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.

E. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

3.4 HYDROSEEDING

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with seed provider recommended tackifier.
2. Apply slurry uniformly to all areas to be seeded. Apply mulch at a minimum rate required to obtain specified seed-sowing rate.
3. Use a bonded fiber matrix with tackifier on all slopes greater than 5 to 1 ratio.

3.5 SATISFACTORY LAWNS

A. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.

B. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.6 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.

C. Remove erosion-control measures after grass establishment period.

END OF SECTION 329200

ATTACHMENT B
HUD Form Forms and
Conflict of Interest Questionnaire
Form 1295 Certificate of Interested Parties

*(Form 1295 is to be completed online by the ***Selected Respondent*** and submitted to the Texas Ethics Commission pursuant to Government Code 2252.908 and a copy returned to SAHA with the Certification prior to contract execution. A copy of the 1295 Form is included herein for information purposes only).*

U.S. Department of Housing and Urban Development

Office of Public and Indian Housing

Instructions to Bidders for Contracts Public and Indian Housing Programs

Instructions to Bidders for Contracts

Public and Indian Housing Programs

Table of Contents

1. Bid Preparation and Submission

(a) Bidders are expected to examine the specifications, drawings, all instructions, and, if applicable, the construction site (see also the contract clause entitled **Site Investigation and Conditions Affecting the Work** of the *General Conditions of the Contract for Construction*). Failure to do so will be at the bidders' risk.

(b) All bids must be submitted on the forms provided by the Public Housing Agency/Indian Housing Authority (PHA/IHA). Bidders shall furnish all the information required by the solicitation. Bids must be signed and the bidder's name typed or printed on the bid sheet and each continuation sheet which requires the entry of information by the bidder. Erasures or other changes must be initialed by the person signing the bid. Bids signed by an agent shall be accompanied by evidence of that agent's authority. (Bidders should retain a copy of their bid for their records.)

(c) Bidders must submit as part of their bid a completed form HUD-5369-A, "Representations, Certifications, and Other Statements of Bidders."

(d) All bid documents shall be sealed in an envelope which shall be clearly marked with the words "Bid Documents," the Invitation for Bids (IFB) number, any project or other identifying number, the bidder's name, and the date and time for receipt of bids.

(e) If this solicitation requires bidding on all items, failure to do so will disqualify the bid. If bidding on all items is not required, bidders should insert the words "No Bid" in the space provided for any item on which no price is submitted.

(f) Unless expressly authorized elsewhere in this solicitation, alternate bids will not be considered.

(g) Unless expressly authorized elsewhere in this solicitation, bids submitted by telegraph or facsimile (fax) machines will not be considered.

(h) If the proposed contract is for a Mutual Help project (as described in 24 CFR Part 905, Subpart E) that involves Mutual Help contributions of work, material, or equipment, supplemental information regarding the bid advertisement is provided as an attachment to this solicitation.

2. Explanations and Interpretations to Prospective Bidders

(a) Any prospective bidder desiring an explanation or interpretation of the solicitation, specifications, drawings, etc., must request it at least 7 days before the scheduled time for bid opening. Requests may be oral or written. Oral requests must be confirmed in writing. The only oral clarifications that will be provided will be those clearly related to solicitation procedures, i.e., not substantive technical information. No other oral explanation or interpretation will be provided. Any information given a prospective bidder concerning this solicitation will be furnished promptly to all other prospective bidders as a written amendment to the solicitation, if that information is necessary in submitting bids, or if the lack of it would be prejudicial to other prospective bidders.

(b) Any information obtained by, or provided to, a bidder other than by formal amendment to the solicitation shall not constitute a change to the solicitation.

3. Amendments to Invitations for Bids

(a) If this solicitation is amended, then all terms and conditions which are not modified remain unchanged.

(b) Bidders shall acknowledge receipt of any amendment to this solicitation (1) by signing and returning the amendment, (2) by identifying the amendment number and date on the bid form, or (3) by letter, telegram, or facsimile, if those methods are authorized in the solicitation. The PHA/IHA must receive acknowledgement by the time and at the place specified for receipt of bids. Bids which fail to acknowledge the bidder's receipt of any amendment will result in the rejection of the bid if the amendment(s) contained information which substantively changed the PHA's/IHA's requirements.

(c) Amendments will be on file in the offices of the PHA/IHA and the Architect at least 7 days before bid opening.

4. Responsibility of Prospective Contractor

(a) The PHA/IHA will award contracts only to responsible prospective contractors who have the ability to perform successfully under the terms and conditions of the proposed contract. In determining the responsibility of a bidder, the PHA/IHA will consider such matters as the bidder's:

(1) Integrity;

(2) Compliance with public policy;

(3) Record of past performance; and

(4) Financial and technical resources (including construction and technical equipment).

(b) Before a bid is considered for award, the bidder may be requested by the PHA/IHA to submit a statement or other documentation regarding any of the items in paragraph (a) above. Failure by the bidder to provide such additional information shall render the bidder nonresponsible and ineligible for award.

5. Late Submissions, Modifications, and Withdrawal of Bids

(a) Any bid received at the place designated in the solicitation after the exact time specified for receipt will not be considered unless it is received before award is made and it:

(1) Was sent by registered or certified mail not later than the fifth calendar day before the date specified for receipt of offers (e.g., an offer submitted in response to a solicitation requiring receipt of offers by the 20th of the month must have been mailed by the 15th);

(2) Was sent by mail, or if authorized by the solicitation, was sent by telegram or via facsimile, and it is determined by the PHA/IHA that the late receipt was due solely to mishandling by the PHA/IHA after receipt at the PHA/IHA; or

(3) Was sent by U.S. Postal Service Express Mail Next Day Service - Post Office to Addressee, not later than 5:00 p.m. at the place of mailing two working days prior to the date specified for receipt of proposals. The term "working days" excludes weekends and observed holidays.

(b) Any modification or withdrawal of a bid is subject to the same conditions as in paragraph (a) of this provision.

(c) The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent either by registered or certified mail is the U.S. or Canadian Postal Service postmark both on the envelope or wrapper and on the original receipt from the U.S. or Canadian Postal Service. Both postmarks must show a legible date or the bid, modification, or withdrawal shall be processed as if mailed late. "Postmark" means a printed, stamped, or otherwise placed impression (exclusive of a postage meter machine impression) that is readily identifiable without further action as having been supplied and affixed by employees of the U.S. or Canadian Postal Service on the date of mailing. Therefore, bidders should request the postal clerk to place a hand cancellation bull's-eye postmark on both the receipt and the envelope or wrapper.

(d) The only acceptable evidence to establish the time of receipt at the PHA/IHA is the time/date stamp of PHA/IHA on the proposal wrapper or other documentary evidence of receipt maintained by the PHA/IHA.

(e) The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent by Express Mail Next Day Service-Post Office to Addressee is the date entered by the post office receiving clerk on the "Express Mail Next Day Service-Post Office to Addressee" label and the postmark on both the envelope or wrapper and on the original receipt from the U.S. Postal Service. "Postmark" has the same meaning as defined in paragraph (c) of this provision, excluding postmarks of the Canadian Postal Service. Therefore, bidders should request the postal clerk to place a legible hand cancellation bull's eye postmark on both the receipt and Failure by a bidder to acknowledge receipt of the envelope or wrapper.

(f) Notwithstanding paragraph (a) of this provision, a late modification of an otherwise successful bid that makes its terms more favorable to the PHA/IHA will be considered at any time it is received and may be accepted.

(g) Bids may be withdrawn by written notice, or if authorized by this solicitation, by telegram (including mailgram) or facsimile machine transmission received at any time before the exact time set for opening of bids; provided that written confirmation of telegraphic or facsimile withdrawals over the signature of the bidder is mailed and postmarked prior to the specified bid opening time. A bid may be withdrawn in person by a bidder or its authorized representative if, before the exact time set for opening of bids, the identity of the person requesting withdrawal is established and the person signs a receipt for the bid.

6. Bid Opening

All bids received by the date and time of receipt specified in the solicitation will be publicly opened and read. The time and place of opening will be as specified in the solicitation. Bidders and other interested persons may be present.

7. Service of Protest

(a) Definitions. As used in this provision:

"Interested party" means an actual or prospective bidder whose direct economic interest would be affected by the award of the contract.

"Protest" means a written objection by an interested party to this solicitation or to a proposed or actual award of a contract pursuant to this solicitation.

(b) Protests shall be served on the Contracting Officer by obtaining written and dated acknowledgement from —

Director Of Procurement
San Antonio Housing Authority
818 S. Flores
San Antonio, TX 78204

[Contracting Officer designate the official or location where a protest may be served on the Contracting Officer]

(c) All protests shall be resolved in accordance with the PHA's/IHA's protest policy and procedures, copies of which are maintained at the PHA/IHA.

8. Contract Award

(a) The PHA/IHA will evaluate bids in response to this solicitation without discussions and will award a contract to the responsible bidder whose bid, conforming to the solicitation, will be most advantageous to the PHA/IHA considering only price and any price-related factors specified in the solicitation.

(b) If the apparent low bid received in response to this solicitation exceeds the PHA's/IHA's available funding for the proposed contract work, the PHA/IHA may either accept separately priced items (see 8(e) below) or use the following procedure to determine contract award. The PHA/IHA shall apply in turn to each bid (proceeding in order from the apparent low bid to the high bid) each of the separately priced bid deductible items, if any, in their priority order set forth in this solicitation. If upon the application of the first deductible item to all initial bids, a new low bid is within the PHA's/IHA's available funding, then award shall be made to that bidder. If no bid is within the available funding amount, then the PHA/IHA shall apply the second deductible item. The PHA/IHA shall continue this process until an evaluated low bid, if any, is within the PHA's/IHA's available funding. If upon the application of all deductibles, no bid is within the PHA's/IHA's available funding, or if the solicitation does not request separately priced deductibles, the PHA/IHA shall follow its written policy and procedures in making any award under this solicitation.

(c) In the case of tie low bids, award shall be made in accordance with the PHA's/IHA's written policy and procedures.

(d) The PHA/IHA may reject any and all bids, accept other than the lowest bid (e.g., the apparent low bid is unreasonably low), and waive informalities or minor irregularities in bids received, in accordance with the PHA's/IHA's written policy and procedures.

(e) Unless precluded elsewhere in the solicitation, the PHA/IHA may accept any item or combination of items bid.

(f) The PHA/IHA may reject any bid as nonresponsive if it is materially unbalanced as to the prices for the various items of work to be performed. A bid is materially unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated for other work.

(g) A written award shall be furnished to the successful bidder within the period for acceptance specified in the bid and shall result in a binding contract without further action by either party.

9. Bid Guarantee (applicable to construction and equipment contracts exceeding $25,000)

All bids must be accompanied by a negotiable bid guarantee which shall not be less than five percent (5%) of the amount of the bid. The bid guarantee may be a certified check, bank draft, U.S. Government Bonds at par value, or a bid bond secured by a surety company acceptable to the U.S. Government and authorized to do business in the state where the work is to be performed. In the case where the work under the contract will be performed on an Indian reservation area, the bid guarantee may also be an irrevocable Letter of Credit (see provision 10, Assurance of Completion, below). Certified checks and bank drafts must be made payable to the order of the PHA/IHA. The bid guarantee shall insure the execution of the contract and the furnishing of a method of assurance of completion by the successful bidder as required by the solicitation. Failure to submit a bid guarantee with the bid shall result in the rejection of the bid. Bid guarantees submitted by unsuccessful bidders will be returned as soon as practicable after bid opening.

10. Assurance of Completion

(a) Unless otherwise provided in State law, the successful bidder shall furnish an assurance of completion prior to the execution of any contract under this solicitation. This assurance may be [Contracting Officer check applicable items] —

[X] (1) a performance and payment bond in a penal sum of 100 percent of the contract price; or, as may be required or permitted by State law;

[ ] (2) separate performance and payment bonds, each for 50 percent or more of the contract price;

[ ] (3) a 20 percent cash escrow;

[ ] (4) a 25 percent irrevocable letter of credit; or,

[ ] (5) an irrevocable letter of credit for 10 percent of the total contract price with a monitoring and disbursements agreement with the IHA (applicable only to contracts awarded by an IHA under the Indian Housing Program).

(b) Bonds must be obtained from guarantee or surety companies acceptable to the U.S. Government and authorized to do business in the state where the work is to be performed. Individual sureties will not be considered. U.S. Treasury Circular Number 570, published annually in the Federal Register, lists companies approved to act as sureties on bonds securing Government contracts, the maximum underwriting limits on each contract bonded, and the States in which the company is licensed to do business. Use of companies listed in this circular is mandatory. Copies of the circular may be downloaded on the U.S. Department of Treasury website **http://www.fms.treas.gov/c570/index.html**, or ordered for a minimum fee by contacting the Government Printing Office at (202) 512-2168.

(c) Each bond shall clearly state the rate of premium and the total amount of premium charged. The current power of attorney for the person who signs for the surety company must be attached to the bond. The effective date of the power of attorney shall not precede the date of the bond. The effective date of the bond shall be on or after the execution date of the contract.

(d) Failure by the successful bidder to obtain the required assurance of completion within the time specified, or within such extended period as the PHA/IHA may grant based upon reasons determined adequate by the PHA/IHA, shall render the bidder ineligible for award. The PHA/IHA may then either award the contract to the next lowest responsible bidder or solicit new bids. The PHA/IHA may retain the ineligible bidder's bid guarantee.

11. Preconstruction Conference (applicable to construction contracts)

After award of a contract under this solicitation and prior to the start of work, the successful bidder will be required to attend a preconstruction conference with representatives of the PHA/IHA and its architect/engineer, and other interested parties convened by the PHA/IHA. The conference will serve to acquaint the participants with the general plan of the construction operation and all other requirements of the contract (e.g., Equal Employment Opportunity, Labor Standards). The PHA/IHA will provide the successful bidder with the date, time, and place of the conference.

12. Indian Preference Requirements (applicable only if this solicitation is for a contract to be performed on a project for an Indian Housing Authority)

(a) HUD has determined that the contract awarded under this solicitation is subject to the requirements of section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e(b)). Section 7(b) requires that any contract or subcontract entered into for the benefit of Indians shall require that, to the greatest extent feasible

(1) Preferences and opportunities for training and employment (other than core crew positions; see paragraph (h) below) in connection with the administration of such contracts or subcontracts be given to qualified "Indians." The Act defines "Indians" to mean persons who are members of an Indian tribe and defines "Indian tribe" to mean any Indian tribe, band, nation, or other organized group or community, including any Alaska Native village or regional or village corporation as defined in or established pursuant to the Alaska Native Claims Settlement Act, which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians; and,

(2) Preference in the award of contracts or subcontracts in connection with the administration of contracts be given to Indian organizations and to Indian-owned economic enterprises, as defined in section 3 of the Indian Financing Act of 1974 (25 U.S.C. 1452). That Act defines "economic enterprise" to mean any Indian-owned commercial, industrial, or business activity established or organized for the purpose of profit, except that the Indian ownership must constitute not less than 51 percent of the enterprise; "Indian organization" to mean the governing body of any Indian tribe or entity established or recognized by such governing body; "Indian" to mean any person who is a member of any tribe, band, group, pueblo, or community which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs and any "Native" as defined in the Alaska Native Claims Settlement Act; and Indian "tribe" to mean any Indian tribe, band, group, pueblo, or community including Native villages and Native groups (including

corporations organized by Kenai, Juneau, Sitka, and Kodiak) as defined in the Alaska Native Claims Settlement Act, which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs.

