



# **PROJECT MANUAL**

## **WILLIAM HOWARD DAY HOMES RENOVATIONS TO BUILDINGS K, L & M Harrisburg, Pennsylvania**

**Contract M201902 Demolition Contract  
Contract M-201903 General Construction Contract  
Contract M-201904 Mechanical Construction Contract  
Contract M201905 Plumbing Construction Contract  
Contract M201906 Electrical Construction Contract**

## **SPECIFICATIONS**

**MARCH 29, 2019**



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## **INVITATION TO BID**

**The Harrisburg Housing Authority will receive sealed bids for HHA – William Howard Day Homes, Renovations to Buildings K, L and M; the project is located off of Community Drive in Harrisburg, Pennsylvania. Bids will be received at 351 Chestnut Street, Harrisburg, Pennsylvania 17101 until 2:00 p.m., Thursday May 2, 2019, at which time and place all bids will be publicly opened and read aloud. Each bid must be placed in a separate envelope with the contract number and name clearly printed on the outside of the envelope. Separate envelopes must be used if a contractor is submitting for multiple contracts.**

Contract M201902 Demolition Contract  
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**All interested parties in this project must register as a vendor by visiting our website [www.harrisburghousing.org](http://www.harrisburghousing.org). Follow vendor registration link to the e-procurement website, the Housing Agency Marketplace.**

Project Documents are available electronically at no charge. Project Documents may be viewed at the office of the Architect: KD3 Design Studio, 426 South Third Street, Suite 101, Lemoyne, PA 17043; by appointment, call 717-920-2282 to arrange an appointment.

A Pre-Bid Conference will be held on Tuesday April 9 at 9 a.m. at the project site. Contractors will be able to review units in the buildings being renovated along with a unit renovated in similar fashion during a previous project.

All Bidders must adhere to the provisions for equal employment opportunity and payment of not less than the minimum Davis Bacon Wage Determination, as set forth in the documents.

HHA strongly supports equal opportunity in competitive contracting, as well. HHA is requiring a 30% presumptive objective for MBE/WBE participation for all contracts.

The Authority reserves the right to reject any or all bids, or to waive informalities in the bidding.

A bid guarantee is required of at least 5% of the bid. No bid shall be withdrawn for a period of ninety (90) days subsequent to the opening of bids without the consent of the Harrisburg Housing Authority.

All questions and requests for information about the content of the documents shall be directed, in writing, to Lori Shope via the Housing Agency Marketplace website no later than 2 p.m. Monday April 22, 2019.

HARRISBURG HOUSING AUTHORITY

Emily J. Leader, Chair

Senghor Manns, President/CEO



**INSTRUCTIONS TO BIDDERS**

**HUD FORM 5369**



**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

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### 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 —

[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, except 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] —

(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 be 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.

## **SECTION 002000**

### **LIST OF DOCUMENTS TO BE RETURNED WITH BID FORM**

The following Documents must be completed and returned with all bids:

1. Bid Form, acknowledging addenda when applicable
2. Bid Guarantee
3. HUD Form 5369A
4. Statement of Bidder's Qualifications
5. Affidavit of Bidder's Qualifications
6. MBE/WBE Action Plan Narratives
7. Section 3 Clause and Certification
8. Section 3 Action Plan Narratives
7. Non-Collusive Affidavit
9. Vendor Information Form
10. Public Works Employment Verification Form – for Prime Contractor

**SECTION 003000**

**BID FORM**

**TO:** HARRISBURG HOUSING AUTHORITY  
351 Chestnut Street  
Harrisburg, PA 17101

**FOR:** HHA William Howard Day Homes  
Renovations to Buildings K, L and M  
Contract No. M-201902 Demolition Contract

Pursuant to and in compliance with the request for Bids on the above-captioned project, the undersigned offers to furnish all labor, superintendence, materials, supplies, equipment, plant and other facilities, utilities and all things necessary or proper for, and to perform all work necessary or incidental to the above-captioned work, complete in every respect, in strict accordance with the Contract Documents as defined in the Project Manual and any future changes therein as provided in the Contract and Project Manual, and to perform all other obligations imposed by the Contract Documents for the prices named in the following **LUMP SUM PRICES:**

**HHA WILLIAM HOWARD DAY HOMES  
RENOVATIONS TO BUILDINGS K, L AND M  
CONTRACT No. M-201902 DEMOLITION CONTRACT**

**TOTAL AMOUNT OF BID** \$ \_\_\_\_\_

Additional and extra work, if any, performed in accordance with the Contract Documents, shall be paid for as provided in the Project Manual.

The Project Manual and all papers required by it and submitted herewith, the Drawings, the Addenda, the Contract and all papers made part thereof by its terms, are hereby made part of this Bid.

The Undersigned acknowledges receipt of the following addenda to the Contract Documents (see Instructions to Bidders regarding Addenda Acknowledgment):

ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_      ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_

ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_      ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_

The undersigned Bidder hereby represents as follows:

(a) that he has visited and carefully examined the site of the work, has made such tests and examinations as he believes necessary to submit a Bid based upon information secured by him independently, and not based on information coming from the Owner, or Architect, and has carefully examined the Contract Documents;

(b) that no officer, agent, or employee of HARRISBURG HOUSING AUTHORITY and its subsidiaries is personally interested, directly or indirectly in this Bid and the accompanying Contract or the compensation to be paid hereunder;

(c) that this Bid is made without connection with any person, firm or corporation making a Bid for the same work, and is in all respects fair, and without collusion or fraud;

(d) that should HARRISBURG HOUSING AUTHORITY notify the undersigned of its intention to award a contract to the undersigned based on this Bid, including any combination of additions, deductions, or omissions, indicated or authorized by this Bid form or the Instructions to Bidders the undersigned will furnish proper insurance certificates, provide the required 100% Performance and Payment Bonds and will execute the proposed Contract within the time and in the forms and amounts required by the Contract Documents as defined in the Project Manual; and

(e) that he intends to be legally bound by the terms of this instrument.

Dated \_\_\_\_\_ 2019

ATTEST:

Secretary/Assistant Secretary

\_\_\_\_\_  
Name of Corporation-Contractor

\_\_\_\_\_  
President/Vice-President

(AFFIX  
CORPORATE  
SEAL)



WITNESS: \_\_\_\_\_ (SEAL)  
(Signature of Individual-Contractor)

Trading and doing business as:

\_\_\_\_\_

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WITNESS: \_\_\_\_\_  
Partnership-Contractor  
\*By \_\_\_\_\_ (SEAL)

Partner

By \_\_\_\_\_ (SEAL)

Partner

By \_\_\_\_\_ (SEAL)

Partner

\* Attach an appropriate authorization evidencing the authority of one general partner to act in behalf of the partnership.

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Business Address \_\_\_\_\_  
of Bidder: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Name of Contact \_\_\_\_\_  
Person: \_\_\_\_\_

**SECTION 003000**

**BID FORM**

**TO:** HARRISBURG HOUSING AUTHORITY  
351 Chestnut Street  
Harrisburg, PA 17101

**FOR:** HHA William Howard Day Homes  
Renovations to Buildings K, L and M  
Contract No. M-201903 General Construction Contract

Pursuant to and in compliance with the request for Bids on the above-captioned project, the undersigned offers to furnish all labor, superintendence, materials, supplies, equipment, plant and other facilities, utilities and all things necessary or proper for, and to perform all work necessary or incidental to the above-captioned work, complete in every respect, in strict accordance with the Contract Documents as defined in the Project Manual and any future changes therein as provided in the Contract and Project Manual, and to perform all other obligations imposed by the Contract Documents for the prices named in the following **LUMP SUM PRICES:**

**HHA WILLIAM HOWARD DAY HOMES  
RENOVATIONS TO BUILDINGS K, L AND M  
CONTRACT No. M-201903 GENERAL CONSTRUCTION CONTRACT**

**TOTAL AMOUNT OF BID** \$ \_\_\_\_\_

Additional and extra work, if any, performed in accordance with the Contract Documents, shall be paid for as provided in the Project Manual.

The Project Manual and all papers required by it and submitted herewith, the Drawings, the Addenda, the Contract and all papers made part thereof by its terms, are hereby made part of this Bid.

The Undersigned acknowledges receipt of the following addenda to the Contract Documents (see Instructions to Bidders regarding Addenda Acknowledgment):

ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_      ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_

ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_      ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_

The undersigned Bidder hereby represents as follows:

(a) that he has visited and carefully examined the site of the work, has made such tests and examinations as he believes necessary to submit a Bid based upon information secured by him independently, and not based on information coming from the Owner, or Architect, and has carefully examined the Contract Documents;

(b) that no officer, agent, or employee of HARRISBURG HOUSING AUTHORITY and its subsidiaries is personally interested, directly or indirectly in this Bid and the accompanying Contract or the compensation to be paid hereunder;

(c) that this Bid is made without connection with any person, firm or corporation making a Bid for the same work, and is in all respects fair, and without collusion or fraud;

(d) that should HARRISBURG HOUSING AUTHORITY notify the undersigned of its intention to award a contract to the undersigned based on this Bid, including any combination of additions, deductions, or omissions, indicated or authorized by this Bid form or the Instructions to Bidders the undersigned will furnish proper insurance certificates, provide the required 100% Performance and Payment Bonds and will execute the proposed Contract within the time and in the forms and amounts required by the Contract Documents as defined in the Project Manual; and

(e) that he intends to be legally bound by the terms of this instrument.

Dated \_\_\_\_\_ 2019

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ATTEST:

Secretary/Assistant Secretary

\_\_\_\_\_  
Name of Corporation-Contractor

\_\_\_\_\_  
President/Vice-President

(AFFIX  
CORPORATE  
SEAL)

WITNESS: \_\_\_\_\_ (SEAL)  
(Signature of Individual-Contractor)

Trading and doing business as:

\_\_\_\_\_

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WITNESS: \_\_\_\_\_  
Partnership-Contractor  
\*By \_\_\_\_\_ (SEAL)

Partner

By \_\_\_\_\_ (SEAL)

Partner

By \_\_\_\_\_ (SEAL)

Partner

\* Attach an appropriate authorization evidencing the authority of one general partner to act in behalf of the partnership.