(b) (1) The successful Contractor under this solicitation shall comply with the requirements of this provision in awarding all subcontracts under the contract and in providing training and employment opportunities.

(2) A finding by the IHA that the contractor, either (i) awarded a subcontract without using the procedure required by the IHA, (ii) falsely represented that subcontracts would be awarded to Indian enterprises or organizations; or, (iii) failed to comply with the contractor's employment and training preference bid statement shall be grounds for termination of the contract or for the assessment of penalties or other remedies.

(c) If specified elsewhere in this solicitation, the IHA may restrict the solicitation to qualified Indian-owned enterprises and Indian organizations. If two or more (or a greater number as specified elsewhere in the solicitation) qualified Indian-owned enterprises or organizations submit responsive bids, award shall be made to the qualified enterprise or organization with the lowest responsive bid. If fewer than the minimum required number of qualified Indian-owned enterprises or organizations submit responsive bids, the IHA shall reject all bids and readvertise the solicitation in accordance with paragraph (d) below.

(d) If the IHA prefers not to restrict the solicitation as described in paragraph (c) above, or if after having restricted a solicitation an insufficient number of qualified Indian enterprises or organizations submit bids, the IHA may advertise for bids from non-Indian as well as Indian-owned enterprises and Indian organizations. Award shall be made to the qualified Indian enterprise or organization with the lowest responsive bid if that bid is -

(1) Within the maximum HUD-approved budget amount established for the specific project or activity for which bids are being solicited; and

(2) No more than the percentage specified in 24 CFR 905.175(c) higher than the total bid price of the lowest responsive bid from any qualified bidder. If no responsive bid by a qualified Indian-owned economic enterprise or organization is within the stated range of the total bid price of the lowest responsive bid from any qualified enterprise, award shall be made to the bidder with the lowest bid.

(e) Bidders seeking to qualify for preference in contracting or subcontracting shall submit proof of Indian ownership with their bids. Proof of Indian ownership shall include but not be limited to:

(1) Certification by a tribe or other evidence that the bidder is an Indian. The IHA shall accept the certification of a tribe that an individual is a member.

(2) Evidence such as stock ownership, structure, management, control, financing and salary or profit sharing arrangements of the enterprise.

(f) (1) All bidders must submit with their bids a statement describing how they will provide Indian preference in the award of subcontracts. The specific requirements of that statement and the factors to used by the IHA in determining the statement's adequacy are included as an attachment to this solicitation. Any bid that fails to include the required statement shall be rejected as nonresponsive. The IHA may require that comparable statements be provided by subcontractors to the successful Contractor, and may require the Contractor to reject any bid or proposal by a subcontractor that fails to include the statement.

(2) Bidders and prospective subcontractors shall submit a certification (supported by credible evidence) to the IHA in any instance where the bidder or subcontractor believes it is infeasible to provide Indian preference in subcontracting. The acceptance or rejection by the IHA of the certification shall be final. Rejection shall disqualify the bid from further consideration.

(g) All bidders must submit with their bids a statement detailing their employment and training opportunities and their plans to provide preference to Indians in implementing the contract; and the number or percentage of Indians anticipated to be employed and trained. Comparable statements from all proposed subcontractors must be submitted. The criteria to be used by the IHA in determining the statement(s)'s adequacy are included as an attachment to this solicitation. Any bid that fails to include the required statement(s), or that includes a statement that does not meet minimum standards required by the IHA shall be rejected as nonresponsive.

(h) Core crew employees. A core crew employee is an individual who is a bona fide employee of the contractor at the time the bid is submitted; or an individual who was not employed by the bidder at the time the bid was submitted, but who is regularly employed by the bidder in a supervisory or other key skilled position when work is available. Bidders shall submit with their bids a list of all core crew employees.

(i) Preference in contracting, subcontracting, employment, and training shall apply not only on-site, on the reservation, or within the IHA's jurisdiction, but also to contracts with firms that operate outside these areas (e.g., employment in modular or manufactured housing construction facilities).

(j) Bidders should contact the IHA to determine if any additional local preference requirements are applicable to this solicitation.

(k) The IHA [ ] does [ ] does not [Contracting Officer check applicable box] maintain lists of Indian-owned economic enterprises and Indian organizations by specialty (e.g., plumbing, electrical, foundations), which are available to bidders to assist them in meeting their responsibility to provide preference in connection with the administration of contracts and subcontracts.

General Conditions for Construction Contracts - Public Housing Programs

U.S. Department of Housing and Urban Development
Office of Public and Indian Housing
OMB Approval No. 2577-0157 (exp. 3/31/2020)

Applicability. This form is applicable to any construction/development contract greater than $150,000.

This form includes those clauses required by OMB's common rule on grantee procurement, implemented at HUD in 2 CFR 200, and those requirements set forth in Section 3 of the Housing and Urban Development Act of 1968 and its amendment by the Housing and Community Development Act of 1992, implemented by HUD at 24 CFR Part 135. The form is required for construction contracts awarded by Public Housing Agencies (PHAs).
The form is used by Housing Authorities in solicitations to provide necessary contract clauses. If the form were not used, HAs would be unable to enforce their contracts.
Public reporting burden for this collection of information is estimated to average 1.0 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Responses to the collection of information are required to obtain a benefit or to retain a benefit.
The information requested does not lend itself to confidentiality.
HUD may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB number.

1. Definitions

(a) "Architect" means the person or other entity engaged by the PHA to perform architectural, engineering, design, and other services related to the work as provided for in the contract. When a PHA uses an engineer to act in this capacity, the terms "architect" and "engineer" shall be synonymous. The Architect shall serve as a technical representative of the Contracting Officer. The Architect's authority is as set forth elsewhere in this contract.

(b) "Contract" means the contract entered into between the PHA and the Contractor. It includes the forms of Bid, the Bid Bond, the Performance and Payment Bond or Bonds or other assurance of completion, the Certifications, Representations, and Other Statements of Bidders (form HUD-5370), these General Conditions of the Contract for Construction (form HUD-5370), the applicable wage rate determinations from the U.S. Department of Labor, any special conditions included elsewhere in the contract, the specifications, and drawings. It includes all formal changes to any of those documents by addendum, change order, or other modification.

(c) "Contracting Officer" means the person delegated the authority by the PHA to enter into, administer, and/or terminate this contract and designated as such in writing to the Contractor. The term includes any successor Contracting Officer and any duly authorized representative of the Contracting Officer also designated in writing. The Contracting Officer shall be deemed the authorized agent of the PHA in all dealings with the Contractor.

(d) "Contractor" means the person or other entity entering into the contract with the PHA to perform all of the work required under the contract.

(e) "Drawings" means the drawings enumerated in the schedule of drawings contained in the Specifications and as described in the contract clause entitled Specifications and Drawings for Construction herein.

(f) "HUD" means the United States of America acting through the Department of Housing and Urban Development including the Secretary, or any other person designated to act on its behalf. HUD has agreed, subject to the provisions of an Annual Contributions Contract (ACC), to provide financial assistance to the PHA, which includes assistance in financing the work to be performed under this contract. As defined elsewhere in these General Conditions or the contract documents, the determination of HUD may be required to authorize changes in the work or for release of funds to the PHA for payment to the Contractor. Notwithstanding HUD's role, nothing in this contract shall be construed to create any contractual relationship between the Contractor and HUD.

(g) "Project" means the entire project, whether construction or rehabilitation, the work for which is provided for in whole or in part under this contract.

(h) "PHA" means the Public Housing Agency organized under applicable state laws which is a party to this contract.

(j) "Specifications" means the written description of the technical requirements for construction and includes the criteria and tests for determining whether the requirements are met.

(l) "Work" means materials, workmanship, and manufacture and fabrication of components.

2. Contractor's Responsibility for Work

(a) The Contractor shall furnish all necessary labor, materials, tools, equipment, and transportation necessary for performance of the work. The Contractor shall also furnish all necessary water, heat, light, and power not made available to the Contractor by the PHA pursuant to the clause entitled Availability and Use of Utility Services herein.

(b) The Contractor shall perform on the site, and with its own organization, work equivalent to at least [ ] (12 percent unless otherwise indicated) of the total amount of work to be performed under the order. This percentage may be reduced by a supplemental agreement to this order if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the PHA.

(c) At all times during performance of this contract and until the work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the work site a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.

(d) The Contractor shall be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence, and shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others. The Contractor shall hold and save the PHA, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.

(e) The Contractor shall lay out the work from base lines and bench marks indicated on the drawings and be responsible for all lines, levels, and measurements of all work executed under the contract. The Contractor shall verify the figures before laying out the work and will be held responsible for any error resulting from its failure to do so.

(f) The Contractor shall confine all operations (including storage of materials) on PHA premises to areas authorized or approved by the Contracting Officer.

(g) The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. After completing the work and before final inspection, the Contractor shall (1) remove from the premises all scaffolding, equipment, tools, and materials (including rejected materials) that are not the property of the PHA and all rubbish caused by its work; (2) leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer; (3) perform all specified tests; and, (4) deliver the installation in complete and operating condition.

(h) The Contractor's responsibility will terminate when all work has been completed, the final inspection made, and the work accepted by the Contracting Officer. The Contractor will then be released from further obligation except as required by the warranties specified elsewhere in the contract.

3. Architect's Duties, Responsibilities, and Authority

(a) The Architect for this contract, and any successor, shall be designated in writing by the Contracting Officer.

(b) The Architect shall serve as the Contracting Officer's technical representative with respect to architectural, engineering, and design matters related to the work performed under the contract. The Architect may provide direction on contract performance. Such direction shall be within the scope of the contract and may not be of a nature which: (1) institutes additional work outside the scope of the contract; (2) constitutes a change as defined in the Changes clause herein; (3) causes an increase or decrease in the cost of the contract; (4) alters the Construction Progress Schedule; or (5) changes any of the other express terms or conditions of the contract.

(c) The Architect's duties and responsibilities may include but shall not be limited to:

(1) Making periodic visits to the work site, and on the basis of his/her on-site inspections, issuing written reports to the PHA which shall include all observed deficiencies. The Architect shall file a copy of the report with the Contractor's designated representative at the site;

(2) Making modifications in drawings and technical specifications and assisting the Contracting Officer in the preparation of change orders and other contract modifications for issuance by the Contracting Officer;

(3) Reviewing and making recommendations with respect to - (i) the Contractor's construction progress schedules; (ii) the Contractor's shop and detailed drawings; (iii) the machinery, mechanical and other equipment and materials or other articles proposed for use by the Contractor; and, (iv) the Contractor's price breakdown and progress payment estimates; and,

(4) Assisting in inspections, signing Certificates of Completion, and making recommendations with respect to acceptance of work completed under the contract.

4. Other Contracts

The PHA may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with PHA employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by PHA employees

Construction Requirements

5. Pre-construction Conference and Notice to Proceed

(a) Within ten calendar days of contract execution, and prior to the commencement of work, the Contractor shall attend a preconstruction conference with representatives of the PHA, its Architect, and other interested parties convened by the PHA. The conference will serve to acquaint the participants with the general plan of the construction operation and all other requirements of the contract. The PHA will provide the Contractor with the date, time, and place of the conference.

(b) The contractor shall begin work upon receipt of a written Notice to Proceed from the Contracting Officer or designee. The Contractor shall not begin work prior to receiving such notice.

6. Construction Progress Schedule

(a) The Contractor shall, within five days after the work commences on the contract or another period of time determined by the Contracting Officer, prepare and submit to the Contracting Officer for approval three copies of a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the several salient features of the work (including acquiring labor, materials, and equipment). The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period. If the Contractor fails to submit a schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments or take other remedies under the contract until the Contractor submits the required schedule.

(b) The Contractor shall enter the actual progress on the chart as required by the Contracting Officer, and immediately deliver three copies of the annotated schedule to the Contracting Officer. If the Contracting Officer determines, upon the basis of inspection conducted pursuant to the clause entitled Inspection and Acceptance of Construction, herein that the Contractor is not meeting the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Contracting Officer, without additional cost to the PHA. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in chart form as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained.

(c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the Contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the Default clause of this contract.

7. Site Investigation and Conditions Affecting the Work

(a) The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to, (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, electric power, and roads;(3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is

reasonably ascertainable from an inspection of the site, including all exploratory work done by the PHA, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the PHA.

(b) The PHA assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the PHA. Nor does the PHA assume responsibility for any understanding reached or representation made concerning conditions which can affect the work by any of its officers or agents before the execution of this contract, unless that understanding or representation is expressly stated in this contract.

8. Differing Site Conditions

(a) The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of (1) subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or (2) unknown physical conditions at the site(s), of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the contract.

(b) The Contracting Officer shall investigate the site conditions promptly after receiving the notice. Work shall not proceed at the affected site, except at the Contractor's risk, until the Contracting Officer has provided written instructions to the Contractor. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performing any part of the work under this contract, whether or not changed as a result of the conditions, the Contractor shall file a claim in writing to the PHA within ten days after receipt of such instructions and, in any event, before proceeding with the work. An equitable adjustment in the contract price, the delivery schedule, or both shall be made under this clause and the contract modified in writing accordingly.

(c) No request by the Contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given the written notice required; provided, that the time prescribed in (a) above for giving written notice may be extended by the Contracting Officer.

(d) No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.

9. Specifications and Drawings for Construction

(a) The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

(b) Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order", "designation", or "prescription", of the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean "approved by", or "acceptable to", or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.

(c) Where "as shown" "as indicated", "as detailed", or of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place" that is "furnished and installed".

(d) "Shop drawings" means drawings, submitted to the PHA by the Contractor, subcontractor, or any lower tier subcontractor, showing in detail (1) the proposed fabrication and assembly of structural elements and (2) the installation (i.e., form, fit, and attachment details) of materials of equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the contract. The PHA may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with other contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the PHA's reasons therefore. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) below.

(f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Architect approves any such variation and the Contracting Officer concurs, the Contracting Officer shall issue an appropriate modification to the contract, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.

(g) It shall be the responsibility of the Contractor to make timely requests of the PHA for such large scale and full size drawings, color schemes, and other additional information, not already in his possession, which shall be

required in the planning and production of the work. Such requests may be submitted as the need arises, but each such request shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay.

(h) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated) of all shop drawings, will be retained by the PHA and one set will be returned to the Contractor. As required by the Contracting Officer, the Contractor, upon completing the work under this contract, shall furnish a complete set of all shop drawings as finally approved. These drawings shall show all changes and revisions made up to the time the work is completed and accepted.