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Business Address \_\_\_\_\_  
of Bidder: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Name of Contact \_\_\_\_\_  
Person: \_\_\_\_\_

**SECTION 003000**

**BID FORM**

**TO:** HARRISBURG HOUSING AUTHORITY  
351 Chestnut Street  
Harrisburg, PA 17101

**FOR:** HHA William Howard Day Homes  
Renovations to Buildings K, L and M  
Contract No. M-201904 Mechanical Construction Contract

Pursuant to and in compliance with the request for Bids on the above-captioned project, the undersigned offers to furnish all labor, superintendence, materials, supplies, equipment, plant and other facilities, utilities and all things necessary or proper for, and to perform all work necessary or incidental to the above-captioned work, complete in every respect, in strict accordance with the Contract Documents as defined in the Project Manual and any future changes therein as provided in the Contract and Project Manual, and to perform all other obligations imposed by the Contract Documents for the prices named in the following **LUMP SUM PRICES:**

**HHA WILLIAM HOWARD DAY HOMES  
RENOVATIONS TO BUILDINGS K, L AND M  
CONTRACT No. M-201904 MECHANICAL CONSTRUCTION CONTRACT**

**TOTAL AMOUNT OF BID** \$ \_\_\_\_\_

Additional and extra work, if any, performed in accordance with the Contract Documents, shall be paid for as provided in the Project Manual.

The Project Manual and all papers required by it and submitted herewith, the Drawings, the Addenda, the Contract and all papers made part thereof by its terms, are hereby made part of this Bid.

The Undersigned acknowledges receipt of the following addenda to the Contract Documents (see Instructions to Bidders regarding Addenda Acknowledgment):

ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_      ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_

ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_      ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_

The undersigned Bidder hereby represents as follows:

(a) that he has visited and carefully examined the site of the work, has made such tests and examinations as he believes necessary to submit a Bid based upon information secured by him independently, and not based on information coming from the Owner, or Architect, and has carefully examined the Contract Documents;

(b) that no officer, agent, or employee of HARRISBURG HOUSING AUTHORITY and its subsidiaries is personally interested, directly or indirectly in this Bid and the accompanying Contract or the compensation to be paid hereunder;

(c) that this Bid is made without connection with any person, firm or corporation making a Bid for the same work, and is in all respects fair, and without collusion or fraud;

(d) that should HARRISBURG HOUSING AUTHORITY notify the undersigned of its intention to award a contract to the undersigned based on this Bid, including any combination of additions, deductions, or omissions, indicated or authorized by this Bid form or the Instructions to Bidders the undersigned will furnish proper insurance certificates, provide the required 100% Performance and Payment Bonds and will execute the proposed Contract within the time and in the forms and amounts required by the Contract Documents as defined in the Project Manual; and

(e) that he intends to be legally bound by the terms of this instrument.

Dated \_\_\_\_\_ 2019

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ATTEST:

Secretary/Assistant Secretary

\_\_\_\_\_  
Name of Corporation-Contractor

\_\_\_\_\_  
President/Vice-President

(AFFIX  
CORPORATE  
SEAL)

WITNESS: \_\_\_\_\_ (SEAL)  
(Signature of Individual-Contractor)

Trading and doing business as:

\_\_\_\_\_

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WITNESS: \_\_\_\_\_  
Partnership-Contractor  
\*By \_\_\_\_\_ (SEAL)

Partner

By \_\_\_\_\_ (SEAL)

Partner

By \_\_\_\_\_ (SEAL)

Partner

\* Attach an appropriate authorization evidencing the authority of one general partner to act in behalf of the partnership.

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Business Address \_\_\_\_\_  
of Bidder: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Name of Contact \_\_\_\_\_  
Person: \_\_\_\_\_

**SECTION 003000**

**BID FORM**

**TO:** HARRISBURG HOUSING AUTHORITY  
351 Chestnut Street  
Harrisburg, PA 17101

**FOR:** HHA William Howard Day Homes  
Renovations to Buildings K, L and M  
Contract No. M-201905 Plumbing Construction Contract

Pursuant to and in compliance with the request for Bids on the above-captioned project, the undersigned offers to furnish all labor, superintendence, materials, supplies, equipment, plant and other facilities, utilities and all things necessary or proper for, and to perform all work necessary or incidental to the above-captioned work, complete in every respect, in strict accordance with the Contract Documents as defined in the Project Manual and any future changes therein as provided in the Contract and Project Manual, and to perform all other obligations imposed by the Contract Documents for the prices named in the following **LUMP SUM PRICES:**

**HHA WILLIAM HOWARD DAY HOMES  
RENOVATIONS TO BUILDINGS K, L AND M  
CONTRACT No. M-201905 PLUMBING CONSTRUCTION CONTRACT**

**TOTAL AMOUNT OF BID** \$ \_\_\_\_\_

Additional and extra work, if any, performed in accordance with the Contract Documents, shall be paid for as provided in the Project Manual.

The Project Manual and all papers required by it and submitted herewith, the Drawings, the Addenda, the Contract and all papers made part thereof by its terms, are hereby made part of this Bid.

The Undersigned acknowledges receipt of the following addenda to the Contract Documents (see Instructions to Bidders regarding Addenda Acknowledgment):

ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_      ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_

ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_      ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_



The undersigned Bidder hereby represents as follows:

(a) that he has visited and carefully examined the site of the work, has made such tests and examinations as he believes necessary to submit a Bid based upon information secured by him independently, and not based on information coming from the Owner, or Architect, and has carefully examined the Contract Documents;

(b) that no officer, agent, or employee of HARRISBURG HOUSING AUTHORITY and its subsidiaries is personally interested, directly or indirectly in this Bid and the accompanying Contract or the compensation to be paid hereunder;

(c) that this Bid is made without connection with any person, firm or corporation making a Bid for the same work, and is in all respects fair, and without collusion or fraud;

(d) that should HARRISBURG HOUSING AUTHORITY notify the undersigned of its intention to award a contract to the undersigned based on this Bid, including any combination of additions, deductions, or omissions, indicated or authorized by this Bid form or the Instructions to Bidders the undersigned will furnish proper insurance certificates, provide the required 100% Performance and Payment Bonds and will execute the proposed Contract within the time and in the forms and amounts required by the Contract Documents as defined in the Project Manual; and

(e) that he intends to be legally bound by the terms of this instrument.

Dated \_\_\_\_\_ 2019

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ATTEST:

Secretary/Assistant Secretary

\_\_\_\_\_  
Name of Corporation-Contractor

\_\_\_\_\_  
President/Vice-President

(AFFIX  
CORPORATE  
SEAL)

WITNESS: \_\_\_\_\_ (SEAL)  
(Signature of Individual-Contractor)

Trading and doing business as:

\_\_\_\_\_

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WITNESS: \_\_\_\_\_  
Partnership-Contractor  
\*By \_\_\_\_\_ (SEAL)

Partner

By \_\_\_\_\_ (SEAL)

Partner

By \_\_\_\_\_ (SEAL)

Partner

\* Attach an appropriate authorization evidencing the authority of one general partner to act in behalf of the partnership.

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Business Address \_\_\_\_\_  
of Bidder: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Name of Contact \_\_\_\_\_  
Person: \_\_\_\_\_

**SECTION 003000**

**BID FORM**

**TO:** HARRISBURG HOUSING AUTHORITY  
351 Chestnut Street  
Harrisburg, PA 17101

**FOR:** HHA William Howard Day Homes  
Renovations to Buildings K, L and M  
Contract No. M-201906 Electrical Construction Contract

Pursuant to and in compliance with the request for Bids on the above-captioned project, the undersigned offers to furnish all labor, superintendence, materials, supplies, equipment, plant and other facilities, utilities and all things necessary or proper for, and to perform all work necessary or incidental to the above-captioned work, complete in every respect, in strict accordance with the Contract Documents as defined in the Project Manual and any future changes therein as provided in the Contract and Project Manual, and to perform all other obligations imposed by the Contract Documents for the prices named in the following **LUMP SUM PRICES:**

**HHA WILLIAM HOWARD DAY HOMES  
RENOVATIONS TO BUILDINGS K, L AND M  
CONTRACT No. M-201906 ELECTRICAL CONSTRUCTION CONTRACT**

**TOTAL AMOUNT OF BID** \$ \_\_\_\_\_

Additional and extra work, if any, performed in accordance with the Contract Documents, shall be paid for as provided in the Project Manual.

The Project Manual and all papers required by it and submitted herewith, the Drawings, the Addenda, the Contract and all papers made part thereof by its terms, are hereby made part of this Bid.

The Undersigned acknowledges receipt of the following addenda to the Contract Documents (see Instructions to Bidders regarding Addenda Acknowledgment):

ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_      ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_

ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_      ADDENDUM \_\_\_\_\_ Dated \_\_\_\_\_

The undersigned Bidder hereby represents as follows:

(a) that he has visited and carefully examined the site of the work, has made such tests and examinations as he believes necessary to submit a Bid based upon information secured by him independently, and not based on information coming from the Owner, or Architect, and has carefully examined the Contract Documents;

(b) that no officer, agent, or employee of HARRISBURG HOUSING AUTHORITY and its subsidiaries is personally interested, directly or indirectly in this Bid and the accompanying Contract or the compensation to be paid hereunder;

(c) that this Bid is made without connection with any person, firm or corporation making a Bid for the same work, and is in all respects fair, and without collusion or fraud;

(d) that should HARRISBURG HOUSING AUTHORITY notify the undersigned of its intention to award a contract to the undersigned based on this Bid, including any combination of additions, deductions, or omissions, indicated or authorized by this Bid form or the Instructions to Bidders the undersigned will furnish proper insurance certificates, provide the required 100% Performance and Payment Bonds and will execute the proposed Contract within the time and in the forms and amounts required by the Contract Documents as defined in the Project Manual; and

(e) that he intends to be legally bound by the terms of this instrument.

Dated \_\_\_\_\_ 2019

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ATTEST:

Secretary/Assistant Secretary

\_\_\_\_\_  
Name of Corporation-Contractor

\_\_\_\_\_  
President/Vice-President

(AFFIX  
CORPORATE  
SEAL)

WITNESS: \_\_\_\_\_ (SEAL)  
(Signature of Individual-Contractor)

Trading and doing business as:

\_\_\_\_\_

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WITNESS: \_\_\_\_\_  
Partnership-Contractor  
\*By \_\_\_\_\_ (SEAL)

Partner

By \_\_\_\_\_ (SEAL)

Partner

By \_\_\_\_\_ (SEAL)

Partner

\* Attach an appropriate authorization evidencing the authority of one general partner to act in behalf of the partnership.