(i) This clause shall be included in all subcontracts at any tier. It shall be the responsibility of the Contractor to ensure that all shop drawings prepared by subcontractors are submitted to the Contracting Officer.

10. As-Built Drawings

(a) "As-built drawings," as used in this clause, means drawings submitted by the Contractor or subcontractor at any tier to show the construction of a particular structure or work as actually completed under the contract. "As-built drawings" shall be synonymous with "Record drawings."

(b) As required by the Contracting Officer, the Contractor shall provide the Contracting Officer accurate information to be used in the preparation of permanent as-built drawings. For this purpose, the Contractor shall record on one set of contract drawings all changes from the installations originally indicated, and record final locations of underground lines by depth from finish grade and by accurate horizontal offset distances to permanent surface improvements such as buildings, curbs, or edges of walks.

(c) This clause shall be included in all subcontracts at any tier. It shall be the responsibility of the Contractor to ensure that all as-built drawings prepared by subcontractors are submitted to the Contracting Officer.

11. Material and Workmanship

(a) All equipment, material, and articles furnished under this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the contract to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of, and as approved by the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.

(b) Approval of equipment and materials.

(1) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.

(2) When required by the specifications or the Contracting Officer, the Contractor shall submit appropriately marked samples (and certificates related to them) for approval at the Contractor's expense, with all shipping charges prepaid. The Contractor shall label, or otherwise properly mark on the container, the material or product represented, its place of origin, the name of the producer, the Contractor's name, and the identification of the construction project for which the material or product is intended to be used.

(3) Certificates shall be submitted in triplicate, describing each sample submitted for approval and certifying that the material, equipment or accessory complies with contract requirements. The certificates shall include the name and brand of the product, name of manufacturer, and the location where produced.

(4) Approval of a sample shall not constitute a waiver of the PHA right to demand full compliance with contract requirements. Materials, equipment and accessories may be rejected for cause even though samples have been approved.

(5) Wherever materials are required to comply with recognized standards or specifications, such specifications shall be accepted as establishing the technical qualities and testing methods, but shall not govern the number of tests required to be made nor modify other contract requirements. The Contracting Officer may require laboratory test reports on items submitted for approval or may approve materials on the basis of data submitted in certificates with samples. Check tests will be made on materials delivered for use only as frequently as the Contracting Officer determines necessary to insure compliance of materials with the specifications. The Contractor will assume all costs of retesting materials which fail to meet contract requirements and/or testing materials offered in substitution for those found deficient.

(6) After approval, samples will be kept in the Project office until completion of work. They may be built into the work after a substantial quantity of the materials they represent has been built in and accepted.

(c) Requirements concerning lead-based paint. The Contractor shall comply with the requirements concerning lead-based paint contained in the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. 4821-4846) as implemented by 24 CFR Part 35.

12. Permits and Codes

(a) The Contractor shall give all notices and comply with all applicable laws, ordinances, codes, rules and regulations. Notwithstanding the requirement of the Contractor to comply with the drawings and specifications in the contract, all work installed shall comply with all applicable codes and regulations as amended by any

waivers. Before installing the work, the Contractor shall examine the drawings and the specifications for compliance with applicable codes and regulations bearing on the work and shall immediately report any discrepancy it may discover to the Contracting Officer. Where the requirements of the drawings and specifications fail to comply with the applicable code or regulation, the Contracting Officer shall modify the contract by change order pursuant to the clause entitled Changes herein to conform to the code or regulation.

(b) The Contractor shall secure and pay for all permits, fees, and licenses necessary for the proper execution and completion of the work. Where the PHA can arrange for the issuance of all or part of these permits, fees and licenses, without cost to the Contractor, the contract amount shall be reduced accordingly.

13. Health, Safety, and Accident Prevention

(a) In performing this contract, the Contractor shall:
(1) Ensure that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his/her health and/or safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation;
(2) Protect the lives, health, and safety of other persons;
(3) Prevent damage to property, materials, supplies, and equipment; and,
(4) Avoid work interruptions.

(b) For these purposes, the Contractor shall:
(1) Comply with regulations and standards issued by the Secretary of Labor at 29 CFR Part 1926. Failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (Public Law 91-54, 83 Stat. 96), 40 U.S.C. 3701 et seq.; and
(2) Include the terms of this clause in every subcontract so that such terms will be binding on each subcontractor.

(c) The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment, and shall report this data in the manner prescribed by 29 CFR Part 1904.

(d) The Contracting Officer shall notify the Contractor of any noncompliance with these requirements and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the work, shall be deemed sufficient notice of the noncompliance and corrective action required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to take corrective action promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not base any claim or request for equitable adjustment for additional time or money on any stop order issued under these circumstances.

(e) The Contractor shall be responsible for its subcontractors' compliance with the provisions of this clause. The Contractor shall take such action with respect to any subcontract as the PHA, the Secretary of Housing and Urban Development, or the Secretary of Labor shall direct as a means of enforcing such provisions.

14. Temporary Heating

The Contractor shall provide and pay for temporary heating, covering, and enclosures necessary to properly protect all work and materials against damage by dampness and cold, to dry out the work, and to facilitate the completion of the work. Any permanent heating equipment used shall be turned over to the PHA in the condition and at the time required by the specifications.

15. Availability and Use of Utility Services

(a) The PHA shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed shall be charged to or paid for by the Contractor at prevailing rates charged to the PHA or, where the utility is produced by the PHA, at reasonable rates determined by the Contracting Officer. The Contractor shall carefully conserve any utilities furnished without charge.

(b) The Contractor, at its expense and in a manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of each utility used for the purpose of determining charges. Before final acceptance of the work by the PHA, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.

16. Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements

(a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed under this contract, and which do not unreasonably interfere with the work required under this contract.

(b) The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during performance of this contract, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.

(c) The Contractor shall protect from damage all existing improvements and utilities (1) at or near the work site and (2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. Prior to disturbing the ground at the construction site, the Contractor shall ensure that all underground utility lines are clearly marked.

(d) The Contractor shall shore up, brace, underpin, secure, and protect as necessary all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be affected by the excavations or other operations connected with the construction of the project.

(e) Any equipment temporarily removed as a result of work under this contract shall be protected, cleaned, and replaced in the same condition as at the time of award of this contract.

(f) New work which connects to existing work shall correspond in all respects with that to which it connects and/or be similar to existing work unless otherwise required by the specifications.
(g) No structural members shall be altered or in any way weakened without the written authorization of the Contracting Officer, unless such work is clearly specified in the plans or specifications.
(h) If the removal of the existing work exposes discolored or unfinished surfaces, or work out of alignment, such surfaces shall be refinished, or the material replaced as necessary to make the continuous work uniform and harmonious. This, however, shall not be construed to require the refinishing or reconstruction of dissimilar finishes previously exposed, or finished surfaces in good condition, but in different planes or on different levels when brought together by the removal of intervening work, unless such refinishing or reconstruction is specified in the plans or specifications.
(i) The Contractor shall give all required notices to any adjoining or adjacent property owner or other party before the commencement of any work.
(j) The Contractor shall indemnify and save harmless the PHA from any damages on account of settlement or the loss of lateral support of adjoining property, any damages from changes in topography affecting drainage, and from all loss or expense and all damages for which the PHA may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.
(k) The Contractor shall repair any damage to vegetation, structures, equipment, utilities, or improvements, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

17. Temporary Buildings and Transportation of Materials

(a) Temporary buildings (e.g., storage sheds, shops, offices, sanitary facilities) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the PHA. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.
(b) The Contractor shall, as directed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any federal, state, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

18. Clean Air and Water

The contactor shall comply with the Clean Air Act, as amended, 42 USC 7401 et seq., the Federal Water Pollution Control Water Act, as amended, 33 U.S.C. 1251 et seq., and standards issued pursuant thereto in the facilities in which this contract is to be performed.

19. Energy Efficiency

The Contractor shall comply with mandatory standards and policies relating to energy efficiency which are contained in the energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Pub.L. 94-163) for the State in which the work under the contract is performed.

20. Inspection and Acceptance of Construction

(a) Definitions. As used in this clause -
(1) "Acceptance" means the act of an authorized representative of the PHA by which the PHA approves and assumes ownership of the work performed under this contract. Acceptance may be partial or complete.
(2) "Inspection" means examining and testing the work performed under the contract (including, when appropriate, raw materials, equipment, components, and intermediate assemblies) to determine whether it conforms to contract requirements.
(3) "Testing" means that element of inspection that determines the properties or elements, including functional operation of materials, equipment, or their components, by the application of established scientific principles and procedures.
(b) The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under the contract conforms to contract requirements. All work is subject to PHA inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.
(c) PHA inspections and tests are for the sole benefit of the PHA and do not: (1) relieve the Contractor of responsibility for providing adequate quality control measures; (2) relieve the Contractor of responsibility for loss or damage of the material before acceptance; (3) constitute or imply acceptance; or, (4) affect the continuing rights of the PHA after acceptance of the completed work under paragraph (j) below.
(d) The presence or absence of the PHA inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specifications without the Contracting Officer's written authorization. All instructions and approvals with respect to the work shall be given to the Contractor by the Contracting Officer.
(e) The Contractor shall promptly furnish, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. The PHA may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. The PHA shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size, and performance tests shall be performed as described in the contract.

(f) The PHA may conduct routine inspections of the construction site on a daily basis.

(g) The Contractor shall, without charge, replace or correct work found by the PHA not to conform to contract requirements, unless the PHA decides that it is in its interest to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.

(h) If the Contractor does not promptly replace or correct rejected work, the PHA may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor, or (2) terminate for default the Contractor's right to proceed.

(i) If any work requiring inspection is covered up without approval of the PHA, it must, if requested by the Contracting Officer, be uncovered at the expense of the Contractor. If at any time before final acceptance of the entire work, the PHA considers it necessary or advisable, to examine work already completed by removing or tearing it out, the Contractor, shall on request, promptly furnish all necessary facilities, labor, and material. If such work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray all the expenses of the examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, the Contracting Officer shall make an equitable adjustment to cover the cost of the examination and reconstruction, including, if completion of the work was thereby delayed, an extension of time.

(j) The Contractor shall notify the Contracting Officer, in writing, as to the date when in its opinion all or a designated portion of the work will be substantially completed and ready for inspection. If the Architect determines that the state of preparedness is as represented, the PHA will promptly arrange for the inspection. Unless otherwise specified in the contract, the PHA shall accept, as soon as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines and designates can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or the PHA's right under any warranty or guarantee.

21. Use and Possession Prior to Completion

(a) The PHA shall have the right to take possession of or use any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the PHA intends to take possession of or use. However, failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The PHA's possession or use shall not be deemed an acceptance of any work under the contract.

(b) While the PHA has such possession or use, the Contractor shall be relieved of the responsibility for (1) the loss of or damage to the work resulting from the PHA's possession or use, notwithstanding the terms of the clause entitled Permits and Codes herein; (2) all maintenance costs on the areas occupied; and, (3) furnishing heat, light, power, and water used in the areas occupied without proper remuneration therefore. If prior possession or use by the PHA delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

22. Warranty of Title

The Contractor warrants good title to all materials, supplies, and equipment incorporated in the work and agrees to deliver the premises together with all improvements thereon free from any claims, liens or charges, and agrees further that neither it nor any other person, firm or corporation shall have any right to a lien upon the premises or anything appurtenant thereto.

23. Warranty of Construction

(a) In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph (j) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or workmanship performed by the Contractor or any subcontractor or supplier at any tier. This warranty shall continue for a period of 2 years (one year unless otherwise indicated) from the date of final acceptance of the work. If the PHA takes possession of any part of the work before final acceptance, this warranty shall continue for a period of (one year unless otherwise indicated) from the date that the PHA takes possession.

(b) The Contractor shall remedy, at the Contractor's expense, any failure to conform, or any defect. In addition, the Contractor shall remedy, at the Contractor's expense, any damage to PHA-owned or controlled real or personal property when the damage is the result of—

(1) The Contractor's failure to conform to contract requirements; or

(2) Any defects of equipment, material, workmanship or design furnished by the Contractor.

(c) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for (one year unless otherwise indicated) from the date of repair or replacement.

(d) The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect or damage.

(e) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the PHA shall have the right to replace, repair or otherwise remedy the failure, defect, or damage at the Contractor's expense.

(f) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall:

(1) Obtain all warranties that would be given in normal commercial practice;

(2) Require all warranties to be executed in writing, for the benefit of the PHA; and,

(3) Enforce all warranties for the benefit of the PHA.

(g) In the event the Contractor's warranty under paragraph (a) of this clause has expired, the PHA may bring suit at its own expense to enforce a subcontractor's, manufacturer's or supplier's warranty.

(h) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defect of material or design furnished by the PHA nor for the repair of any damage that results from any defect in PHA furnished material or design.

(i) Notwithstanding any provisions herein to the contrary, the establishment of the time periods in paragraphs (a) and (c) above relate only to the specific obligation of the Contractor to correct the work, and have no relationship to the time within which its obligation to comply with the contract may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to its obligation other than specifically to correct the work.

(j) This warranty shall not limit the PHA's rights under the Inspection and Acceptance of Construction clause of this contract with respect to latent defects, gross mistakes or fraud.

24. Prohibition Against Liens

The Contractor is prohibited from placing a lien on the PHA's property. This prohibition shall apply to all subcontractors at any tier and all materials suppliers.

Administrative Requirements

25. Contract Period

this contract within calendar days of the effective date of the contract, or within the time schedule established in the notice to proceed issued by the Contracting Officer.

26. Order of Provisions

In the event of a conflict between these General Conditions and the Specifications, the General Conditions shall prevail. In the event of a conflict between the contract and any applicable state or local law or regulation, the state or local law or regulation shall prevail; provided that such state or local law or regulation does not conflict with, or is less restrictive than applicable federal law, regulation, or Executive Order. In the event of such a conflict, applicable federal law, regulation, and Executive Order shall prevail.

27. Payments

(a) The PHA shall pay the Contractor the price as provided in this contract.

(b) The PHA shall make progress payments approximately every 30 days as the work proceeds, on estimates of work accomplished which meets the standards of quality established under the contract, as approved by the Contracting Officer. The PHA may, subject to written determination and approval of the Contracting Officer, make more frequent payments to contractors which are qualified small businesses.

(c) Before the first progress payment under this contract, the Contractor shall furnish, in such detail as requested by the Contracting Officer, a breakdown of the total contract price showing the amount included therein for each principal category of the work, which shall substantiate the payment amount requested in order to provide a basis for determining progress payments. The breakdown shall be approved by the Contracting Officer and must be acceptable to HUD. If the contract covers more than one project, the Contractor shall furnish a separate breakdown for each. The values and quantities employed in making up this breakdown are for determining the amount of progress payments and shall not be construed as a basis for additions to or deductions from the contract price. The Contractor shall prorate its overhead and profit over the construction period of the contract.

(d) The Contractor shall submit, on forms provided by the PHA, periodic estimates showing the value of the work performed during each period based upon the approved

submitted not later than 30 days in advance of the date set for payment and are subject to correction and revision as required. The estimates must be approved by the Contracting Officer with the concurrence of the Architect prior to payment. If the contract covers more than one project, the Contractor shall furnish a separate progress payment estimate for each.

(e) Along with each request for progress payments and the required estimates, the Contractor shall furnish the following certification, or payment shall not be made: I hereby certify, to the best of my knowledge and belief, that:

(1) The amounts requested are only for performance in accordance with the specifications, terms, and conditions of the contract;

(2) Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements; and,

(3) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract.

_____

Name:

_____

Title:

_____

Date:

(f) Except as otherwise provided in State law, the PHA shall retain ten (10) percent of the amount of progress payments until completion and acceptance of all work under the contract; except, that if upon completion of 50 percent of the work, the Contracting Officer, after consulting with the Architect, determines that the Contractor's performance and progress are satisfactory, the PHA may make the remaining payments in full for the work subsequently completed. If the Contracting Officer subsequently determines that the Contractor's performance and progress are unsatisfactory, the PHA shall reinstate the ten (10) percent (or other percentage as provided in State law) retainage until such time as the Contracting Officer determines that performance and progress are satisfactory.

(g) The Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration when computing progress payments.

Material delivered to the Contractor at locations other than the site may also be taken into consideration if the Contractor furnishes satisfactory evidence that (1) it has acquired title to such material; (2) the material is properly stored in a bonded warehouse, storage yard, or similar suitable place as may be approved by the Contracting Officer; (3) the material is insured to cover its full value; and (4) the material will be used to perform this contract. Before any progress payment which includes delivered material is made, the Contractor shall furnish such documentation as the Contracting Officer may require to assure the protection of the PHA's interest in such materials. The Contractor shall remain responsible for such stored material notwithstanding the transfer of title to the PHA.

(h) All material and work covered by progress payments made shall, at the time of payment become the sole property of the PHA, but this shall not be construed as (1) relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or, (2) waiving the right of the PHA to require the fulfillment of all of the terms of the contract. In the event the work of the Contractor has been damaged by other contractors or persons other than employees of the PHA in the course of their employment, the Contractor shall restore such damaged work without cost to the PHA and to seek redress for its damage only from those who directly caused it.

(i) The PHA shall make the final payment due the Contractor under this contract after (1) completion and final acceptance of all work; and (2) presentation of release of all claims against the PHA arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically excepted from the operation of the release. Each such exception shall embrace no more than one claim, the basis and scope of which shall be clearly defined. The amounts for such excepted claims shall not be included in the request for final payment. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned.

(j) Prior to making any payment, the Contracting Officer may require the Contractor to furnish receipts or other evidence of payment from all persons performing work and supplying material to the Contractor, if the Contracting Officer determines such evidence is necessary to substantiate claimed costs.

(k) The PHA shall not; (1) determine or adjust any claims for payment or disputes arising there under between the Contractor and its subcontractors or material suppliers; or, (2) withhold any moneys for the protection of the subcontractors or material suppliers. The failure or refusal of the PHA to withhold moneys from the Contractor shall in nowise impair the obligations of any surety or sureties under any bonds furnished under this contract.

28. Contract Modifications

(a) Only the Contracting Officer has authority to modify any term or condition of this contract. Any contract modification shall be authorized in writing.

(b) The Contracting Officer may modify the contract unilaterally (1) pursuant to a specific authorization stated in a contract clause (e.g., Changes); or (2) for administrative matters which do not change the rights or responsibilities of the parties (e.g., change in the PHA address). All other contract modifications shall be in the form of supplemental agreements signed by the Contractor and the Contracting Officer.

(c) When a proposed modification requires the approval of HUD prior to its issuance (e.g., a change order that exceeds the PHA's approved threshold), such modification shall not be effective until the required approval is received by the PHA.

29. Changes

(a) The Contracting Officer may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract including changes:
(1) In the specifications (including drawings and designs);
(2) In the method or manner of performance of the work;
(3) PHA-furnished facilities, equipment, materials, services, or site; or,
(4) Directing the acceleration in the performance of the work.

(b) Any other written order or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer written notice stating (1) the date, circumstances and source of the order and (2) that the Contractor regards the order as a change order.

(c) Except as provided in this clause, no order, statement or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for a adjustment based on defective specifications, no proposal for any change under paragraph (b) above shall be allowed for any costs incurred more than 20 days (5 days for oral orders) before the Contractor gives written notice as required. In the case of defective specifications for which the PHA is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.

(e) The Contractor must assert its right to an adjustment under this clause within 30 days after (1) receipt of a written change order under paragraph (a) of this clause, or (2) the furnishing of a written notice under paragraph (b) of this clause, by submitting a written statement describing the general nature and the amount of the proposal. If the facts justify it, the Contracting Officer may extend the period for submission. The proposal may be included in the notice required under paragraph (b) above. No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.

(f) The Contractor's written proposal for equitable adjustment shall be submitted in the form of a lump sum proposal supported with an itemized breakdown of all increases and decreases in the contract in at least the following details:

(1) Direct Costs. Materials (list individual items, the quantity and unit cost of each, and the aggregate cost); Transportation and delivery costs associated with materials; Labor breakdowns by hours or unit costs (identified with specific work to be performed); Construction equipment exclusively necessary for the change; Costs of preparation and/ or revision to shop drawings resulting from the change; Worker's Compensation and Public Liability Insurance; Employment taxes under FICA and FUTA; and, Bond Costs when size of change warrants revision.

(2) Indirect Costs. Indirect costs may include overhead, general and administrative expenses, and fringe benefits not normally treated as direct costs.

(3) Profit. The amount of profit shall be negotiated and may vary according to the nature, extent, and complexity of the work required by the change. The allowability of the direct and indirect costs shall be determined in accordance with the Contract Cost Principles and Procedures for Commercial Firms in Part 31 of the Federal Acquisition Regulation (48 CFR 1-31), as implemented by HUD Handbook 2210.18, in effect on the date of this contract. The Contractor shall not be allowed a profit on the profit received by any subcontractor. Equitable adjustments for deleted work shall include a credit for profit and may include a credit for indirect costs. On proposals covering both increases and decreases in the amount of the contract, the application of indirect costs and profit shall be on the net-change in direct costs for the Contractor or subcontractor performing the work.

(g) The Contractor shall include in the proposal its request for time extension (if any), and shall include sufficient information and dates to demonstrate whether and to what extent the change will delay the completion of the contract in its entirety.

(h) The Contracting Officer shall act on proposals within 30 days after their receipt, or notify the Contractor of the date when such action will be taken.

(i) Failure to reach an agreement on any proposal shall be a dispute under the clause entitled Disputes herein. Nothing in this clause, however, shall excuse the Contractor from proceeding with the contract as changed.

(j) Except in an emergency endangering life or property, no change shall be made by the Contractor without a prior order from the Contracting Officer.

30. Suspension of Work

(a) The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the PHA.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified (or within a reasonable time if not specified) in this contract an adjustment shall be made for any increase in the cost of performance of the contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor or for which any equitable adjustment is provided for or excluded under any other provision of this contract.

(c) A claim under this clause shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order); and, (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of final payment under the contract.

31. Disputes

(a) "Claim," as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to the contract. A claim arising under the contract, unlike a claim relating to the contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim. The submission may be converted to a claim by complying with the requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.

(b) Except for disputes arising under the clauses entitled Labor Standards - Davis Bacon and Related Acts, herein, all disputes arising under or relating to this contract, including any claims for damages for the alleged breach thereof which are not disposed of by agreement, shall be resolved under this clause.

(c) All claims by the Contractor shall be made in writing and submitted to the Contracting Officer for a written decision. A claim by the PHA against the Contractor shall be subject to a written decision by the Contracting Officer.

(d) The Contracting Officer shall, within 60 (unless otherwise indicated) days after receipt of the request, decide the claim or notify the Contractor of the date by which the decision will be made.

(e) The Contracting Officer's decision shall be final unless the Contractor (1) appeals in writing to a higher level in the PHA in accordance with the PHA's policy and procedures, (2) refers the appeal to an independent mediator or arbitrator, or (3) files suit in a court of competent jurisdiction. Such appeal must be made within (30 unless otherwise indicated) days after receipt of the Contracting Officer's decision.

(f) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under or relating to the contract, and comply with any decision of the Contracting Officer.

32. Default

(a) If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with the diligence that will insure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within this time, the Contracting Officer may, by written notice to the Contractor, terminate the right to

proceed with the work (or separable part of the work) that has been delayed. In this event, the PHA may take over the work and complete it, by contract or otherwise, and may take possession of and use any materials, equipment, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to the PHA resulting from the Contractor's refusal or failure to complete the work within the specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the PHA in completing the work.

(b) The Contractor's right to proceed shall not be terminated or the Contractor charged with damages under this clause if—

(1) The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include (i) acts of God, or of the public enemy, (ii) acts of the PHA or other governmental entity in either its sovereign or contractual capacity, (iii) acts of another contractor in the performance of a contract with the PHA, (iv) fires, (v) floods, (vi) epidemics, (vii) quarantine restrictions, (viii) strikes, (ix) freight embargoes, (x) unusually severe weather, or (xi) delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and the subcontractors or suppliers; and

(2) The Contractor, within days (10 days unless otherwise indicated) from the beginning of such delay (unless extended by the Contracting Officer) notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of the delay. If, in the judgment of the Contracting Officer, the findings of fact warrant such action, time for completing the work shall be extended by written modification to the contract. The findings of the Contracting Officer shall be reduced to a written decision which shall be subject to the provisions of the Disputes clause of this contract.

(c) If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been for convenience of the PHA.

33. Liquidated Damages

(a) If the Contractor fails to complete the work within the time specified in the contract, or any extension, as specified in the clause entitled Default of this contract, the Contractor shall pay to the PHA as liquidated damages, the sum of $_____Contracting Officer insert amount] for each day of delay. If different completion dates are specified in the contract for separate parts or stages of the work, the amount of liquidated damages shall be assessed on those parts or stages which are delayed. To the extent that the Contractor's delay or nonperformance is excused under another clause in this contract, liquidated damages shall not be due the PHA. The Contractor remains liable for damages caused other than by delay.

(b) If the PHA terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the PHA in completing the work.

(c) If the PHA does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

34. Termination for Convenience

(a) The Contracting Officer may terminate this contract in whole, or in part, whenever the Contracting Officer determines that such termination is in the best interest of the PHA. Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which the performance of the work under the contract is terminated, and the date upon which such termination becomes effective.

(b) If the performance of the work is terminated, either in whole or in part, the PHA shall be liable to the Contractor for reasonable and proper costs resulting from such termination upon the receipt by the PHA of a properly presented claim setting out in detail: (1) the total cost of the work performed to date of termination less the total amount of contract payments made to the Contractor; (2) the cost (including reasonable profit) of settling and paying claims under subcontracts and material orders for work performed and materials and supplies delivered to the site, payment for which has not been made by the PHA to the Contractor or by the Contractor to the subcontractor or supplier; (3) the cost of preserving and protecting the work already performed until the PHA or assignee takes possession thereof or assumes responsibility therefore; (4) the actual or estimated cost of legal and accounting services reasonably necessary to prepare and present the termination claim to the PHA; and (5) an amount constituting a reasonable profit on the value of the work performed by the Contractor.

(c) The Contracting Officer will act on the Contractor's claim within days (60 days unless otherwise indicated) of receipt of the Contractor's claim.

(d) Any disputes with regard to this clause are expressly made subject to the provisions of the Disputes clause of this contract.

35. Assignment of Contract

The Contractor shall not assign or transfer any interest in this contract; except that claims for monies due or to become due from the PHA under the contract may be assigned to a bank, trust company, or other financial institution. Such assignments of claims shall only be made with the written concurrence of the Contracting Officer. If the Contractor is a partnership, this contract shall inure to the benefit of the surviving or remaining member(s) of such partnership as approved by the Contracting Officer.

36. Insurance

(a) Before commencing work, the Contractor and each subcontractor shall furnish the PHA with certificates of insurance showing the following insurance is in force and will insure all operations under the Contract:

(1) Workers' Compensation, in accordance with state or Territorial Workers' Compensation laws.

(2) Commercial General Liability with a combined single limit for bodily injury and property damage of not less than $2MM [Contracting Officer insert amount]

per occurrence to protect the Contractor and each subcontractor against claims for bodily injury or death and damage to the property of others. This shall cover the use of all equipment, hoists, and vehicles on the site(s) not covered by Automobile Liability under (3) below. If the Contractor has a "claims made" policy, then the following additional requirements apply: the policy must provide a "retroactive date" which must be on or before the execution date of the Contract; and the extended reporting period may not be less than five years following the completion date of the Contract.

(3) Automobile Liability on owned and non -owned motor vehicles used on the site(s) or in connection therewith for a combined single limit for bodily injury and property damage of not less than $ 500K [Contracting Officer insert amount] per occurrence.

(b) Before commencing work, the Contractor shall furnish the PHA with a certificate of insurance evidencing that Builder's Risk (fire and extended coverage) Insurance on all work in place and/or materials stored at the building site(s), including foundations and building equipment, is in force. The Builder's Risk Insurance shall be for the benefit of the Contractor and the PHA as their interests may appear and each shall be named in the policy or policies as an insured. The Contractor in installing equipment supplied by the PHA shall carry insurance on such equipment from the time the Contractor takes possession thereof until the Contract work is accepted by the PHA. The Builder's Risk Insurance need not be carried on excavations, piers, footings, or foundations until such time as work on the superstructure is started. It need not be carried on landscape work. Policies shall furnish coverage at all times for the full cash value of all completed construction, as well as materials in place and/or stored at the site(s), whether or not partial payment has been made by the PHA. The Contractor may terminate this insurance on buildings as of the date taken over for occupancy by the PHA. The Contractor is not required to carry Builder's Risk Insurance for modernization work which does not involve structural alterations or additions and where the PHA's existing fire and extended coverage policy can be endorsed to include such work.

(c) All insurance shall be carried with companies which are financially responsible and admitted to do business in the State in which the project is located. If any such insurance is due to expire during the construction period, the Contractor (including subcontractors, as applicable) shall not permit the coverage to lapse and shall furnish evidence of coverage to the Contracting Officer. All certificates of insurance, as evidence of coverage, shall provide that no coverage may be canceled or non-renewed by the insurance company until at least 30 days prior written notice has been given to the Contracting Officer.

37. Subcontracts

(a) Definitions. As used in this contract -

(1) "Subcontract" means any contract, purchase order, or other purchase agreement, including modifications and change orders to the foregoing, entered into by a subcontractor to furnish supplies, materials, equipment, and services for the performance of the prime contract or a subcontract.

(2) "Subcontractor" means any supplier, vendor, or firm that furnishes supplies, materials, equipment, or services to or for the Contractor or another subcontractor.

(b) The Contractor shall not enter into any subcontract with any subcontractor who has been temporarily denied participation in a HUD program or who has been suspended or debarred from participating in contracting programs by any agency of the United States Government or of the state in which the work under this contract is to be performed.