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Business Address \_\_\_\_\_  
of Bidder: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Name of Contact \_\_\_\_\_  
Person: \_\_\_\_\_

**REPRESENTATIONS, CERTIFICATIONS, AND OTHER  
STATEMENTS OF BIDDERS**

**HUD FORM 5369A**

**U.S. Department of Housing  
and Urban Development**  
Office of Public and Indian Housing

**Representations, Certifications,  
and Other Statements of Bidders**  
**Public and Indian Housing Programs**

# Representations, Certifications, and Other Statements of Bidders

## Public and Indian Housing Programs

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### 1. Certificate of Independent Price Determination

(a) The bidder certifies that--

(1) The prices in this bid have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other bidder or competitor relating to (i) those prices, (ii) the intention to submit a bid, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this bid have not been and will not be knowingly disclosed by the bidder, directly or indirectly, to any other bidder or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a competitive proposal solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the bidder to induce any other concern to submit or not to submit a bid for the purpose of restricting competition.

(b) Each signature on the bid is considered to be a certification by the signatory that the signatory--

(1) Is the person in the bidder's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above.

\_\_\_\_\_ [insert full name of person(s) in the bidder's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the bidder's organization];

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above.

(c) If the bidder deletes or modifies subparagraph (a)2 above, the bidder must furnish with its bid a signed statement setting forth in detail the circumstances of the disclosure.

[Contracting Officer check if following paragraph is applicable]

(d) Non-collusive affidavit. (applicable to contracts for construction and equipment exceeding \$50,000)

(1) Each bidder shall execute, in the form provided by the PHA/IHA, an affidavit to the effect that he/she has not colluded with any other person, firm or corporation in regard to any bid submitted in response to this solicitation. If the successful bidder did not submit the affidavit with his/her bid, he/she must submit it within three (3) working days of bid opening. Failure to submit the affidavit by that date may render the bid nonresponsive. No contract award will be made without a properly executed affidavit.

(2) A fully executed "Non-collusive Affidavit" [ ] is, [ ] is not included with the bid.

### 2. Contingent Fee Representation and Agreement

(a) Definitions. As used in this provision:

"Bona fide employee" means a person, employed by a bidder and subject to the bidder's supervision and control as to time, place, and manner of performance, who neither exerts, nor proposes to exert improper influence to solicit or obtain contracts nor holds out as being able to obtain any contract(s) through improper influence.

"Improper influence" means any influence that induces or tends to induce a PHA/IHA employee or officer to give consideration or to act regarding a PHA/IHA contract on any basis other than the merits of the matter.

(b) The bidder represents and certifies as part of its bid that, except for full-time bona fide employees working solely for the bidder, the bidder:

(1) [ ] has, [ ] has not employed or retained any person or company to solicit or obtain this contract; and

(2) [ ] has, [ ] has not paid or agreed to pay to any person or company employed or retained to solicit or obtain this contract any commission, percentage, brokerage, or other fee contingent upon or resulting from the award of this contract.

(c) If the answer to either (a)(1) or (a)(2) above is affirmative, the bidder shall make an immediate and full written disclosure to the PHA/IHA Contracting Officer.

(d) Any misrepresentation by the bidder shall give the PHA/IHA the right to (1) terminate the contract; (2) at its discretion, deduct from contract payments the amount of any commission, percentage, brokerage, or other contingent fee; or (3) take other remedy pursuant to the contract.

### 3. Certification and Disclosure Regarding Payments to Influence Certain Federal Transactions (applicable to contracts exceeding \$100,000)

(a) The definitions and prohibitions contained in Section 1352 of title 31, United States Code, are hereby incorporated by reference in paragraph (b) of this certification.



(b) The bidder, by signing its bid, hereby certifies to the best of his or her knowledge and belief as of December 23, 1989 that:

(1) No Federal appropriated funds 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 on his or her behalf in connection with the awarding of a contract resulting from this solicitation;

(2) 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 on his or her behalf in connection with this solicitation, the bidder shall complete and submit, with its bid, OMB standard form LLL, "Disclosure of Lobbying Activities;" and

(3) He or she will include the language of this certification in all subcontracts at any tier and require that all recipients of subcontract awards in excess of \$100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than \$10,000, and not more than \$100,000, for each such failure.

(d) Indian tribes (except those chartered by States) and Indian organizations as defined in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450B) are exempt from the requirements of this provision.

#### 4. Organizational Conflicts of Interest Certification

The bidder certifies that to the best of its knowledge and belief and except as otherwise disclosed, he or she does not have any organizational conflict of interest which is defined as a situation in which the nature of work to be performed under this proposed contract and the bidder's organizational, financial, contractual, or other interests may, without some restriction on future activities:

- (a) Result in an unfair competitive advantage to the bidder; or,
- (b) Impair the bidder's objectivity in performing the contract work.

In the absence of any actual or apparent conflict, I hereby certify that to the best of my knowledge and belief, no actual or apparent conflict of interest exists with regard to my possible performance of this procurement.

#### 5. Bidder's Certification of Eligibility

(a) By the submission of this bid, the bidder certifies that to the best of its knowledge and belief, neither it, nor any person or firm which has an interest in the bidder's firm, nor any of the bidder's subcontractors, is ineligible to:

- (1) Be awarded contracts by any agency of the United States Government, HUD, or the State in which this contract is to be performed; or,
- (2) Participate in HUD programs pursuant to 24 CFR Part 24.

(b) The certification in paragraph (a) above is a material representation of fact upon which reliance was placed when making award. If it is later determined that the bidder knowingly rendered an erroneous certification, the contract may be terminated for default, and the bidder may be debarred or suspended from participation in HUD programs and other Federal contract programs.

#### 6. Minimum Bid Acceptance Period

(a) "Acceptance period," as used in this provision, means the number of calendar days available to the PHA/IHA for awarding a contract from the date specified in this solicitation for receipt of bids.

(b) This provision supersedes any language pertaining to the acceptance period that may appear elsewhere in this solicitation.

(c) The PHA/IHA requires a minimum acceptance period of [Contracting Officer insert time period] calendar days.

(d) In the space provided immediately below, bidders may specify a longer acceptance period than the PHA's/IHA's minimum requirement. The bidder allows the following acceptance period: calendar days.

(e) A bid allowing less than the PHA's/IHA's minimum acceptance period will be rejected.

(f) The bidder agrees to execute all that it has undertaken to do, in compliance with its bid, if that bid is accepted in writing within (1) the acceptance period stated in paragraph (c) above or (2) any longer acceptance period stated in paragraph (d) above.

#### 7. Small, Minority, Women-Owned Business Concern Representation

The bidder represents and certifies as part of its bid/ offer that it --

(a)  is,  is not a small business concern. "Small business concern," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding, and qualified as a small business under the criteria and size standards in 13 CFR 121.

(b)  is,  is not a women-owned business enterprise. "Women-owned business enterprise," as used in this provision, means a business that is at least 51 percent owned by a woman or women who are U.S. citizens and who also control and operate the business.

(c)  is,  is not a minority business enterprise. "Minority business enterprise," as used in this provision, means a business which is at least 51 percent owned or controlled by one or more minority group members or, in the case of a publicly owned business, at least 51 percent of its voting stock is owned by one or more minority group members, and whose management and daily operations are controlled by one or more such individuals. For the purpose of this definition, minority group members are:

(Check the block applicable to you)

- |   |   |
|---|---|
| <input type="checkbox"/> Black Americans    | <input type="checkbox"/> Asian Pacific Americans  |
| <input type="checkbox"/> Hispanic Americans | <input type="checkbox"/> Asian Indian Americans   |
| <input type="checkbox"/> Native Americans   | <input type="checkbox"/> Hasidic Jewish Americans |

#### 8. Indian-Owned Economic Enterprise and Indian Organization Representation (applicable only if this solicitation is for a contract to be performed on a project for an Indian Housing Authority)

The bidder represents and certifies that it:

(a)  is,  is not an Indian-owned economic enterprise. "Economic enterprise," as used in this provision, means any commercial, industrial, or business activity established or organized for the purpose of profit, which is at least 51 percent Indian owned. "Indian," as used in this provision, means 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.

(b)  is,  is not an Indian organization. "Indian organization," as used in this provision, means the governing body of any Indian tribe or entity established or recognized by such governing body. Indian "tribe" means 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.

**9. Certification of Eligibility Under the Davis-Bacon Act** (applicable to construction contracts exceeding \$2,000)

(a) By the submission of this bid, the bidder certifies that neither it nor any person or firm who has an interest in the bidder'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).

(b) No part of the contract resulting from this solicitation shall be subcontracted to any 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).

(c) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.

**10. Certification of Nonsegregated Facilities** (applicable to contracts exceeding \$10,000)

(a) The bidder's attention is called to the clause entitled **Equal Employment Opportunity** of the General Conditions of the Contract for Construction.

(b) "Segregated facilities," as used in this provision, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin because of habit, local custom, or otherwise.

(c) By the submission of this bid, the bidder certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The bidder agrees that a breach of this certification is a violation of the Equal Employment Opportunity clause in the contract.

(d) The bidder further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) prior to entering into subcontracts which exceed \$10,000 and are not exempt from the requirements of the Equal Employment Opportunity clause, it will:

(1) Obtain identical certifications from the proposed subcontractors;

(2) Retain the certifications in its files; and

(3) Forward the following notice to the proposed subcontractors (except if the proposed subcontractors have submitted identical certifications for specific time periods):

**Notice to Prospective Subcontractors of Requirement for Certifications of Nonsegregated Facilities**

A Certification of Nonsegregated Facilities must be submitted before the award of a subcontract exceeding \$10,000 which is not exempt from the provisions of the Equal Employment Opportunity clause of the prime contract. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

**Note:** The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001.

**11. Clean Air and Water Certification** (applicable to contracts exceeding \$100,000)

The bidder certifies that:

(a) Any facility to be used in the performance of this contract [ ] is, [ ] is not listed on the Environmental Protection Agency List of Violating Facilities:

(b) The bidder will immediately notify the PHA/IHA Contracting Officer, before award, of the receipt of any communication from the Administrator, or a designee, of the Environmental Protection Agency, indicating that any facility that the bidder proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and,

(c) The bidder will include a certification substantially the same as this certification, including this paragraph (c), in every nonexempt subcontract.

**12. Previous Participation Certificate** (applicable to construction and equipment contracts exceeding \$50,000)

(a) The bidder shall complete and submit with his/her bid the Form HUD-2530, "Previous Participation Certificate." If the successful bidder does not submit the certificate with his/her bid, he/she must submit it within three (3) working days of bid opening. Failure to submit the certificate by that date may render the bid nonresponsive. No contract award will be made without a properly executed certificate.

(b) A fully executed "Previous Participation Certificate"

[ ] is, [ ] is not included with the bid.

**13. Bidder's Signature**

The bidder hereby certifies that the information contained in these certifications and representations is accurate, complete, and current.

\_\_\_\_\_  
(Signature and Date)

\_\_\_\_\_  
(Typed or Printed Name)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
(Company Name)

\_\_\_\_\_  
(Company Address)

STATEMENT OF BIDDER'S QUALIFICATIONS  
HARRISBURG HOUSING AUTHORITY

I All questions must be answered. The data given must be clear and comprehensive. This statement must be notarized.

1. Name of Bidder \_\_\_\_\_
2. Business Address \_\_\_\_\_
3. When Organized \_\_\_\_\_
4. Where Incorporated \_\_\_\_\_
5. How many years have you been engaged in business under your present firm or trading name? \_\_\_\_\_
6. Plan of Organization \_\_\_\_\_
7. List executive personnel \_\_\_\_\_
8. Have you ever refused to sign a contract at your original bid? \_\_\_\_\_
9. Have you ever defaulted on a contract? \_\_\_\_\_
10. Will you, upon request, furnish any other information that the Local Authority may require? \_\_\_\_\_

II Attached hereto as part of this Statement of Bidder's Qualifications is the financial statement of the Bidder for the most recent fiscal year.

III Attached hereto as part of this Statement of Bidder's Qualifications are the details of at least three other projects similar in nature and scope.

IV Bidder shall also respond to the attached Contractor's Qualifications by submitting all information requested and the completed Contractor's Qualification Statement.

V The undersigned hereby authorizes and requests any person to furnish any information requested by the Local Authority in verification of the recitals comprising this Statement of Bidder's Qualifications.

Dated at \_\_\_\_\_  
this \_\_\_\_\_ day of, 20\_\_\_\_

\_\_\_\_\_  
(Name of Bidder)

By \_\_\_\_\_

Title \_\_\_\_\_

AFFIDAVIT OF BIDDERS QUALIFICATIONS

COMMONWEALTH OF

ss.

COUNTY OF \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Before me, the undersigned notary public, this day personally appeared \_\_\_\_\_ of \_\_\_\_\_ to me known, who being dully sworn to law, deposes and says that he is \_\_\_\_\_ of \_\_\_\_\_, and that the answers to the foregoing questions are true and correct.

\_\_\_\_\_  
*Signed*

SUBSCRIBED AND SWORN to BEFORE ME

This \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_

\_\_\_\_\_  
Notary Public

**SECTION 3 CLAUSE AND CERTIFICATION**

**Harrisburg Housing Authority**

**Section 3 Clause**

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## **SECTION 3 CLAUSE**

The Harrisburg Housing Authority will provide to each Solicitation Bid, A copy of the Section 3 Clause in relation to the Section 3 requirements under the Housing and Urban Development act of 1968, as amended, 12 U.S.C. 1701u (Section 3).

### **A.-E. Purpose/General Requirements**

- A.** The work to be performed in connection with the underlying 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 should if possible and 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 the underlying contract agree to comply with HUD's regulations in 24 CFR, Part 135, which implements Section 3. As evidenced by their execution of the Section 3 certification, the parties to the underlying 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 worker's 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 the minimum number of positions and job titles subject to hire, the availability of apprenticeship and training positions along with qualifications for each, 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.

**Noncompliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of the underlying contract for default, and debarment or suspension from future HUD assisted contracts.**

#### **F. Section 3 Regulations (numerical goals)**

1. When contractors and/or sub-contractor are subject to the “hiring” section of the Section 3 regulations by adding new hires, the contractors and/or sub-contractors are required, to the greatest extent feasible, to initially, reach out to the residents of the Harrisburg Housing Authority concerning the opportunity for employment, contracts and/or training, thereafter the contractors and/or sub-contractors must direct these opportunities to other low income people in the community where the project is located.
2. All contractors and/or sub-contractors that are subject to the “hiring” section of the Section 3 regulations, must document every effort that was made to offer and fill the employment, contract and/or training opportunity with a Section 3 person or business.
3. The minimum requirements for documenting solicitation of a Section 3 person or business include: distributing flyers, placing ads, local media, community organizations, and posting signs in the resident relations office, community rental offices and in and around the community where the covered contract has been awarded. (Refer to H. "Geographical Area Tier System" below for a description of the required solicitation area and individuals)
4. The contractors and/or sub-contractors must prove that he or she has made every effort to notify The Harrisburg Housing Authority's residents, those Section 3 residents within a 15 mile radius of the covered contract area, and those Section 3 residents within the current metropolitan service area in which the covered contract lies of the contractors opportunities for employment, contracts, and/or training. If the contractors and/or sub-contractors prove these efforts and the contractors and/or sub-contractors were unable to solicit Section 3 persons or businesses, then at that time the contractors and/or sub-contractors may open up these opportunities to other non-Section 3 persons or contractors.
5. Documentation of all contractors and/or sub-contractors efforts to provide employment, contracts, and/or training to Section 3 persons or businesses must be presented to the Section 3 compliance office before moving forward.
6. All contractors and/or sub-contractors that have not met the Section 3 regulations set forth in this section have the burden of demonstrating why it was not feasible to meet these regulations.
7. Section 3 regulations are mandated by HUD and are required by all contractors and/or subcontractors. Noncompliance with HUD’s regulations in 24 CFR part 135 may result in sanctions, termination of the contract for default, and debarment or suspension from future HUD assisted contracts.

#### **G. Resident Relations**

Contractors and/or sub-contractors may contact the Resident Relations office of the Harrisburg Housing Authority for possible Section 3 applicants, business concerns and joint venture candidates for hire.

#### **H. Geographical Area Tier System: (starting point for residents)**

1. Harrisburg Housing Authority residents & Section 8 residents
2. The 15 mile radius surrounding the covered contract area
3. Current MSA (Metropolitan Service Area) in which the contract lie



**I. Hiring and Contracting Obligations (Section 3 / Business Concerns)**

Hiring Obligation

To the greatest extent feasible, all contractors and/or sub-contractors who are a party to the underlying Section 3 covered contract will commit to hiring 30 percent of Section 3 new hires, or maintaining at least 30 percent full time permanent employees that are Section 3 residents within 3 years of being employed.

Contracting Obligation

To the greatest extent feasible, all contractors and/or sub-contractors who are a party to the underlying contract will commit to awarding at least 10 percent of the total contract amount to Section 3 business concerns, and at least 3 percent of the total contract amount of all covered non-construction contracts to be awarded to Section 3 business concerns.

**J. Section 3 Applicants Proving Eligibility**

A person seeking the training and employment preference provided by Section 3 covered assistance, has the responsibility of providing evidence (if requested) that the person is eligible for the preference. The willful falsification of an individual's Section 3 status may subject the individual to civil or criminal prosecution. (See, 18 USC § 1001 and 31 USC § 231)

Nothing will be construed to require the employment of a Section 3 resident who does not meet the qualifications of the position to be filled.

**K. Training Fund**

As an alternative, Section 3 compliance can be achieved by contributing into the Harrisburg Housing Authority's Section 3 Training fund in the amount specified in the section below. This does not apply to sub-contractors. This applies to the base contract amount for the prime contractor and is not assessed to subsequent change orders or addendums.

When the contract amount is **less than \$100,000**

5 % of base contract, or \$4,500

**At least \$100,000, but less than \$200,000**

4.5 % of base contract, or \$8,000

**At least \$200,000, but less than \$300,000**

4 % of base contract, or \$10,500

**At least \$300,000, but less than \$400,000**

3.5 % of base contract, or \$12,000

**At least \$400,000, but less than \$500,000**

3 % of base contract, or \$12,500

**At least \$500,000, but less than \$1 million**

2.5 % of base contract, or \$20,000

**At least \$1 million, but less than \$2 million**

2 % of base contract, or \$30,000

**At least \$2 million, but less than \$4 million**

1.5 % of base contract, or \$40,000

**At least \$4 million, but less than \$7 million**

1 % of base contract, or \$52,500

**\$7 million or more**

.75 % of base contract

**L. Preference for Section 3 Certified Contractors**

1. An award shall be given to the qualified and responsible Section 3 Business Concern with the lowest responsive bid, if that bid is:
  - a. Within the maximum total contract price established in the contracting budget for the specific project for which bids are being taken, and
  - b. Not more than "X" higher than the total bid price of the lowest responsive bid from any responsible, responsive bidder.

"X" is determined as follows,

X= the lesser of:

When the lowest responsive bid is **less than \$100,000**

10 % of that bid or \$ 9,000

**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

If no responsive bid by a Section 3 business concern meets the requirements of section L. of this clause, the contract shall be awarded to a responsive bidder with the lowest responsive bid.

**M. Section 3 Business Concern**

Is a business in which:

1. 51 percent of the business, or more, is owned by Section 3 residents; or
2. Is a business that at least 30 percent of its permanent, full time employees include people who are currently Section 3 residents, or within three years of the date of their first employment with the business were Section 3 residents; or
3. A business that provides evidence of a commitment to sub-contract in excess of 25 percent of the dollar award of all sub-contracts to be awarded to business concerns that meet the qualifications set forth in paragraphs 1. or 2.

**N. Fines for Non-Compliance**

Contractors found to have violated the terms of this clause are liable for fines in an amount equal to the amounts paid into the training fund as specified above in section K. The Harrisburg Housing Authority will not consider the contractor responsive for future contracts for a period of 120 days after the fine is paid.

**O. Contractors That are Unable to Engage in Opportunities for Section 3/Business**

For contractors that do not engage in training, employment, and contracting opportunities for Section 3 residents, the contractor must contribute to the Harrisburg Housing Authority training fund. For all contracts awarded to sub-contractors, the prime contractor must ensure that, to the greatest extent feasible, all sub-contractors will provide training, employment, contracting, and joint venture opportunities to Section 3 residents and business concerns of the Harrisburg Housing Authority.