(c) The Contractor shall be as fully responsible for the acts or omissions of its subcontractors, and of persons either directly or indirectly employed by them as for the acts or omissions of persons directly employed by the Contractor.

(d) The Contractor shall insert appropriate clauses in all subcontracts to bind subcontractors to the terms and conditions of this contract insofar as they are applicable to the work of subcontractors.

(e) Nothing contained in this contract shall create any contractual relationship between any subcontractor and the PHA or between the subcontractor and HUD.

38. Subcontracting with Small and Minority Firms, Women's Business Enterprise, and Labor Surplus Area Firms

The Contractor shall take the following steps to ensure that, whenever possible, subcontracts are awarded to small business firms, minority firms, women's business enterprises, and labor surplus area firms:

(a) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;

(b) Ensuring that small and minority businesses and women's business enterprises are solicited whenever they are potential sources;

(c) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses and women's business enterprises;

(d) Establishing delivery schedules, where the requirements of the contract permit, which encourage participation by small and minority businesses and women's business enterprises; and

(e) Using the services and assistance of the U.S. Small Business Administration, the Minority Business Development Agency of the U.S. Department of Commerce, and State and local governmental small business agencies.

39. Equal Employment Opportunity

During the performance of this contract, the Contractor agrees as follows:

(a) The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, or handicap.

(b) The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, national origin, or handicap. Such action shall include, but not be limited to, (1) employment, (2) upgrading, (3) demotion, (4) transfer, (5) recruitment or recruitment advertising, (6) layoff or termination, (7) rates of pay or other forms of compensation, and (8) selection for training, including apprenticeship.

(c) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.

(d) The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, or handicap.

(e) The Contractor shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.

(f) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

(g) The Contractor shall furnish all information and reports required by Executive Order 11246, as amended, Section 503 of the Rehabilitation Act of 1973, as amended, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto. The Contractor shall permit access to its books, records, and accounts by the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(h) In the event of a determination that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, this contract may be canceled, terminated, or suspended in whole or in part, and the Contractor may be declared ineligible for further Government contracts, or Federally assisted construction contracts under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law.

(i) The Contractor shall include the terms and conditions of this clause in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor. The Contractor shall take such action with respect to any subcontract or purchase order as the Secretary of Housing and Urban Development or the Secretary of Labor may direct as a means of enforcing such provisions, including sanctions for noncompliance; provided that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

(j) Compliance with the requirements of this clause shall be to the maximum extent consistent with, but not in derogation of, compliance with section 7(b) of the Indian Self-Determination and Education Assistance Act and the Indian Preference clause of this contract.

40. Employment, Training, and Contracting Opportunities for Low-Income Persons, Section 3 of the Housing and Urban Development Act of 1968.

(a) The work to be performed under this contract is subject to the requirements of section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (section 3). The purpose of section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

(b) The parties to this contract agree to comply with HUD's regulations in 24 CFR Part 135, which implement section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the Part 135 regulations.

(c) The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

(d) The contractor agrees to include this section 3 clause in every subcontract subject to compliance with regulations in 24 CFR Part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR Part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR Part 135.

(e) The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR Part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR Part 135.

(f) Noncompliance with HUD's regulations in 24 CFR Part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

(g) With respect to work performed in connection with section 3 covered Indian housing assistance, section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this contract that are subject to the provisions of section 3 and section 7(b)agree to comply with section 3 to the maximum extent feasible, but not in derogation of compliance with section 7(b).

41. Interest of Members of Congress

No member of or delegate to the Congress of the United States of America shall be admitted to any share or part of this contract or to any benefit that may arise therefrom.

42. Interest of Members, Officers, or Employees and Former Members, Officers, or Employees

No member, officer, or employee of the PHA, no member of the governing body of the locality in which the project is situated, no member of the governing body of the locality in which the PHA was activated, and no other public official of such locality or localities who exercises any functions or responsibilities with respect to the project, shall, during his or her tenure, or for one year thereafter, have any interest, direct or indirect, in this contract or the proceeds thereof.

43. Limitations on Payments made to Influence Certain Federal Financial Transactions

(a) The Contractor agrees to comply with Section 1352 of Title 31, United States Code which prohibits the use of Federal appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.

(b) The Contractor further agrees to comply with the requirement of the Act to furnish a disclosure (OMB Standard Form LLL, Disclosure of Lobbying Activities) if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

44. Royalties and Patents

The Contractor shall pay all royalties and license fees. It shall defend all suits or claims for infringement of any patent rights and shall save the PHA harmless from loss on account thereof; except that the PHA shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified and the Contractor has no reason to believe that the specified design, process, or product is an infringement. If, however, the Contractor has reason to believe that any design, process or product specified is an infringement of a patent, the Contractor shall promptly notify the Contracting Officer. Failure to give such notice shall make the Contractor responsible for resultant loss.

45. Examination and Retention of Contractor's Records

(a) The PHA, HUD, or Comptroller General of the United States, or any of their duly authorized representatives shall, until 3 years after final payment under this contract, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract for the purpose of making audit, examination, excerpts, and transcriptions.

(b) The Contractor agrees to include in first-tier subcontracts under this contract a clause substantially the same as paragraph (a) above. "Subcontract," as used in this clause, excludes purchase orders not exceeding $10,000.

(c) The periods of access and examination in paragraphs (a) and (b) above for records relating to (1) appeals under the Disputes clause of this contract, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which the PHA, HUD, or Comptroller General or any of their duly authorized representatives has taken exception shall continue until disposition of such appeals, litigation, claims, or exceptions.

46. Labor Standards - Davis-Bacon and Related Acts

If the total amount of this contract exceeds $2,000, the Federal labor standards set forth in the clause below shall apply to the development or construction work to be performed under the contract.

(a) Minimum Wages.

(1) All laborers and mechanics employed under this contract in the development or construction of the project(s) involved will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the regular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall

be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(2) (i) Any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when all the following criteria have been met: (A) The work to be performed by the classification requested is not performed by a classification in the wage determination; and (B) The classification is utilized in the area by the construction industry; and (C) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(ii) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employee Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.

(iii) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.

(iv) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (a)(2)(ii) or (iii) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in classification.

(3) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(4) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(b) Withholding of funds. HUD or its designee shall, upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working in the construction or development of the project, all or part of the wages required by the contract, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the Contractor, disburse such amounts withheld for and on account of the Contractor or subcontractor to the respective employees to whom they are due.

(c) Payrolls and basic records.

(1) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working in the construction or development of the project. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under 29 CFR 5.5(a)(1)(iv), that the wages of any laborer or mechanic include the amount of costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(2) (i) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under subparagraph (c)(1) of this clause. This information may be submitted in any form desired. Optional Form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. The Contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1214-0149.)

(ii) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(A) That the payroll for the payroll period contains the information required to be maintained under paragraph (c) (1) of this clause and that such information is correct and complete;

(B) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3; and

(C) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(iii) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirements for submission of the "Statement of Compliance" required by subparagraph (c)(2)(ii) of this clause.

(iv) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

(3) The Contractor or subcontractor shall make the records required under subparagraph (c)(1) available for inspection, copying, or transcription by authorized representatives of HUD or its designee, the Contracting Officer, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(d) (1) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship and Training, Employer and Labor Services (OATELS), or with a State Apprenticeship Agency recognized by OATELS, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by OATELS or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in this paragraph, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator of the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event OATELS, or a State Apprenticeship Agency recognized by OATELS, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(2) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under

the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(3) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

(e) Compliance with Copeland Act requirements. The Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this contract.

(f) Contract termination; debarment. A breach of this contract clause may be grounds for termination of the contract and for debarment as a Contractor and a subcontractor as provided in 29 CFR 5.12.

(g) Compliance with Davis-Bacon and related Act requirements. All rulings and interpretations of the Davis-Bacon and related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

(h) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this clause shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the PHA, HUD, the U.S. Department of Labor, or the employees or their representatives.

(i) Certification of eligibility.

(1) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(2) No part of this contract shall be subcontracted to any person or firm ineligible for award of a United States Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(3) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.

(j) Contract Work Hours and Safety Standards Act. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics, including watchmen and guards, shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the provisions set forth in subparagraph (j)(1) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic (including watchmen and guards) employed in violation of the provisions set forth in subparagraph (j)(1) of this clause, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by provisions set forth in subparagraph (j)(1) of this clause.

(3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in subparagraph (j)(2) of this clause.

(k) Subcontracts. The Contractor or subcontractor shall insert in any subcontracts all the provisions contained in this clause, and such other clauses as HUD or its designee may by appropriate instructions require, and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all these provisions.

47. Non-Federal Prevailing Wage Rates

(a) Any prevailing wage rate (including basic hourly rate and any fringe benefits), determined under State or tribal law to be prevailing, with respect to any employee in any trade or position employed under the contract, is inapplicable to the contract and shall not be enforced against the Contractor or any subcontractor, with respect to employees engaged under the contract whenever such non-Federal prevailing wage rate exceeds:
(1) The applicable wage rate determined by the Secretary of Labor pursuant to the Davis-Bacon Act (40 U.S.C. 3141 et seq.) to be prevailing in the locality with respect to such trade;
(b) An applicable apprentice wage rate based thereon specified in an apprenticeship program registered with the U.S. Department of Labor (DOL) or a DOL-recognized State Apprenticeship Agency; or
(c) An applicable trainee wage rate based thereon specified in a DOL-certified trainee program.

48. Procurement of Recovered Materials.

(a) In accordance with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, the Contractor shall procure items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition. The Contractor shall procure items designated in the EPA guidelines that contain the highest percentage of recovered materials practicable unless the Contractor determines that such items: (1) are not reasonably available in a reasonable period of time; (2) fail to meet reasonable performance standards, which shall be determined on the basis of the guidelines of the National Institute of Standards and Technology, if applicable to the item; or (3) are only available at an unreasonable price.
(b) Paragraph (a) of this clause shall apply to items purchased under this contract where: (1) the Contractor purchases in excess of $10,000 of the item under this contract; or (2) during the preceding Federal fiscal year, the Contractor: (i) purchased any amount of the items for use under a contract that was funded with Federal appropriations and was with a Federal agency or a State agency or agency of a political subdivision of a State; and (ii) purchased a total of in excess of $10,000 of the item both under and outside that contract.

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ

For vendor doing business with local governmental entity

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. *See* Section 176.006(a-1), Local Government Code.

A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.

OFFICE USE ONLY

Date Received

1 **Name of vendor who has a business relationship with local governmental entity.**

2 ☐ **Check this box if you are filing an update to a previously filed questionnaire.** (The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 **Name of local government officer about whom the information is being disclosed.**

_____

Name of Officer

4 **Describe each employment or other business relationship with the local government officer, or a family member of the officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship with the local government officer. Complete subparts A and B for each employment or business relationship described. Attach additional pages to this Form CIQ as necessary.**

A. Is the local government officer or a family member of the officer receiving or likely to receive taxable income, other than investment income, from the vendor?

☐ Yes ☐ No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer or a family member of the officer AND the taxable income is not received from the local governmental entity?

☐ Yes ☐ No

5 **Describe each employment or business relationship that the vendor named in Section 1 maintains with a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more.**

6 ☐ Check this box if the vendor has given the local government officer or a family member of the officer one or more gifts as described in Section 176.003(a)(2)(B), excluding gifts described in Section 176.003(a-1).

7

_____ _____

Signature of vendor doing business with the governmental entity Date

CONFLICT OF INTEREST QUESTIONNAIRE
For vendor doing business with local governmental entity

A complete copy of Chapter 176 of the Local Government Code may be found at http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.176.htm. For easy reference, below are some of the sections cited on this form.

Local Government Code § 176.001(1-a): "Business relationship" means a connection between two or more parties based on commercial activity of one of the parties. The term does not include a connection based on:

(A) a transaction that is subject to rate or fee regulation by a federal, state, or local governmental entity or an agency of a federal, state, or local governmental entity;

(B) a transaction conducted at a price and subject to terms available to the public; or

(C) a purchase or lease of goods or services from a person that is chartered by a state or federal agency and that is subject to regular examination by, and reporting to, that agency.

Local Government Code § 176.003(a)(2)(A) and (B):

(a) A local government officer shall file a conflicts disclosure statement with respect to a vendor if:

***

(2) the vendor:

(A) has an employment or other business relationship with the local government officer or a family member of the officer that results in the officer or family member receiving taxable income, other than investment income, that exceeds $2,500 during the 12-month period preceding the date that the officer becomes aware that

(i) a contract between the local governmental entity and vendor has been executed; or

(ii) the local governmental entity is considering entering into a contract with the vendor;

(B) has given to the local government officer or a family member of the officer one or more gifts that have an aggregate value of more than $100 in the 12-month period preceding the date the officer becomes aware that:

(i) a contract between the local governmental entity and vendor has been executed; or

(ii) the local governmental entity is considering entering into a contract with the vendor.

Local Government Code § 176.006(a) and (a-1)

(a) A vendor shall file a completed conflict of interest questionnaire if the vendor has a business relationship with a local governmental entity and:

(1) has an employment or other business relationship with a local government officer of that local governmental entity, or a family member of the officer, described by Section 176.003(a)(2)(A);

(2) has given a local government officer of that local governmental entity, or a family member of the officer, one or more gifts with the aggregate value specified by Section 176.003(a)(2)(B), excluding any gift described by Section 176.003(a-1); or

(3) has a family relationship with a local government officer of that local governmental entity.

(a-1) The completed conflict of interest questionnaire must be filed with the appropriate records administrator not later than the seventh business day after the later of:

(1) the date that the vendor:

(A) begins discussions or negotiations to enter into a contract with the local governmental entity; or

(B) submits to the local governmental entity an application, response to a request for proposals or bids, correspondence, or another writing related to a potential contract with the local governmental entity; or

(2) the date the vendor becomes aware:

(A) of an employment or other business relationship with a local government officer, or a family member of the officer, described by Subsection (a);

(B) that the vendor has given one or more gifts described by Subsection (a); or

(C) of a family relationship with a local government officer.

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

OFFICE USE ONLY

Complete Nos. 1 - 4 and 6 if there are interested parties.
Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.

3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the goods or services to be provided under the contract.

4 Name of Interested Party	City, State, Country (place of business)	Nature of Interest (check applicable)	
		Controlling	Intermediary

5 Check only if there is NO Interested Party. ☐

6 AFFIDAVIT

I swear, or affirm, under penalty of perjury, that the above disclosure is true and correct.

_____
Signature of authorized agent of contracting business entity

AFFIX NOTARY STAMP / SEAL ABOVE

Sworn to and subscribed before me, by the said _____, this the _____ day of _____, 20 _____ , to certify which, witness my hand and seal of office.

_____ _____ _____
Signature of officer administering oath | Printed name of officer administering oath | Title of officer administering oath

ADD ADDITIONAL PAGES AS NECESSARY

DISCLOSURE OF LOBBYING ACTIVITIES

Approved by OMB
0348-0046

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352
(See reverse for public burden disclosure.)