**P. Section 3 Joint Venture**

A Section 3 joint venture is an association of business concerns, one of which qualifies as a Section 3 business concern, formed by a written joint venture agreement to engage in and carry out a specific business venture where the business concerns combine their efforts, resources, skills and knowledge for joint profit, but not necessarily on a continuing or permanent basis and for which the Section 3 business concern is responsible for a clearly defined portion of the work to be performed and:

- i. Holds management responsibilities in the venture, and
- ii. Performs at least 25 percent of the work and
- iii. Is contractually entitled to compensation proportionate to its work.



**SECTION 3 CONTRACTOR'S CERTIFICATION**

The Bidder certifies that they are ( ) **or**, are not ( ) a Section 3 Contractor as defined by the Housing and Urban Development Act of 1968 as amended, and defined in the definitions found at 24 CFR 135.5, as follows:

A Section 3 business concern, means a business concern, as defined in this section- (check appropriate field)

- ( ) That is 51 percent or more owned by Section 3 residents; or
- ( ) Whose permanent, full-time employees include persons, at least 30 percent of whom are currently Section 3 residents, or within three years of the date of first employment with the business concern were Section 3 residents; or
- ( ) That provides evidence of a commitment to subcontract in excess of 25 percent of the dollar award of all subcontracts to be awarded to business concerns that meet the qualifications set forth in paragraphs (1) or (2) of this definition of "Section 3 Business Concern."

Corporate Seal

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name and Title

Before me, the undersigned Notary Public, this day personally appeared \_\_\_\_\_ who being dully sworn to law, deposes and says that he is \_\_\_\_\_ of \_\_\_\_\_, and that the foregoing is true and correct.

\_\_\_\_\_  
Notary Public

SUBSCRIBED AND SWORN TO BEFORE ME This \_\_\_\_\_ day of \_\_\_\_\_ AD: 20 \_\_\_\_\_

## ASSURANCE OF COMPLIANCE (Section 3, HUD ACT of 1968)

### TRAINING, EMPLOYMENT, AND CONTRACTING OPPORTUNITIES FOR BUSINESS AND LOWER INCOME PERSONS

A. The project assisted under this (contract) (agreement) is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S. C. 170U. Section 3 requires that to the greatest extent feasible opportunities for training and employment be given to lower income residents of the project area and contracts for work in connection with the project be awarded to business concerns which are located in or owned in substantial part by persons residing in the area of the project.

B. Notwithstanding any other provision of this (contract) (agreement), the (applicant) (recipient) shall carry out the provisions of said Section 3 and the regulations issued pursuant thereto by the Secretary set forth in 24 CFR Part 135 (published in 38 Federal Register 29220, October 23, 1973), and all applicable rules and orders of the Secretary issued there under prior to the execution of this (contract) (agreement). The requirements of said regulations include but are not limited to development and implementation of an affirmative action plan for utilizing business concerns located within or owned in substantial part by persons residing in the area of the project; the making of a good faith effort, as defined by the regulation, to provide training, employment and business opportunities required by Section 3; and incorporation of the "Section 3 Clause" specified by Section 135.20 (b) of the regulations in all contracts for work in connection with the project. The (applicant) (recipient) certifies and agrees that it is under no contractual or other disability which would prevent it from complying with these requirements.

C. Compliance with the provisions of the Section 3 Clause of this covered contract, the regulations set forth in 24 CFR Part 135, and all applicable rules and orders of the Secretary issued there under prior to approval by the Government of the application for this (contract) (agreement), shall be a condition of the Federal financial assistance provided to the project, binding upon the (applicant) (recipient), its successors and assigns. Failure to fulfill these requirements shall subject the (applicant) (recipient), its contractors and subcontractors, its successors, and assigns to the sanctions specified by the (contract) (agreement), and to such sanctions as are specified by 24 CFR Section 135

D. Attachment to this certification: **Bidder's Section 3 action plan.** Submission of a detailed plan shall be attached to and becomes a part of this certification.

**APPLICANT:** \_\_\_\_\_

**SIGNATURE:** \_\_\_\_\_

**Address:** \_\_\_\_\_

**Date:** \_\_\_\_\_

## E-MAIL/CONTACTS

Section 3 Compliance Office  
Gary Deavers  
[gdeavers@harrisburghousing.org](mailto:gdeavers@harrisburghousing.org)

Resident Relations Office  
Evelyn Ayala  
[evelyna@harrisburghousing.org](mailto:evelyna@harrisburghousing.org)

Procurement Department  
Lori Shope  
[loris@harrisburghousing.org](mailto:loris@harrisburghousing.org)

Christine Campbell  
[christinec@harrisburghousing.org](mailto:christinec@harrisburghousing.org)

Modernization

**Non- Collusive Affidavit**

State of: \_\_\_\_\_

SS

County of: \_\_\_\_\_

\_\_\_\_\_, being first duly sworn, disposes and says:

That he/she is the \_\_\_\_\_ of the party making the foregoing proposal or bid; that such proposal or bid is genuine and that said bidder has not colluded or conspired, either directly or indirectly with any other bidder or person in any manner; to fix the bid or refrain from bidding in order to secure any advantage against the Harrisburg Housing Authority or any party with interest in the proposed contract; and that all statements in the said proposal or bid are true and accurate.

\_\_\_\_\_  
Affiant

Subscribed and sworn to before me this

\_\_\_\_\_ day of \_\_\_\_\_, 20\_\_

\_\_\_\_\_  
Notary Public

My commission expires \_\_\_\_\_, 20\_\_



## LIST OF DRAWINGS

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A402	BUILDINGS K, L, & M - ENLARGED PORCH 'A' & 'F' PLANS & DETS
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A409	BUILDINGS K, L, & M - ENLARGED KITCHEN PLANS & ELEV
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H102	BUILDING L – FLOOR PLANS – HVAC
H103	BUILDING M – FLOOR PLANS – HVAC
H104	BUILDING K – LARGE SCALE PLAN – HVAC
H105	BUILDING L – LARGE SCALE PLAN – HVAC
H106	BUILDING M – LARGE SCALE PLAN – HVAC
H107	BUILDINGS K, L, & M – SCHEDULES & DETAILS - HVAC

## PLUMBING

P101	BUILDING K – FLOOR PLANS - PLUMBING
P102	BUILDING L – FLOOR PLANS – PLUMBING
P103	BUILDING M – FLOOR PLANS – PLUMBING
P104	BUILDING K – LARGE SCALE PLAN – PLUMBING
P105	BUILDING L – LARGE SCALE PLAN – PLUMBING
P106	BUILDING M – LARGE SCALE PLAN – PLUMBING
P107	BUILDINGS K, L, & M – PLUMBING SCHEDULES & DETAILS
P108	BUILDINGS K, L, & M – PLUMBING ISOMETRICS

## ELECTRICAL

E101	BUILDING K – FLOOR PLANS - ELECTRICAL
E102	BUILDING L – FLOOR PLANS – ELECTRICAL
E103	BUILDING M – FLOOR PLANS – ELECTRICAL
E104	BUILDING K – LARGE SCALE PLAN – ELECTRICAL
E105	BUILDING L – LARGE SCALE PLAN – ELECTRICAL
E106	BUILDING M – LARGE SCALE PLAN – ELECTRICAL
E107	BUILDINGS K, L, & M – SCHEDULES, NOTES, ABBREVIATIONS AND SYMBOLS
E108	BUILDINGS K, L, & M – PANELBOARDS AND RISER DIAGRAM

**FORM OF CONTRACT**

**HARRISBURG HOUSING AUTHORITY  
351 CHESTNUT STREET  
HARRISBURG, PA 17101**

**FORM OF CONTRACT**

**THIS AGREEMENT** made this \_\_\_\_ day of \_\_\_\_\_, in the year **Two Thousand Nineteen** by and between \_\_\_\_\_ a corporation organized and existing under the laws of the State of \_\_\_\_\_ a partnership consisting of \_\_\_\_\_ or individual trading as \_\_\_\_\_ hereinafter called the "**Contractor**", and **THE HARRISBURG HOUSING AUTHORITY** hereinafter called the "**Local Authority**", WITNESSETH, that the Contractor and the Local Authority for the consideration stated herein mutually agree as set forth below:

ARTICLE 1. Statement of Work. The Contractor shall furnish all labor, material, equipment and services, and perform and complete all work required for **William Howard Day Homes – Renovations to Buildings K, L and M: Contract No. M-2019** \_\_\_\_\_ **Contract** in strict accordance with the SPECIFICATIONS which said SPECIFICATIONS are Dated March 27, 2019 and the Addendum (Addenda) to SPECIFICATIONS is (are) numbered \_\_\_\_\_ and dated (in the order of each Addendum as issued) \_\_\_\_\_, which SPECIFICATIONS and Addendum (Addenda) are incorporated herein by reference and made a part hereof.

ARTICLE 2. The Contract Price. The Local Authority shall pay the Contractor for the performance of the Contract, in current funds, subject to additions and deductions as provided in the Specifications, the sum of \_\_\_\_\_ DOLLARS \_\_\_\_\_.

Article 3. Contract Documents. The Contract shall consist of the following component parts:

- |                         |                            |
|-------------------------|----------------------------|
| a. This Instrument      | b. General Conditions      |
| c. General Requirements | d. Technical Specification |
| e. Drawings             |                            |

This instrument, together with the other documents enumerated in this Article 3, which said other documents are as fully a part of the Contract as if hereto attached or herein repeated, form the Contract. In the event that any provision in any component part of this Contract conflicts with any provision of any other component part, the provision of the component part first enumerated in this Article 3 shall govern, except as otherwise specifically stated. The various provisions in Addendum (Addenda) shall be construed in the order of preference of the component part of the Contract which each modifies.

IN WITNESS WHEREOF, the parties hereto have caused this Instrument to be executed in 3 original counterparts as of the day and year first above written.

Witness: (SEAL)

\_\_\_\_\_  
Contractor-Individual

\*\*

Witness: (SEAL)

\_\_\_\_\_  
Contractor-Partnership

Witness: (SEAL)

\_\_\_\_\_  
Contractor-Partnership

Witness: (SEAL)

\_\_\_\_\_  
Contractor-Partnership

\*\*

**Corporation**

ATTEST: \_\_\_\_\_  
(Name of Corporation)

\_\_\_\_\_  
(Secretary or Assistant Secretary) (President or Vice President)

Corporate Seal

\*\*

\_\_\_\_\_  
HARRISBURG HOUSING AUTHORITY  
(Local Housing Authority)

ATTEST:

\_\_\_\_\_  
Corporate Seal President

(All names shall be printed or typed beneath all signatures)

STIPULATION AGAINST LIENS

\_\_\_\_\_  
Harrisburg Housing Authority )  
Owner )  
vs. \_\_\_\_\_ )  
Contractor )

WHEREAS, the Harrisburg Housing Authority, a body politic and corporate, of the Commonwealth of Pennsylvania, is about to execute contemporaneously herewith a contract with

\_\_\_\_\_ a corporation organized and existing under the laws of the State of \_\_\_\_\_ for the William Howard Day Homes – Buildings K, L, and M Contract No. M-2019\_\_, located in Harrisburg, PA.

NOW THEREFORE, on \_\_\_\_\_, 2019, at the time of and immediately before the execution of the contract and before any authority has been given by the said Harrisburg Housing Authority to said \_\_\_\_\_ (Name of Contractor)

to commence work on the said project or purchase materials for the same, in consideration of the making of the said contract with the said \_\_\_\_\_ (Name of Contractor)

and for the further consideration of One Dollar paid to the said Harrisburg Housing Authority by the said \_\_\_\_\_, it is agreed that no mechanic's claims or other liens shall be filed against the (Name of Contractor) building and/or lot of ground appurtenant thereto by the said \_\_\_\_\_ (Name of Contractor)

nor any subcontractor, nor by any of the material men or workmen or any person for any materials or labor or extra materials or labor purchased or furnished in connection with the construction of the said project or any part thereof, the right to file such claims or liens being expressly waived and relinquished herewith.

(Seal) Witness: \_\_\_\_\_

\_\_\_\_\_  
Harrisburg Housing Authority  
BY: \_\_\_\_\_  
President

(Seal) ATTEST: \_\_\_\_\_

\_\_\_\_\_  
BY: \_\_\_\_\_  
Contractor  
\_\_\_\_\_  
Title

**GENERAL CONDITIONS FOR CONSTRUCTION CONTRACTS**

**HUD FORM 5370**

# 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.

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## 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.
- (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.

## 2. Contractor's Responsibility for Work

- (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

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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 contractor 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 400 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 \_\_\_\_\_ 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 \$1,000 [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 \$ 1,000,000 [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 \$ 1,000,000 [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).

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#### 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

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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.

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#### 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.

## **SECTION 007500**

### **SUPPLEMENTARY CONDITIONS**

#### **PART 1 SUPPLEMENTED ARTICLES**

##### **1.01 SUPPLEMENTARY GENERAL CONDITIONS**

- A. The following supplements add to the “General Conditions for Construction Contracts” (HUD Form 5370). Where an article, paragraph, or subparagraph in the General Conditions is supplemented, the provisions of such article, paragraph, or subparagraph shall remain in effect and the Supplemental Instructions shall be considered as added thereto.
- B. The following Articles are those of the above-referenced General Conditions that are being supplemented herein.

##### **1.02 ARTICLE 27 PAYMENTS**

- A. Add the following paragraph at the end of paragraph 27 (k):

“(l) A release of liens from all subcontractors and material men from previous application of payments must be included with the subsequent applications for payment before the Architect can issue certificate of payment to the Owner.”

**END OF SECTION**

**DAVIS BACON WAGE RATES**

General Decision Number: PA190017 01/04/2019 PA17

Superseded General Decision Number: PA20180039

State: Pennsylvania

Construction Types: Residential

Counties: Cumberland, Dauphin, Lebanon and Perry Counties in Pennsylvania.

RESIDENTIAL CONSTRUCTION PROJECTS (Consisting of single family homes and apartments up to and including 4 stories)

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.60 for calendar year 2019 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.60 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2019. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Modification Number	Publication Date
0	01/04/2019

SUPA1997-002 02/24/1997

	Rates	Fringes
Bricklayer.....	\$ 14.78	.57
Carpenter (Excluding Drywall Hanging).....	\$ 13.00	
Electrician.....	\$ 14.51	1.90
Laborers:		

Mason Tender.....	\$ 9.47	
Unskilled.....	\$ 9.47	
Painter (Brush & Roller).....	\$ 9.15	
Plumber.....	\$ 11.57	1.80
Power equipment operators:		
Backhoe.....	\$ 12.20	
Loader.....	\$ 13.87	
Roller.....	\$ 8.92	

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

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The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

#### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were

prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

#### Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

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#### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
 Wage and Hour Division  
 U.S. Department of Labor  
 200 Constitution Avenue, N.W.  
 Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
 U.S. Department of Labor  
 200 Constitution Avenue, N.W.  
 Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
 U.S. Department of Labor  
 200 Constitution Avenue, N.W.  
 Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION



## **PERFORMANCE BOND**

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS that we \_\_\_\_\_ as Principal and \_\_\_\_\_ as Surety are held and firmly bound unto the HARRISBURG HOUSING AUTHORITY, a body politic and corporate organized and existing under and by virtue of the Housing Authorities Law of Pennsylvania, approved May 28, 1937, P.L. 955; (hereinafter called the Obligee) in the full and just sum of \_\_\_\_\_ dollars (\$\_\_\_\_\_), lawful money of the United States of America, to be paid to the said Obligee or its assigns to which payment well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents:

WHEREAS, said Principal has entered into a certain contract with said Obligee dated \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_ (hereinafter called the Contract) for the furnishing of \_\_\_\_\_ which Contract, together with the documents therein described as the "Contract Documents" shall be deemed a part hereof as fully as if set out herein.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH that if the Principal shall well and faithfully do and perform the things agreed by him to be done and performed, according to the terms of said Contract and the documents therein referred to as the "Contract Documents", and made a part thereof and such alterations as may be made in said "Contract Documents" as therein provided and which are hereby made a part of this obligation on the same as though they were set forth herein, and shall indemnify and save harmless the said Obligee from any expenses incurred through the failure of said Principal to complete the work specified and for any damages growing out of the manner of performance of said contract by said principal contractor or all sub-contractors or his or their agents or servants including patent, trade mark and copyright infringements, and shall remedy without cost to the Obligee any defect which may develop within one year from the date of completion and acceptance of the work to be performed under the said contract; provided said defects, in the judgment of the Obligee or its successors or assigns having jurisdiction in the premises, are caused by defective or inferior materials and/or workmanship, then this obligation to be void, otherwise to remain in full force and effect.

The said surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any wise effect its obligation of this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specification.

IN WITNESS WHEREOF the said Principal and Surety have duly executed this Bond in triplicate under seal the \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

ATTEST:

BY: \_\_\_\_\_  
Corporation-Contractor  
\_\_\_\_\_  
President

WITNESS: \_\_\_\_\_ (SEAL)

WITNESS: \_\_\_\_\_  
Individual-Contractor  
\_\_\_\_\_  
Partnership-Contractor

BY: \_\_\_\_\_ (SEAL)  
\_\_\_\_\_  
(SEAL)

WITNESS: \_\_\_\_\_  
\_\_\_\_\_  
Surety Company

BY: \_\_\_\_\_  
Attorney-in-Fact

ATTEST: \_\_\_\_\_  
\_\_\_\_\_  
Surety Company  
BY: \_\_\_\_\_  
\_\_\_\_\_  
Attorney-in-Fact

The rate of premium on the bond is \$\_\_\_\_\_ per thousand. The total amount of premium charged is \$\_\_\_\_\_. (The above is to be filled in by surety company, and the power of attorney of person signing for the surety company must be attached.

**IMPORTANT NOTE**

Surety Companies executing bonds must appear on the Treasury Department's most current list (Circular 570) and be authorized to transact business in the State where the Project is located.

**PAYMENT BOND**

PAYMENT BOND  
(LABOR AND MATERIALMEN'S BOND)

KNOW ALL MEN BY THESE PRESENTS that we \_\_\_\_\_ as Principal and \_\_\_\_\_ as Surety are held and firmly bound unto the HARRISBURG HOUSING AUTHORITY, a body politic and corporate, created by Act of the General Assembly of the Commonwealth of Pennsylvania (hereinafter called the Obligee) in the full and just sum of \_\_\_\_\_ Dollars (\$\_\_\_\_\_) lawful money of the United States of America, to be paid to the said Obligee or its assigns to which payment well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents:

WHEREAS, said Principal has entered into a certain contract with said Obligee dated \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_ (hereinafter called the Contract), for \_\_\_\_\_ which contract, together with the documents therein described as the "Contract Documents" shall be deemed a part hereof as fully as if set out herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH that if the above bounden Principal shall and will promptly pay or cause to be paid in full all sums of money which may be due any and every person, co-partnership, association or corporation for all material furnished and labor supplied, or performed, rent for equipment employed and services rendered by public utilities in or in connection with the prosecution of the work whether or not the said material or labor, equipment or services enter into and become component parts of the work or the improvement contemplated, then this obligation shall be void, otherwise the same shall remain in full force and effect.

The Principal and Surety hereby jointly and severally agree with the Obligee herein that any and every person, co-partnership, association or corporation who, whether as contractor or otherwise has furnished material or supplied or performed labor or hired, leased or rented equipment or rendered services as a public utility in connection with the prosecution of the work as above provided who has not been paid in full therefore, may sue in assumpsit on this bond in the name of the Obligee, for his, their or its use, to prosecute the same to final judgment for the sums as may be justly due him, them or it, and have execution thereon, provided, however, that the Obligee shall not be liable for the payment of any costs or expenses of such suit.

Provided further, that no suits shall be commenced prior to ninety (90) days from the date upon which said person, co-partnership, association or corporation furnished, supplied or performed the last of the material, or labor, equipment or services, for which said claim is made and no such suit shall be commenced by any such person, co-partnership, association or corporation having direct contractual relationship with a sub-contractor but no contractual relationship with the Principal, unless he, they or it shall have given written notice to the Principal which shall state with substantial accuracy the amount claimed and the name of the party to whom the material was furnished or supplied or for whom the labor was done or performed or to whom the equipment was rented; to whom or on whose behalf the services of a public utility were rendered, by serving said written notice upon said Principal by mailing the same by registered mail, postage prepaid, in an envelope addressed to said Principal at any place he, they or it maintains his, their or its business or his residence, or otherwise duly serving the same in any manner in which the United States Marshal of the United States District Court for the Middle District of Pennsylvania is authorized by law to serve a summons within ninety (90) days from the date on which he, they or it performed that last of the labor or furnished the last of the material or the rented equipment was last employed or the services of a public utility was last rendered which such claim is made, and every such suit shall be commenced not later than one year from the date when the causes of action accrued.

The said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the Specifications accompanying the same shall in any wise effect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the Specifications.