1. Type of Federal Action:	2. Status of Federal Action:	3. Report Type:
☐ a. contract b. grant c. cooperative agreement d. loan e. loan guarantee f. loan insurance	☐ a. bid/offer/application b. initial award c. post-award	☐ a. initial filing b. material change **For Material Change Only:** year _____ quarter _____ date of last report _____

4. Name and Address of Reporting Entity:	5. If Reporting Entity in No. 4 is a Subawardee, Enter Name and Address of Prime:
☐ **Prime** ☐ **Subawardee** Tier _____, *if known*: **Congressional District**, *if known*: 4c	 **Congressional District**, *if known*:
6. Federal Department/Agency:	**7. Federal Program Name/Description:** CFDA Number, *if applicable*: _____
8. Federal Action Number, *if known*:	**9. Award Amount,** *if known*: $
10. a. Name and Address of Lobbying Registrant (*if individual, last name, first name, MI*):	**b. Individuals Performing Services** (*including address if different from No. 10a*) (*last name, first name, MI*):
11. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.	Signature: _____ Print Name: _____ Title: _____ Telephone No.: _____ Date: _____
Federal Use Only:	Authorized for Local Reproduction Standard Form LLL (Rev. 7-97)

PRINT

INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime Federal recipient, at the initiation or receipt of a covered Federal action, or a material change to a previous filing, pursuant to title 31 U.S.C. section 1352. The filing of a form is required for each payment or agreement to make payment to any lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employeeof a Member of Congress in connection with a covered Federal action. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered Federal action for which lobbying activity is and/or has been secured to influence the outcome of a covered Federal action.

2. Identify the status of the covered Federal action.

3. Identify the appropriate classification of this report. If this is a followup report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity for this covered Federal action.

4. Enter the full name, address, city, State and zip code of the reporting entity. Include Congressional District, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be, a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the 1st tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.

5. If the organization filing the report in item 4 checks "Subawardee," then enter the full name, address, city, State and zip code of the prime Federal recipient. Include Congressional District, if known.

6. Enter the name of the Federal agency making the award or loan commitment. Include at least one organizationallevel below agency name, if known. For example, Department of Transportation, United States Coast Guard.

7. Enter the Federal program name or description for the covered Federal action (item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.

8. Enter the most appropriate Federal identifying number available for the Federal action identified in item 1 (e.g., Request for Proposal (RFP) number; Invitation for Bid (IFB) number; grant announcement number; the contract, grant, or loan award number; the application/proposal control number assigned by the Federal agency). Include prefixes, e.g., "RFP-DE-90-001."

9. For a covered Federal action where there has been an award or loan commitment by the Federal agency, enter the Federal amount of the award/loan commitment for the prime entity identified in item 4 or 5.

10. (a) Enter the full name, address, city, State and zip code of the lobbying registrant under the Lobbying Disclosure Act of 1995 engaged by the reporting entity identified in item 4 to influence the covered Federal action.

    (b) Enter the full names of the individual(s) performing services, and include full address if different from 10 (a). Enter Last Name, First Name, and Middle Initial (MI).

11. The certifying official shall sign and date the form, print his/her name, title, and telephone number.

OMB Approval No. 2577-0157 (Exp. 01/31/2017)

Certification of Payments to Influence Federal Transactions

U.S. Department of Housing and Urban Development
Office of Public and Indian Housing

Applicant Name

Program/Activity Receiving Federal Grant Funding

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, Disclosure Form to Report Lobbying, in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all sub recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

I hereby certify that all the information stated herein, as well as any information provided in the accompaniment herewith, is true and accurate. **Warning:** HUD will prosecute false claims and statements. Conviction may result in criminal and/or civil penalties. (18 U.S.C. 1001, 1010, 1012; 31 U.S.C. 3729, 3802)

Name of Authorized Official	Title

Signature	Date (mm/dd/yyyy)

U.S. Department of Labor
Employment Standards Administration
Wage and Hour Division

PAYROLL

(For Contractor's Optional Use; See Instructions at www.dol.gov/esa/whd/forms/wh347instr.htm)

Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.

U.S. Wage and Hour Division

Rev. Dec. 2008

OMB No.: 1215-0149
Expires: 12/31/2011

NAME OF CONTRACTOR ☐ OR SUBCONTRACTOR ☐	ADDRESS	
PAYROLL NO.	FOR WEEK ENDING	PROJECT AND LOCATION / PROJECT OR CONTRACT NO.

(1) NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g., LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER) OF WORKER	(2) NO. OF WITHHOLDING EXEMPTIONS	(3) WORK CLASSIFICATION	OT. OR ST.	(4) DAY AND DATE — HOURS WORKED EACH DAY	(5) TOTAL HOURS	(6) RATE OF PAY	(7) GROSS AMOUNT EARNED	(8) DEDUCTIONS: FICA	WITH-HOLDING TAX			OTHER	TOTAL DEDUCTIONS	(9) NET WAGES PAID FOR WEEK
			O											
			S											
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			O											
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While completion of Form WH-347 is optional, it is mandatory for covered contractors and subcontractors performing work on Federally financed or assisted construction contracts to respond to the information collection contained in 29 C.F.R. §§ 3.3, 5.5(a). The Copeland Act (40 U.S.C. § 3145) contractors and subcontractors performing work on Federally financed or assisted construction contracts to "furnish weekly a statement with respect to the wages paid each employee during the preceding week." U.S. Department of Labor (DOL) regulations at 29 C.F.R. § 5.5(a)(3)(ii) require contractors to submit weekly a copy of all payrolls to the Federal agency contracting for or financing the construction project, accompanied by a signed "Statement of Compliance" indicating that the payrolls are correct and complete and that each laborer or mechanic has been paid not less than the proper Davis-Bacon prevailing wage rate for the work performed. DOL and federal contracting agencies receiving this information review the information to determine that employees have received legally required wages and fringe benefits.

Public Burden Statement

We estimate that is will take an average of 55 minutes to complete this collection, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, ESA, U.S. Department of Labor, Room S3502, 200 Constitution Avenue, N.W. Washington, D.C. 20210

(over)

Date _____

I, _____ _____
(Name of Signatory Party) (Title)

do hereby state:

(1) That I pay or supervise the payment of the persons employed by

_____ on the
(Contractor or Subcontractor)

_____; that during the payroll period commencing on the
(Building or Work)

_____ day of _____, _____, and ending the _____ day of _____, _____,

all persons employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said

_____ from the full
(Contractor or Subcontractor)

weekly wages earned by any person and that no deductions have been made either directly or indirectly from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part 3 (29 C.F.R. Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948, 63 Start. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. § 3145), and described below:

_____

_____

_____

_____

(2) That any payrolls otherwise under this contract required to be submitted for the above period are correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the applicable wage rates contained in any wage determination incorporated into the contract; that the classifications set forth therein for each laborer or mechanic conform with the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:

(a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS

☐ – in addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above referenced payroll, payments of fringe benefits as listed in the contract have been or will be made to appropriate programs for the benefit of such employees, except as noted in section 4(c) below.

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

☐ – Each laborer or mechanic listed in the above referenced payroll has been paid, as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract, except as noted in section 4(c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION

REMARKS:

NAME AND TITLE	SIGNATURE

THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. SEE SECTION 1001 OF TITLE 18 AND SECTION 231 OF TITLE 31 OF THE UNITED STATES CODE.

ATTACHMENT C
Profile of Firm Form
Company Biography
Subcontractor Listing

PROFILE OF FIRM FORM (Page 1 of 2)

(1) Prime ____ Joint Venture/Partner____ Sub-contractor _____ (This form shall be completed by and for each).

(2) Legal Name of Firm:_____

dba if applicable: _____

Telephone:_____ Fax: _____

Street Address, City, State, Zip:_____

(3) Identify Principals/Partners in Firm

NAME	*TITLE*	% OF OWNERSHIP

(4) Please indicate the operating structure of your company.

☐ Publicly Held Corporation ☐ Privately Held Corporation ☐ Government Agency ☐ Non-Profit Organization ☐ Partnership ☐ Sole Proprietorship

(5) Respondent's Diversity Statement: You must check all of the following that apply to the ownership of this firm and enter where provided the correct percentage (%) of ownership of each:

Minority- (MBE), or Woman-Owned (WBE) Business Enterprises qualify by virtue of 51% or more ownership and active management by one or more of the following:

☐African American ☐ Native American ☐Hispanic American ☐Asian/Pacific American ☐Hasidic Jew ☐Asian/Indian American

_____% _____% _____% _____% _____% _____%

☐Woman-Owned (MBE) ☐Woman-Owned (Caucasian) ☐Disabled Veteran ☐ Caucasian American (Male) ☐Other (Specify):

_____% _____% _____% _____% _____%

(6) Is the business 51% or more owned by a public housing resident? ___ Yes; ___ No. If yes, provide name and address of the public housing facility:

Facility Name:_____

Facility Address:_____ City:_____

(7) SWMBE Certification Number: _____

Certification Agency: _____
(NOTE: A CERTIFICATION/NUMBER IS NOT REQUIRED – ENTER IF AVAILABLE)

(8) Federal Tax ID Number: _____

(9) City of San Antonio Business License No.:_____

(10) State of Texas License Type and No.: _____

PROFILE OF FIRM FORM (Page 2 of 2)

(11) Has your firm or any member of your firm been a party to litigation with a public entity? If yes, when, with whom and state the circumstances and any resolution.

(12) Has your firm or any member of your firm ever sued or been sued by the San Antonio Housing Authority or its affiliated entities? If yes, when and state the circumstances and any resolution of the lawsuit.

(13) Has your firm or any member of your firm ever had a claim brought against because of breach of contract or nonperformance? If yes, when and state the circumstances and any resolution of the matter.

(14) Debarred Statement: Has this firm, or any principal(s) ever been debarred from providing any services by the Federal Government, any state government, the State of Texas, or any local government agency within or without the State of Texas? Yes ☐ No ☐

Initials_____

If "Yes," please attach a full detailed explanation, including dates, circumstances and current status.

(15) Disclosure Statement: Does this firm or any principals thereof have any current, past personal or professional relationship with any Commissioner or Officer of SAHA? Yes ☐ No ☐

Initials_____

If "Yes," please attach a full detailed explanation, including dates, circumstances and current status.

(16) Verification Statement: The undersigned Offerer hereby states that by completing and submitting this form he/she is verifying that all information provided herein is, to the best of his/her knowledge, true and accurate, and agrees that if the SAHA discovers that any information entered herein is false, that shall entitle the SAHA to not consider nor make award or to cancel any award with the undersigned party.

Initials_____

(17) In performing this contract, the contractor(s) shall comply with any and all applicable federal, state or local laws including but not limited to: Occupational Safety & Health, Equal Employment Opportunity, Immigration and Naturalization, The Americans with Disabilities Act, State Tax and Insurance Law, and the Fair Housing Act.

Initials_____

_____	_____	_____	_____
Signature	**Date**	**Printed Name**	**Company**

Company Biography

Company Name:

Headquarters Location:

Field Office Locations:

Business Specialty or Focus:

Number of Full Time Staff:

Founding Date and Brief History:

Texas Projects and/or Clients:
(past & current)

Previous Housing Authority Experience: **YES** **NO**

List the Authorities:

Proposed Subcontractors

Note: A completed Profile of Firm Form must be submitted for each subcontractor.

Proposed Subcontractors					
Item	Company Name	Address	Phone	Specialty	S/W/M/V BE
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

I understand and agree that if awarded a contract as a result of this solicitation that the use of the above subcontractors is subject to the approval of SAHA and becomes a part of the contract. I further understand that any change in subcontractors also requires the pre-approval of SAHA.	_____ (Signature) _____ (Printed Name & Title) _____ (Company Name)

ATTACHMENT D
Section 3 and SWMBE Guidelines and Forms

SAN ANTONIO HOUSING AUTHORITY

SECTION 3 PROGRAM

CONTRACTOR COMPLIANCE GUIDE

BACKGROUND

The San Antonio Housing Authority (SAHA) adopted a formal Section 3 program, policy, and procedures on June 2, 2011 (Resolution 5164) to provide the framework for its compliance with Section 3 of the Housing and Urban Development (HUD) Act of 1968 which applies to all employment and economic projects funded in whole or in part by HUD.

Therefore, all prime contractors participating on a HUD-assisted project shall comply with all applicable sections of the SAHA Section 3 Program.

The objective of the SAHA Section 3 Program is to ensure to the greatest extent feasible that employment and other economic-related opportunities are directed to low- and very-low income individuals and businesses owned by such individuals.

SECTION 3 GUIDANCE

1. The SAHA Section 3 Program adopted on June 2, 2011 is hereby incorporated by reference as part of this Interim Section 3 Guidance. Notice is hereby given that it is the responsibility of bidder/proposer or contractor to ensure understanding and compliance with all applicable sections of the Section 3 Program. Bidders/proposers and/or prime contractors are directed to the SAHA website for more information on the Section 3 Program.

2. The Section 3 Program requirements apply to all HUD-assisted projects covered by Section 3 and are therefore applicable to SAHA bidders/proposers and recipients of contracts and subcontracts.

3. In order to achieve the Section 3 Program objectives, numerical goals for training/employment and subcontracting opportunities for Section 3 residents and Business Concerns have been established. The Section 3 goals (below) apply to the entire Section 3 covered project and represent minimum numerical goals set forth in the Section 3 Program. In the absence of evidence to the contrary, a contractor that meets the minimum numerical goals will be considered to have complied with the Section 3 Program requirements. SAHA reserves the right to increase project-specific goals as may be deemed appropriate by the SAHA representatives. Contractors are advised to read each solicitation carefully to determine the applicable goals for compliance. In the event the solicitation changes the goals listed below, Contractor must follow the stricter goals.

   Employment: Thirty percent (30%) of new hires per contract should be Section 3 residents.

Contracting: Subcontract ten percent (10%) of the total value of a construction contract with Section 3 Business Concerns.
Professional Services: Subcontract three percent (3%) with Section 3 Business Concerns on non-construction contracts (professional services).

3. In order to ensure the greatest impact on employment, contracting and economic opportunities, SAHA contractors and subcontractors shall direct their efforts to Section 3 residents and Business Concerns on a "preference" tiered basis as follows:

Training/Employment

a) Category 1: Residents of the housing development or developments for which the Section 3 covered assistance is expended.
b) Category 2: Residents of the other housing developments managed by the housing authority that is expending the Section 3 covered assistance.
c) Category 3: Participants in HUD Youthbuild programs being carried out in the metropolitan area in which the Section 3 covered assistance is expended.
d) Other Section 3 residents.

Contracting Opportunities

a) Category 1: Business Concerns that are 51 percent or more owned by residents of the housing development or developments for which the Section 3 covered assistance is expended, or whose full-time permanent workforce includes 30 percent of those persons as employees.
b) Category 2: Business Concerns that are 51 percent or more owned by residents of other housing developments or developments managed by the housing authority that is expending the Section 3 covered assistance, or whose full-time permanent workforce includes 30 percent of those persons as employees.
c) Category 3: HUD Youthbuild programs being carried out in the metropolitan area (or non-metropolitan county) in which the Section 3 covered assistance is expended.
d) Category 4: Business concerns that are 51 percent or more owned by Section 3 residents or whose permanent, full-time workforce includes no less than 30 percent Section 3 residents, or that subcontract in excess of 25 percent of the total amount of subcontracts to Category 1 or 2 business concerns identified above.