IN WITNESS WHEREOF the said Principal and Surety have duly executed this bond in triplicate under seal the \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_.

ATTEST:

\_\_\_\_\_  
Corporation-Contractor (SEAL)

BY:

\_\_\_\_\_  
Title

WITNESS:

\_\_\_\_\_  
Individual-Contractor (SEAL)

WITNESS:

\_\_\_\_\_  
Partnership-Contractor

BY:

\_\_\_\_\_  
(SEAL)

\_\_\_\_\_  
Surety Company

ATTEST:

BY:

\_\_\_\_\_  
Attorney-in-Fact

The rate of premium on the bond is \$\_\_\_\_\_ per thousand. The total amount of premium charged is \$\_\_\_\_\_.  
(The above is to be filled in by surety company, and the power of attorney of person signing for the surety company must be attached.)

IMPORTANT NOTE

Surety Companies executing bonds must appear on the Treasury Department's most current list (Circular 570) and be authorized to transact business in the State where the Project is located.

# PROJECT FORMS

## Vendor Information Form

1) Prime \_\_\_\_ Sub-contractor \_\_\_\_ (This form must be completed by and for each).

2) Name of Firm: \_\_\_\_\_

Telephone: \_\_\_\_\_

Fax: \_\_\_\_\_

3) Street Address, City, State, Zip: \_\_\_\_\_

\_\_\_\_\_

4) E-mail Address: \_\_\_\_\_

*E-mail is our preferred method of contact; please correspond by same.*

5) Identify Principals/Partners in Firm

Name	Title	% of Ownership

6) Identify the individual(s) who will act as project manager, along with other supervisory personnel on the engagement team working the HHA contract.. (Do not duplicate any resumes required above):

Name	Title

7) Diversity Statement: Check all of the following that apply to the ownership of your firm, entering the percentage (%) of ownership of each:

Caucasian American (Male) \_\_\_\_\_%     
  Public-Held Corporation \_\_\_\_\_%     
  Government Agency \_\_\_\_\_%     
  Non-Profit Organization \_\_\_\_\_%

8) Minority- (MBE) or Woman-Owned (WBE) Business Enterprise (Qualifies 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 \_\_\_\_\_%     
  Other (Specify): \_\_\_\_\_%

WMBE Certification Number: \_\_\_\_\_

Certified by (Agency): \_\_\_\_\_

(NOTE: A CERTIFICATION/NUMBER IS NOT REQUIRED; ENTER IF AVAILABLE)



- 9) Are you a Section 3 Business Concern: \_\_\_\_\_  
*For clarification of a Section 3 Business Concern, please refer to the HHA Website listed below.*
- 10) Federal Tax ID Number: \_\_\_\_\_
- 11) Pennsylvania Business License Number: \_\_\_\_\_
- 12) State of \_\_\_\_\_ License Type and Number: \_\_\_\_\_
- 13) Worker's Compensation Insurance Carrier: \_\_\_\_\_  
 Policy Number: \_\_\_\_\_ Expiration Date: \_\_\_\_\_
- 14) General Liability Insurance Carrier: \_\_\_\_\_  
 Policy Number: \_\_\_\_\_ Expiration Date: \_\_\_\_\_
- 15) Professional Liability Insurance Carrier: \_\_\_\_\_  
 Policy Number: \_\_\_\_\_ Expiration Date: \_\_\_\_\_
- 16) Debarred Statement: Has this firm, or any principal(s), ever been debarred from providing any services by the Federal Government, any state government, or any local government agency within or out the State of Pennsylvania? Yes  No   
 If "Yes," please attach a full detailed explanation, including dates, circumstances and current status.
- 17) If your firm currently holds any State or Federal Contracts, please list all contract #s. (i.e. CoStars, DGS Contracts, GSA Schedule 70 or 84, US Communities, WSCA, etc)
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- 18) Please provide a list of services this firm provides.
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- 19) Would your company be interested in receiving Direct Deposit Payment from HHA? Yes  No
- 20) Verification Statement: The undersigned proposer hereby states that by completing and submitting this form, he/she verifies that all information provided herein is, to the best of his/her knowledge, true and accurate, and agrees that if the HHA discovers any information entered herein is false, that shall entitle the HHA to not consider nor make award or to cancel any award with the undersigned party.

\_\_\_\_\_  
 Signature Date Printed Name Company

**Please provide current copies of all your insurance policies, Section 3 Self Certification forms, licenses, etc.**

**This form along with HHA Policies are available at [www.harrisburghousing.org](http://www.harrisburghousing.org).**

# Schedule of Amounts for Contract Payments

U.S. Department of Housing  
and Urban Development  
Office of Public and Indian Housing

OMB Approval No. 2577-0157  
(Exp. 1/31/2017)

No progress payments shall be made to the contractor unless a schedule of amounts for contract payments in accordance with the construction contract is received.

Public reporting burden for this collection of information is estimated to average 1 hour 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. This agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless that collection displays a valid OMB control number.

Construction practices and HUD administrative requirements establish the need that HAs maintain certain records or submit certain documents in conjunction with the oversight of the award of construction contracts for the construction of new low-income housing developments or modernization of existing developments. These forms are used by HAs to provide information on the construction progress schedule and schedule of amounts for contract payments. 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.

Project Name and Location	Project Number
---------------------------	----------------

Name, Address, and Zip Code of Contractor
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Nature of Contract	Contract Number
--------------------	-----------------

Approved for Contractor by	Title	Date (mm/dd/yyyy)
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Approved for Architect by	Title	Date (mm/dd/yyyy)
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Approved for Owner by	Title	Date (mm/dd/yyyy)
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Item No. (1)	Description of Item (2)	Quantity (3)	Unit of Measure (4)	Unit Price in Place (5)	Amount of Sub-Item (6)	Amount of Principal Item (7)

<b>Total Amount of Contract or Carried Forward</b>	\$
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To the best of my knowledge, 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)

Signature of authorized representative	Date signed (mm/dd/yyyy)
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**Instructions for Preparation of form HUD-51000**

1. A separate breakdown is required for each project and prime contract instructions for preparation are given below.
  - a. **Heading.** Enter all identifying information required for both forms.
  - b. **Columns 1 and 2.** In column 1, enter the item numbers starting with No. 1, and in column 2 enter each principal division of work incorporated in the contract work.
    - (1) **Master List.** The Master list contains the basic items into which any construction contract may be subdivided for the purpose of preparing the Construction Progress Schedule and the Periodical Estimates for Partial Payments. Only those items shall be selected which apply to the particular contract. To ensure uniformity, no change shall be made in the item numbers. Generally, about 25 to 40 major items appear in a contract.
    - (2) **Items Subdivided.** In the Contractor's breakdown, against which all periodical estimates will be checked prior to payment, each major item must be subdivided into sub-items pertinent to the project involved and in agreement with the Contractor's intended basis for requesting monthly payments.
  - c. **Column 3.** Enter the total quantity for each sub-item of each principal division of work listed in the breakdown.
  - d. **Column 4.** Enter the appropriate unit of measure for each sub-item of work opposite the quantities described in column 3, such as "sq. ft.," "yd.," "tons," "lb.," "lumber per M/BM," "brickwork per M," etc., applicable to the particular sub-item. Items shown on "lump sum" or equivalent basis will be paid for only on completion of the whole item and not on a percentage of completion basis.
  - e. **Column 5.** Enter the unit price, in place, of each sub-item of work.
  - f. **Column 6.** Enter the amount of each sub-item obtained by multiplying the quantities in column 3 by the corresponding unit prices in column 5.
  - g. **Column 7.** Enter the amount of principal item only, obtained by adding the amounts of all sub-items of each principal division of work listed in column 6. Continue with the breakdown on form HUD-51000.
  - h. The "Schedule of Amounts for Contract Payments" shall be signed and dated in the space provided at the bottom of each sheet of the form by the individual who prepared the breakdown for the Contractor.
2. The minimum number of copies required for each submission for approval is an original and two copies. When approved, one fully approved copy will be returned to the Contractor.

**Master List of Items**

Item No.	Division of Work	Item No.	Division of Work	Item No.	Division of Work
	Bond	20	Rough Carpentry		<b>Site Improvements</b>
21	General Conditions 1	21	Metal Bucks	44	Retaining Walls
22	Demolition & Clearing	22	Caulking	45	Storm Sewers
	<b>Structures</b>	23	Weatherstripping	46	Sanitary Sewers
	General Excavation	24	Lath & Plastering-Drywall	47	Water Distribution System
	Footing Excavation	25	Stucco	48	Gas Distribution System
	Backfill	26	Finish Carpentry	49	Electrical Distribution System
	Foundation Piles & Caissons	27	Finish Hardware	50	Street & Yard Lighting Fire &
	Concrete Foundations	28	Glass & Glazing	51	Police Alarm System Fire
	Concrete Superstructures	29	Metal Doors	52	Protection System Street
	Reinforcing Steel	30	Metal Base & Trim	53	Work
	Waterproofing & Dampproofing	31	Toilet Partitions	54	Yard Work
23	Spandrel Waterproofing	32	Floors	55	(Other)
	Structural Steel	33	Painting & Decorating	56	(Other)
	Masonry	34	Screens		<b>Equipment</b>
	Stonework	35	Plumbing	57	Shades & Drapery Rods
	Miscellaneous & Ornamental Metal	36	Heating	58	Ranges
1	Metal Windows	37	Ventilating System	59	Refrigerators
	Roofing	38	Electrical	60	Kitchen Cabinets & Work Tables
	Sheet Metal	39	Elevators	61	Laundry Equipment
		40	Elevator Enclosures—Metal	62	(Other)
		41	Incinerators—Masonry & Parts		<b>Punch List 12</b>
		42	(Other)	63	Lawns & Planting
		43	(Other)	64	

1 General Conditions should be 3% to 5% of contract amount.  
 2 Punch List should be approximately 1/2 of 1% or \$30 per dwelling unit, whichever is greater.

# Periodic Estimate for Partial Payment

**U.S. Department of Housing  
and Urban Development**  
Office of Public and Indian Housing

OMB Approval No. 2577-0157  
(exp. 1/31/2017)

Submit original and one copy to the Public Housing Agency.  
Complete instructions are on the back of this form.

Public reporting burden for this collection of information is estimated to average 3.5 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. This agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless that collection displays a valid OMB control number.