4. To more effectively apply the Section 3 preferences, the following incentives shall be applicable to Section 3 HUD-assisted projects:

Solicitations Under $50,000

On solicitations under $50,000 and where two or more certified Section 3 Business Concerns are available to compete, SAHA will institute a "first source" solicitation initiative whereby two of the three solicited firms must be Section 3 Business Concerns.

Solicitations Greater than $50,000

On Requests for Proposals the following incentives will be instituted:

1) A twenty percent (20%) preference will be instituted for Category 1 Section 3 Business Concerns bidding as prime contractors.
2) A fifteen percent (15%) preference will be instituted for Category 2 Section 3 Business Concerns bidding as prime contractors.
3) A ten percent (10%) preference will be instituted for Category 3 Section 3 Business Concerns bidding as prime contractors.
4) A five percent (5%) preference will be instituted for Category 4 Section 3 Business Concerns bidding as prime contractors.
5) A five percent (5%) preference will be provided to SAHA prime contractors that have achieved both the resident hires and business concern contracting goals in their immediate past contract performance within the last year.
6) A five percent (5%) preference will be provided to SAHA prime contractors participating in a SAHA approved Joint Venture or Mentor-Protégé program with an eligible Section 3 Business Concern.
7) A five percent (5%) preference will be provided to prime contractors that have formal apprenticeship programs approved by DOL and commit to training no less than ten (10) eligible Section 3 residents through such programs annually that provide no less than 250 hours of formal training.

On Invitations for Bids the following preference will be instituted:

1). Contractors who are certified as Section 3 Business Concerns and whose prices are within the independent cost estimate of the project and are both responsive and responsible, shall receive a preference according to the following table, where x is the amount by which the Section 3 Business Concern may be above the lowest responsive bid.

---

x=lesser of:

When the lowest responsive bid
is less than $100,000 10% of that bid or $9,000.

.

When the lowest responsive bid is:
At least $100,000, but less than $200,000 9% of that bid, or $16,000.
At least $200,000, but less than $300,000 8% of that bid, or $21,000.
At least $300,000, but less than $400,000 7% of that bid, or $24,000.

At least $400,000, but less than $500,000 6% of that bid, or $25,000.
At least $500,000, but less than $1 million 5% of that bid, or $40,000.
At least $1 million, but less than $2 million 4% of that bid, or $60,000.
At least $2 million, but less than $4 million 3% of that bid, or $80,000.
At least $4 million, but less than $7 million 2% of that bid, or $105,000.
$7 million or more 1\1/2\% of the lowest responsive bid, with no dollar limit.

2) Where two or more Section 3 business concerns are both responsive and responsible, the Section 3 business concern with the lowest price shall receive the contract award.

A successful contractor's usage of the above preferences shall be capped annually at $1 million dollars in the aggregate. Once a contractor has been awarded annually $1 million dollars in contracts as a result of a preference, the contractor is no longer eligible for the above preferences for the remainder of the calendar year.

5. Bidders/proposers must either achieve the Section 3 Program employment and subcontracting goals identified above (under number 3) or demonstrate acceptable good faith efforts to achieve the numerical goals in the proposal/bid. SAHA representatives shall review and deem acceptable, in their sole determination, a bidder or proposer's good faith efforts prior to the award of the contract. Please be advised that a contractor Section 3 performance will be considered and evaluated on future SAHA contracts and will be a factor in t the selection and/or contract award.

6. To ensure that the SAHA Section 3 Program benefits individuals and businesses that are eligible Section 3 residents and Business Concerns, all Section 3 resident and Business Concerns must be deemed eligible through documentation of a "Section 3 Eligibility Form" for each eligible individual or business. Notice is hereby given that it is the responsibility of the prime contractor to ensure that all participating and eligible Section 3 residents and/or Business Concerns (vendors, suppliers or subcontractors) submit the necessary information for proper SAHA status review and credit.

7. All SAHA prime contractors must submit a Section 3 program compliance report on a monthly basis in the form and content as requested by SAHA staff. This report shall document Section 3 resident and Business Concern training, employment, and subcontracting monthly performance against goals and opportunities.

8. Failure or refusal by a SAHA bidder/proposer or contractor to satisfy or comply with the Section 3 Program requirements, either during the bid/proposal process or during the term of the SAHA agreement, shall constitute a material breach of contract whereupon the contract, at the option of SAHA, may be cancelled, terminated, or suspended in whole or in part; and, the contractor debarred from further contracts with SAHA as a non-responsible contractor. SAHA may at its discretion also declare bids/proposals not complying with the Section 3 Program requirements in whole or in part nonresponsive and eliminate them from consideration of a contract award.

INTERIM PRIME CONTRACTOR COMPLIANCE REQUIREMENTS

Prime contractors participating on SAHA Section 3 HUD-assisted projects are specifically required to address and satisfy the Section 3 Program requirements described below *prior* to the award of the contract. The Section 3 Program requirements shall be applicable throughout the duration of the contract and to any amendment and renewal.

1. In the absence of evidence to the contrary, a prime contractor that meets the minimum Section 3 Program numerical goals set forth in the solicitation will be considered to have complied with the Section 3 Program requirements. A prime contractor who meets this goal must submit with the bid/proposal a "*Good Faith Effort Compliance Plan*" (**Attachment A**) by simply completing Sections A and B which present the project and contractor information and goal commitment information respectfully.

2. In evaluating compliance, a prime contractor that *has not* met the numerical goals set forth in the solicitation has the burden of fully demonstrating its efforts to achieve the Section 3 goals through the submittal and approval of a "*Good Faith Effort Compliance Plan*" (**Attachment A**) to include completion of Sections A. B and C which must be included with the bid/proposal. SAHA representatives shall review and determine in their sole discretion whether a bidder or proposer's (contractor) good faith effort compliance plan achieves the Section 3 Program goals and objectives. A responsive good faith effort compliance plan shall address all questions in Sections A, B and C and describe the concrete efforts that were taken and will be taken to reach numerical goals in hiring/employment, training, and contracting. The final agreed-upon plan shall become part of the SAHA contract.

3. SAHA reserves the right to disregard bids/proposals as non-responsive bids and proposals which fail to demonstrate a good faith effort towards compliance with the Section 3 Program requirements.

4. As required under the Section 3 Program's contractual clause, prime contractors specifically agree to include the Section 3 Clause in every subcontract subject to compliance with regulations in 24 CFR Part 135, and agree to take appropriate action, as provided in an applicable provision of the subcontract or in the Section 3 Clause, upon a finding that a subcontractor is in violation of the regulations in 24 CFR Part 135. A prime contractor shall not subcontract with any subcontractor where the bidder/proposer has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR Part 135.

5. Prime contractors shall submit a properly completed and executed "Section 3 Eligibility Form" for all participating Section 3 residents and/or Section 3 Business Concerns (**Attachment B**). It is the responsibility of the prime contractor to ensure that eligible Section 3 residents and Business Concerns submit all necessary information for SAHA review and credit, to include an eligible Section 3 prime contractor, if applicable.

6. Prime contractors requesting a Section 3 Program preference based upon employment or ownership interest shall submit a properly completed and executed Section 3 Eligibility Forms for all employees and owners who qualify, and provide any supporting documentation that may subsequently be required by SAHA. Prime contractors and subcontractors must employ any Section 3 residents full-time for not less than one month prior to the submittal of the bid/proposal in order for the prime contractor to receive credit for employing the Section 3 resident for a preference.

7. Notwithstanding the fact that a prime contractor may have the capability to complete a total project with its own workforce and without the use of subcontractors, all SAHA prime contractors on a HUD-assisted project shall be required to achieve the Section 3 Program numerical goals or demonstrate a good faith effort to achieve those goals within the industry. Should the need arise to hire or subcontract during the term of a contract, the hiring and/or subcontracting goals shall still be applicable and the training component remains in force.

8. All changes to the original list of subcontractors submitted with the bid or proposal shall be submitted for review and approval in accordance with SAHA's procedures when adding, changing, or deleting subcontractors/sub-consultants. Prime contractors are required to make a good faith effort to replace any Section 3 Business Concern with another eligible Section 3 Business Concern. SAHA may deny such requests when it finds that a prime contractor fails to provide acceptable justification or when the effect of such change would dilute a preference received on a HUD-assisted contract.

9. All prime contractors participating on a HUD-assisted project shall submit a Section 3 Performance Report no later than the third business day of the following month detailing Section 3 employment and contracting activity not only for themselves but also all subcontractors on the project. The report is to also detail training and other economic opportunity activities by the prime contractor and subcontractors.

SAN ANTONIO HOUSING AUTHORITY
SECTION 3 PROGRAM UTILIZATION PLAN

INSTRUCTION SHEET

Please read these instructions carefully before completing the required *Section 3 Utilization Plan* document. These instructions are designed to assist bidders/proposers document Section 3 Program compliance. or present a detailed explanation why, despite their best efforts the minimum numerical goals were not met. These numerical goals are ***minimum*** targets that must be reached in order for SAHA to consider a recipient in compliance.

Questions regarding completion of the *Section 3 Utilization Plan* document should be directed to:
Section 3 Coordinator, at 210 -477 -6165 or section3@saha.org.

- Bidders/proposers are required to make sincere efforts to achieve the Section 3 Program numerical goals as specified in solicitation documents. A bidders/proposers approved Section 3 Utilization Plan will be monitored throughout the duration of the SAHA contractual term.

- Contractor shall submit a *Section 3 Utilization Plan* at the time of bid/proposal submittal in order to be considered responsive.

- This *Section 3 Utilization Plan* is subject to SAHA's review and approval. SAHA may at its sole discretion approve or disapprove the plan. SAHA's determination is administratively appealable to the CEO and to the Board of Commissioners pursuant to SAHA's Section 3 Program, Policy & Procedures.

- All bidders/proposers are to complete the following:

_____ **Section A,** Bidder/Proposer Information

_____ **Section B,** Contractor Commitments - New Hires

_____ **Section C,** Contractor Commitments - Subcontractors

_____ **Section D,** Contractor Commitments – Other Economic Opportunities

_____ **Section E,** Good Faith Efforts

_____ **Section F,** Section 3 Compliance Certification

Optional:

_____ Certification for Section 3 Business Concerns

_____ Section 3 Individual Verification Form (S3-6003b REV 2/2016)

- SAHA requires all Section 3 residents and/or Business Concerns to certify or submit evidence to SAHA, contractor, or subcontractor, that the person or business is Section 3 eligible. SAHA has developed a Certification Process for this purpose. It is the responsibility of the Contractor to submit these forms to the SAHA Section 3 Coordinator at section3@saha.org.

SECTION 3 PROGRAM UTILIZATION PLAN

Project Title: _____

SECTION A – BIDDER/PROPOSER INFORMATION

Name of Firm: _____

Contact Person: _____ Telephone: _____

Email: _____

Is your firm a "Section 3 Business Concern": Yes _____ No_____
If "Yes"; complete the Certification for Section 3 Business Form and attach the Required Documentation.

SECTION B – CONTRACTOR COMMITMENTS – NEW HIRES (If more space is needed, please provide an attachment).

Hiring Goal: A minimum of Thirty percent (30%) of the aggregate number of new hires shall be Section 3 residents

B.1 Explain how you intend to recruit a minimum of 30% of Section 3 residents for **full-time new hires**, and what actions you will use to require subcontractors to do the same. **Note**: Section 3 individuals must work a minimum of 32 hours per week or 135 hours per month to be considered full-time employees.

B.2 Complete the table below to identify the bidder's/proposer's employee positions required for the execution of this project**.**

Job Category*	Number of Positions to be Filled with Section 3 Residents	Anticipated wages per hour
Professionals		
Technicians		
Office/Clerical		
Officers/Managers		
Sales		
Craft Workers (Skilled)		
Operatives (Semi-Skilled)		
Laborers (Unskilled)		
Service Workers		
Other List & describe		

B.3 The contractor has committed to employ _____ resident(s) in order to comply with its Section 3 requirements. Indicate the estimated percentage of Section 3 new hires for this project: _____

SECTION C – CONTRACTOR COMMITMENTS – SUBCONTRACTORS (If more space is needed, please provide an attachment).

Contracting Goal: A minimum of ten percent (10%) of all covered **construction** contracts shall be awarded to Section 3 business concerns C. Three percent (3%) of all covered **non-construction** contracts shall be awarded to Section 3 business concerns

C.1 Describe how bids from Section 3 businesses will be solicited for subcontracting.

C.2 Complete the table below to identify the subcontractors/suppliers that will be utilized for the execution of this project**.**

Subcontractor/Supplier Listing

Subcontractor or Supplier/ Name and Address and phone number	Scope of Work/Product	$ Value	Certified Section 3 Business Concern (Y/N)

(*Make Additional Copies as Necessary*)

C.3 The Prime Contractor will subcontract with a total of _____ Section 3 Business Concerns totaling _____% of the Contract Value. ***NOTE:*** *The contractual opportunity goal is a percentage of the total gross dollar value of the proposed contract awarded to a Section 3 eligible Business Concern. SAHA will only credit participation by Section 3 Business Concerns that submit documentation acceptable to SAHA certifying their Section 3 status.*

SECTION D – CONTRACTOR COMMITMENTS – OTHER ECONOMIC OPPORTUNITIES (If more space is needed, please provide an attachment).

B.3 The undersigned bidder/proposer will satisfy the Section 3 *other economic opportunity* goal:
Yes _____ No_____

Please outline your plan to provide other economic opportunities to Section 3 residents. Examples of plans may include training agreements, internship programs, mentorship programs etc.

SECTION E – GOOD FAITH EFFORTS

NOTE: Fill this section only, if Plan as submitted fails to meet the employment and contractual opportunity goals as stated herein or as amended in the solicitation.

D.1 If no contracting, hiring or other economic opportunities are anticipated, briefly explain why.

SECTION F: SECTION 3 UTILIZATION PLAN CERTIFICATION

I CERTIFY THAT I HAVE REVIEWED AND FULLY UNDERSTAND SAHA'S SECTION 3 PROGRAM AND THE SECTION 3 CLAUSE INCORPORATED BY REFERENCE INTO THIS DOCUMENT. I HEREBY AFFIRM THAT THE INFORMATION SUBMITTED HEREIN IS TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.
I HEREBY CERTIFYTHAT THE ABOVE TABLES IDENTIFY THE NUMBER OF SECTION 3 BUSINESS CONCERNS THE COMPANY WILL UTILIZE AND THE NUMBER OF SECTION 3 RESIDENTS THE COMPANY PROPOSES TO EMPLOY.
I FURTHER UNDERSTAND AND AGREE THAT, THIS DOCUMENT SHALL BE ATTACHED THERETO AND BECOME A BINDING PART OF THE SAHA CONTRACT.

NAME AND TITLE OF AUTHORIZED OFFICIAL:
_____

SIGNATURE: _____ DATE: _____

San Antonio Housing Authority

Section 3 Individual New Hire Verification Form

NEW HIRES MUST COMPLETE THIS FORM. The Section 3 Program requires that recipients of certain HUD financial assistance, to the greatest extent feasible provide employment, training or education opportunities for low- and very-low income persons in connection with projects and activities in their neighborhood. Completion of this form helps your new employer and SAHA monitor compliance to the Section 3 program and may help in obtaining future business with the Housing Authority. Your information is kept CONFIDENTIAL and will not affect any federal subsidies you currently receive, if any.

CONTACT INFORMATION

First Name:	Last:	M.I:	Suffix:
Residence Address:	City:		
State:	Zip:	County:	Phone:
Email Address (required):		DOB:	
Date of Hire:	Company Name:		
Job Title:	Type of job: ◯ Full-Time (32+ hours per week) ◯ Part-Time		

INCOME DISCLOSURE (CHECK ONE OPTION BELOW)

In order to be eligible as a Section 3 individual, your household income must meet the income criteria by household size. Individuals are eligible for Section 3 status if their household income is at or below 80% of Area Median Income in Bexar County during the current calendar year or be a resident of public housing or Section 8.

◯ **Option 1:** I choose to disclose this information

Choose the number of individuals in your household in the chart below to determine your HUD income limit. The dollar amount below the number you indicate is your HUD income limit.

FY 2018 80% Area Median Income Limits (by Household Size)

Number of persons in household	1	2	3	4	5	6	7	8
80% of Area Median Income (FY 2018 HUD Income Limits)	$37,450 ◯	$42,800 ◯	$48,150 ◯	$53,450 ◯	$57,750 ◯	$62,050 ◯	$66,300 ◯	$70,600 ◯

YOU MUST ANSWER THE FOLLOWING QUESTIONS IF YOU ARE CLAIMING SECTION 3 ELIGIBILITY:

Is your household income at or below the HUD income limit for the current year? ◯ **Yes** ◯ **No**

If your answer is YES and you reside in Bexar County, you are a Section 3 individual, regardless of public housing status.

Are you a resident of public housing or Section 8? ◯ **Yes** ◯ **No**

If your answer is YES, you are a Section 3 individual regardless of your income.

◯ **Option 2:** I choose NOT to disclose this information OR I do not qualify as a Section 3 eligible individual.

CERTIFICATION

By signing, I authorize my employer to release relevant information to the San Antonio Housing Authority (SAHA) for contract compliance purposes. I further affirm that the information on this form is to the best of my knowledge and belief true, correct, and complete.

Signature_____ DATE: _____

M/WBE UTILIZATION STATEMENT
SAN ANTONIO HOUSING AUTHORITY
M/WBE PROGRAM OFFICE

Please read these instructions carefully before completing the required Minority/Women Business Enterprise (M/WBE) Utilization Statement. These instructions are designed to assist prime contractors/consultants document M/WBE program compliance or in preparing the required detailed and complete good faith effort information.

Contractors/Consultants are required to submit detailed documentation when the contract specified M/WBE participation ranges or goals are not met. The SAHA M/WBE Program Manager will review and consider a bidder's or proposer's good faith efforts in assisting SAHA to meet its M/WBE policy and program objectives.

A. Bidders/Proposers are required to make sincere efforts in attempting to achieve the applicable SAHA M/WBE participation ranges or goals. The approved M/WBE participation ranges or goals will be monitored throughout the duration of the project;

B. All bidders/proposers are to complete Section A, Project Identification and Section B, Project M/WBE Utilization, if applicable. Should there be subcontracting/sub consulting opportunities, yet the bidder/proposer *not* achieve the project's applicable M/WBE participation range or goal, the bidder/proposer must complete all other sections of the Statement.

C. This Statement should be prepared by the company's project M/WBE Coordinator or designee. The Statement must be signed and dated by an authorized company official. The Coordinator or designee should have a working knowledge as to the project's subcontracting or sub-consulting and supplier activities (actual and anticipated). This individual shall be a key figure in directing the prime contractor's M/WBE activities.

D. The M/WBE Utilization Statement demonstrating a contractor's good faith efforts is subject to the SAHA M/WBE Program Coordinator's review and approval.

E. SAHA requires all M/WBE firms to be certified as such by an entity acceptable to SAHA for project M/WBE credit.

F. SAHA reserves the right to approve all additions or deletions of subcontractors, subconsultants, and/or major vendors. In the event that an M/WBE subcontractor, subconsultant, and/or major vendor is replaced, the contractor must make a good faith effort to involve and utilize another M/WBE subcontractor, sub consultant, and/or major vendor.

Should you have any questions or need additional information, please contact:

Charles Bode
818 S Flores
Asst. Director of Procurement
charles_bode@saha.org
210-477-6165

FOR SAHA PROCUREMENT DEPARTMENT USE ONLY
Reviewed by: _____
Date: _____
Signature of SAHA Official: _____
Recommendation: Approval: _____ Denial: _____
subject to the SAHA M/WBE Program Manager's review and approval.

M/WBE UTILIZATION STATEMENT
SAN ANTONIO HOUSING AUTHORITY
M/WBE PROGRAM OFFICE

SECTION A: PROJECT IDENTIFICATION

Project Number_____ Project Title_____

Contract Amount _____ Company Name _____

Project Participation Range/Goal: M/WBE ____ %

Contract Anticipated Participation Range: M/WBE ____ %

The M/WBE participation range/goal is expressed as a percentage of the total dollar amount of the prime contract awarded to M/WBEs. The goal is applicable for those areas, which the prime contractor has subcontracted, sub-consulted, and/or major supplies necessary in the performance of the contract.

SECTION B: SUBCONTRACTOR/SUB CONSULTANT/VENDOR UTILIZATION

1. List all actual *and* anticipated subcontracts, subconsultants, and/or major material purchases, include *both* M/WBE and non-M/WBE, to be utilized on the project (*use additional sheets if necessary*).

TRADE AREA	ESTIMATED AMOUNT ($)	SUB/SUPPLIER	SUB/SUPPLIER M/WBE Yes (√) No	

2. MBE utilization in total dollars: _____ WBE utilization in total dollars: _____
3. Overall MBE utilization percentage (%): _____
4. Overall WBE utilization percentage (%): _____
5. Overall M/WBE utilization percentage (%): _____
6. Anticipated M/WBE utilization on this contract will occur:
Throughout ___ Beginning 1/3 ___ Middle 1/3 ___ Final 1/3 ___

Please Note: SAHA will credit only those M/WBEs that have been certified by an entity acceptable to SAHA. All changes, additions, or deletions occurring during the life of this contract relative to use of the listed subcontractors, sub-consultants and/or

major suppliers, M/WBE or otherwise, must be submitted to SAHA for review and approval.

If Bidder/Proposer is unable to meet the M/WBE participation range/goal, please
proceed to complete Section C and submit documentation demonstrating contractual good faith efforts.

SECTION C: GOOD FAITH EFFORT

The following items are minimally considered as good faith efforts and demonstrate specific initiatives made in attempting to achieve SAHA's M/W/BE participation ranges. The bidder/proposer is not limited to these particular areas and may include other efforts deemed appropriate. Please feel free to elaborate on any question below.

Required Questions	Yes	No
1. If applicable, was your company represented at the pre-bid conference?		
2. Did your company request and obtain a copy of the certified M/WBE firms?		
3. Were M/WBE firms solicited for contract participation?		
4. Provide listing of solicited M/WBEs with whom contact was made? Please identify name of company, contact person, date, phone number and briefly describe nature of solicitation. **(Include as an Attachment)**		
5. Was direct contact made with SAHA's M/WBE Program Office? If yes, please identify date/person contacted and assistance sought. **(Include as an Attachment)**		
6. Identify all M/WBE support agencies/associations contacted for M/WBE assistance or solicitation (Minority Chamber's of Commerce, purchasing councils, contractor groups, etc.). **(Please attach copies of solicitation letters of assistance and/or describe, as an Attachment to this section, the personal contact made)**		
7. Were bid opportunities related to this project advertised in minority/women newspapers and trade journals? **(If yes, please include a copy of the advertisement or detail the name of the publication(s), date of advertisement and describe the solicitation)**		
8. Were copies of plans and specification furnished to any M/WBEs?		
9. Were subcontractors, subconsultants, and/or suppliers (if applicable) required to provide insurance or be bonded? **(If yes, please detail any assistance that was provided or if they were referred, to whom)**		
10. List, as an Attachment, all M/WBE bids received but rejected. Identify company name, contact person, telephone number, date, trade area, and the reason for rejecting the bid/proposal.		
11. Discuss any other effort(s) aimed at involving M/WBEs (Include as an Attachment): (a) Identify any specific efforts to divide work, in accordance with normal industry practices, to allow maximum M/WBE participation.		

(b) Discuss joint ventures initiatives, requesting second-tier M/WBE subcontracting, etc., if any. (c) List all other good faith efforts employed, please elaborate.		

The undersigned acknowledges and states that all information submitted as part of this Good Faith Effort Statement is true and correct to the best of his/her knowledge. I further agree that this document shall be attached thereto and become a binding part of the SAHA contract.

_____ _____

Print Name ***Title Date***

_____ _____

Signature ***Telephone Number***

ATTACHMENT E
Proposal Checklist and Certification

PROPOSAL Checklist and Certification

(Attachment E)

(This Form must be fully completed and placed under Tab No. 8 of the proposal submitted.)

Instructions: Unless otherwise specifically required, the items listed below must be completed and included in the proposal submittal. Please complete this form by marking an "X," where provided, to verify that the referenced completed form or information has been included within the "hard copy" proposal submittal submitted by the Respondents. Also, complete the Section 3 Statement and the Respondent's Statement as noted below:

X=ITEM INCLUDED	SUBMITTAL ITEMS Change these for the section headings
_____	Tab 1 Form of Proposal
_____	Tab 2 HUD and State Forms
_____	Tab 3 Profile of Firm, Company Biography, and Subcontractors List
_____	Tab 4 Evaluation Criteria Response
_____	Tab 5 Section 3 Business Preference
_____	Tab 6 Small/Minority/Disadvantaged/Veteran Business Enterprise Utilization Plan
_____	Tab 7 Section 3 Good Faith Effort Compliance Plan
_____	Tab 8 Proposal Checklist and Certification
_____	
_____	
_____	

SECTION 3 STATEMENT

Are you claiming a Section 3 business preference? YES___ or NO____. If "YES," pursuant to the documentation justifying such submitted under Tab No 8, which category are you claiming?

_____ Category I

_____ Category II

_____ Category III

_____ Category IV

Respondent's Certification

By signing below, Respondent certifies that the following statements are true and correct:

1. He/she has full authority to bind Respondents and that no member of Respondent's organization is disbarred, suspended or otherwise prohibited from contracting with any federal, state or local agency,

2. Items for which Proposals were provided herein will be delivered as specified in the Proposal,

3. In performing this contract, the contractor(s) shall comply with any and all applicable federal, state or local laws including but not limited to: Occupational Safety & Health, Equal Employment Opportunity, Immigration and Naturalization, The Americans with Disabilities Act, State Tax and Insurance Law, and the Fair Housing Act.,

4. Respondents agrees that this proposal shall remain open and valid for at least a period of 90 days from the date of the Proposal Opening and that this Proposal shall constitute an offer, which, if accepted by SAHA and subject to the terms and conditions of such acceptance, shall result in a contract between SAHA and the undersigned Respondents,

5. He/she has not given, offered to give, nor intends to give at any time hereafter any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor, or service to a public servant in connection with this Proposal,

6. Respondents, nor the firm, corporation, partnership, or institution represented by the Respondents, or anyone acting for such firm, corporation or institution has violated the antitrust laws of the State of Texas or the Federal Antitrust laws, nor communicated directly or indirectly the Proposal made to any competitor or any other person engaged in such line of business,

7. Respondents has not received compensation for participation in the preparation of the specifications for this RFP,

8. Non-Collusive Affidavit: The undersigned party submitting this Proposal hereby certifies that such Proposal is genuine and not collusive and that said Respondents has not colluded, conspired, connived or agreed, directly or indirectly, with any Respondents or person, to put in a sham Proposal or to refrain from bidding, and has not in any manner, directly or indirectly sought by agreement or collusion, or communication or conference, with any person, to fix the Proposal price of affiant or of any other Respondents, to fix overhead, profit or cost element of said Proposal price, or that of any other Respondents or to secure any advantage against SAHA or any person interested in the proposed contract; and that all statements in said Proposal are true.

9. Child Support**:** Pursuant to Section 231.006 (d) of the Texas Family Code, regarding child support, the bidder certifies that the individual or business entity named in this bid is not ineligible to receive the specified payment and acknowledges that this contract may be terminated and payment may be withheld if this certification is inaccurate.

10. Lobbying Prohibition**:** The Contractor agrees to comply with Section 1352 of Title 31, United States Code which prohibits the use of Federal appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.

Addendum #1_____ Date_____

Addendum #2_____ Date_____

Addendum #3_____ Date_____

_____ _____

Signature **Date**

_____ _____

Printed Name **Company**

_____

E-mail address if available

_____ _____

Phone **Fax**

ATTACHMENT F
Form of Proposal

The Form of Proposal shall be the first document in the "ORIGINAL" proposal binder only and shall be printed on the Respondent's Letterhead.

***Do Not* include this form in the "COPIES"**

San Antonio Housing Authority
818 S. Flores
San Antonio, Texas 78204

Attention: Charles Bode, Assist. Director of Procurement

RE: 1806-909-23-47XX Victoria Plaza Apartments Rehabilitation and Modernization

Gentlemen:

The undersigned Respondent, having read and examined the RFP and associated documents for the ***Victoria Plaza Apartments Rehabilitation and Modernization*** and after thoroughly considering the factors which will affect the execution of the project and the cost thereof, does hereby propose this Proposal. All prices stated herein are firm and shall not be subject to escalation provided this Proposal is accepted within one hundred eighty (180) days after the official opening of proposals.

The undersigned hereby declares that the following list states any and all variations from and exceptions to the requirements of the proposal requirements and that, otherwise, it is the intent of this Proposal that the Project will be performed in strict accordance with the subsequent Contract Documents.
(If no exceptions are taken, indicate so by entering "None").

(Continue on separate page, if necessary, and attach hereto).

The undersigned Respondent herein proposes to execute the Property Rehabilitation and Modernization Services for the following pricing/fee structure:

Item	Base Cost	Construction Time
Rehabilitation and Modernization	$	
Alternates (Deduct)	Cost (-)	Construction Time (+/-)
Stair Pressurization	$	
Roof Guardrail	$	
Delete Downspout Replacement	$	
Eliminate Penthouse Screen	$	
Replace ladder and cage	$	

Dated this _____ day of _____, 20_____.

Offeror _____

By _____

Title _____

ATTEST:

_____

Business Address of Offeror _____

State of Incorporation _____

Address of Principal Office_____

_____

Email:_____