This information is collected under the authority of Section 6(c) of the U.S Housing Act of 1937 and HUD regulations. HAs are responsible for contract administration to ensure that the work for project development is done in accordance with State laws and HUD requirements. The contractor/subcontractor reports provide details and summaries on payments, change orders, and schedule of materials stored for the project. The information will be used to ensure that the total development costs, identified in the ACC, are kept as low as possible and consistent with HUD construction requirements. Responses to the collection are necessary to obtain a benefit. The information requested does not lend itself to confidentiality.

Name of Public Housing Agency	Periodic Estimate Number	Period From (mm/dd/yyyy) To (mm/dd/yyyy)
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Location of Project	Project Number
---------------------	----------------

Name of Contractor	Contract Number
--------------------	-----------------

Item Number (1)	Description of Item (2)	Completed to Date (3)
		\$

<b>Value of Contract Work Completed to Date (Transfer this total to line 5 on back of this sheet)</b>	<b>\$</b>
---	-----------

**Instructions**

**Headings.** Enter all identifying data required. Periodic estimates must be numbered in sequence beginning with the number 1.

**Columns 1 and 2.** The "Item Number" and "Description of Item" must correspond to the number and descriptive title assigned to each principal division of work in the "Schedule of Amounts for Contract Payments", form HUD-51000.

**Column 3.** Enter the accumulated value of each principal division of work completed as of the closing date of the periodic estimate. Enter the total in the space provided.

**Certifications.** The certification of the contractor includes the analysis of amounts used to determine the net balance due. In the first paragraph, enter the name of the Public Housing Agency, the contractor, and the date of the contract. Enter the calculations used in arriving at the "Balance Due This Payment" on lines 1 through 16.

Enter the contractor's name and signature in the certification following line 16.

The latter portion of this certification relating to payment of legal rates of wages, is required by the contract before any payment may be made. However, if the contractor does not choose to certify on behalf of his/her subcontractors to wage payments made by them, he/she may modify the language to cover only himself /herself and attach a list of all subcontractors who employed labor on the site during the period covered by the Periodic Estimate, together with the individual certifications of each.

**Certification of the Contractor or Duly Authorized Representative**

According to the best of my knowledge and belief, I certify that all items and amounts shown on the other side of this form are correct; that all work has been performed and material supplied in full accordance with the items and conditions of the contract between the (name of owner)

\_\_\_\_\_ and (contractor) \_\_\_\_\_

dated (mm/dd/yyyy) \_\_\_\_\_, and duly authorized deviations, substitutions, alterations, and additions; that the following is a true and correct statement of the Contract Account up to and including the last day of the period covered by this estimate, and that no part of the "Balance Due This Payment" has been received.

1. Original Contract Amount \$ \_\_\_\_\_

**Approved Change Orders:**

2. Additions (Total from Col. 3, form HUD-51002) \$ \_\_\_\_\_

3. Deductions (Total from Col. 5, form HUD-51002) \$ \_\_\_\_\_ (net) \$ \_\_\_\_\_

4. Current Adjusted Contract Amount (line 1 plus or minus net) \$ \_\_\_\_\_

**Computation of Balance Due this Payment**

5. Value of Original Contract work completed to date (from other side of this form) \$ \_\_\_\_\_

**Completed Under Approved Change Orders**

6. Additions (from Col. 4, form HUD-51002) \$ \_\_\_\_\_

7. Deductions (from Col.5, form HUD-51002) \$ \_\_\_\_\_ (net) \$ \_\_\_\_\_

8. Total Value of Work in Place (line 5 plus or minus net line 7) \$ \_\_\_\_\_

9. Less: Retainage, \_\_\_\_\_% \$ \_\_\_\_\_

10. Net amount earned to date (line 8 less line 9) \$ \_\_\_\_\_

11. Less: Previously earned (line 10, last Periodic Estimate) \$ \_\_\_\_\_

12. Net amount due, work in place (line 10 less line 11) \$ \_\_\_\_\_

**Value of Materials Properly Stored**

13. At close of this period (from form HUD-51004) \$ \_\_\_\_\_

14. Less: Allowed last period \$ \_\_\_\_\_

15. Increase (decrease) from amount allowed last period \$ \_\_\_\_\_

16. Balance Due This Payment \$ \_\_\_\_\_

I further certify that all just and lawful bills against the undersigned and his/her subcontractors for labor, material, and equipment employed in the performance of this contract have been paid in full in accordance with the terms and conditions of this contract, and that the undersigned and his/her subcontractors have complied with, or that there is an honest dispute with respect to, the labor provisions of this contract.

Name of Contractor \_\_\_\_\_ Signature of Authorized Representative \_\_\_\_\_ Title \_\_\_\_\_ Date (mm/dd/yyyy) \_\_\_\_\_

**Certificate of Authorized Project Representative and of Contracting Officer**

Each of us certifies that he/she has checked and verified this Periodic Estimate No. \_\_\_\_\_; that to the best of his/her knowledge and belief it is a true statement of the value of work performed and material supplied by the contractor; that all work and material included in this estimate has been inspected by him/her or by his/her authorized assistants; and that such work has been performed or supplied in full accordance with the drawings and specifications, the terms and conditions of the contract, and duly authorized deviations, substitutions, alterations, and additions, all of which have been duly approved.

We, therefore, approve as the "Balance Due this Payment" the amount of \$ \_\_\_\_\_

Authorized Project Representative \_\_\_\_\_ Date (mm/dd/yyyy) \_\_\_\_\_ Contracting Officer \_\_\_\_\_ Date (mm/dd/yyyy) \_\_\_\_\_

**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)

# Schedule of Change Orders

**U.S. Department of Housing and Urban Development**  
Office of Public and Indian Housing

OMB Approval No. 2577-0157  
(exp. 1/31/2017)

Public reporting burden for this collection of information is estimated to average 1 hour 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. This agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless that collection displays a valid OMB control number.

This information is collected under the authority of Section 6(c) of the U.S Housing Act of 1937 and HUD regulations. HAs are responsible for contract administration to ensure that the work for project development is done in accordance with State laws and HUD requirements. The contractor/subcontractor reports provide details and summaries on payments, change orders, and schedule of materials stored for the project. The information will be used to ensure that the total development costs, identified in the ACC, are kept as low as possible and consistent with HUD construction requirements. Responses to the collection are necessary to obtain a benefit. The information requested does not lend itself to confidentiality.

**Instructions:** Contractors use this form for reporting the details of approved Change Orders. Attach an original (or a copy) to each copy of the Periodic Estimate for Partial Payment (form HUD-51001) submission, and send to the Public Housing Agency. Complete all entries. Only Change Orders which bear the signatures required by the contract are to be recorded.

Name of Public Housing Agency	Supporting Periodic Estimate for Partial Payment Number	Period From (mm/dd/yyyy) to (mm/dd/yyyy)
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Location of Project	Project Number
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Name of Contractor	Contract Number
--------------------	-----------------

Approved Change Orders		Additions		Deductions
Change Order Number (1)	Dated (mm/dd/yyyy) (2)	Total Amount of Change Order (3)	Value of Work Completed to Date (4)	Total Amount of Change Order (5)
		\$	\$	\$
<b>Totals</b>		\$	\$	\$

Authorized Project Representative	Date (mm/dd/yyyy)
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**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)

**PAYROLL**

(For Contractor's Optional Use; See Instructions at [www.dol.gov/whd/forms/wh347instr.htm](http://www.dol.gov/whd/forms/wh347instr.htm))



Rev. Dec. 2008

Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.

OMB No.: 1235-0008  
Expires: 01/31/2015

NAME OF CONTRACTOR		OR SUBCONTRACTOR			ADDRESS							OMB No.: 1235-0008 Expires: 01/31/2015								
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	(4) DAY AND DATE							(5) TOTAL HOURS	(6) RATE OF PAY	(7) GROSS AMOUNT EARNED	(8) DEDUCTIONS					(9) NET WAGES PAID FOR WEEK
					HOURS WORKED EACH DAY	FICA	WITH- HOLDING TAX		OTHER	TOTAL DEDUCTIONS										
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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 it 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, U.S. Department of Labor, Room S3502, 200 Constitution Avenue, N.W. Washington, D.C. 20210

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 Stat. 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.



**HARRISBURG HOUSING AUTHORITY**  
**Minority Business Enterprises (MBE)**  
**Women Business Enterprises (WBE)**

A "minority business enterprise" (MBE) is one that is owned or controlled by one or more socially or economically disadvantaged persons. Such persons include Black Americans, Native Americans, Hispanic Americans, Asian/Pacific Americans, and Hasidic Jews. A "women business enterprise" (WBE) is one owned and controlled by women.

"Owned or controlled" by one or more socially and economically disadvantaged persons means that a socially and economically disadvantaged person or persons, or a for-profit business, or a non-profit organization controlled by such person or a for-profit business, or a non-profit organization controlled by such person or persons, possesses at least fifty-one percent (51%) of the ownership of the business, and its management and daily business operation are controlled by such persons.

The Harrisburg Housing Authority will take the following actions to provide every feasible opportunity for minority business enterprises (MBEs) and women business enterprises (WBE) to participate in bidding for HA work.

- A. The Harrisburg Housing Authority strongly supports equal opportunity in competitive contracting. Therefore, HHA has established a 30% presumptive objective for MBE/WBE participation for all prime contracts. This supports HHA's goal to award at least twenty percent (20%) of the dollar value of approved CFP funds to contractors with MBE and WBE construction contractors, A/E's, or consultants (for both physical and management improvements). Where the main construction contract is awarded to an MBE or WBE the HA will count the entire dollar amount of the contract toward its MBE/WBE goal. Where the main construction contract is not awarded to an MBE/WBE but one or more of the subcontract(s) is awarded to an MBE/WBE, the HA will count the dollar value of such subcontracts toward the MBE/WBE goal. The HA will not double count the dollar value of the main construction contract and its subcontracts. The HA will report its MBE/WBE progress to HUD as required.
- B. To ensure that MBE/WBEs are aware of CFP bid opportunities, the HA will, in addition to its existing procedures for publicizing upcoming Invitations for Bid or Requests for Proposals, may:

1. purchase timely advertisement in media with a largely minority and women audience;
  2. solicit bids or requests for proposals directly from existing MBE/WBE lists;
  3. post signs around developments and in the HA management office and local stores;
  4. notify community organizations, public or private institutions, and local minority and women business organizations and trade associations;
  5. notify resident organizations;
  6. notify The Mayor's office of Economic Development of opportunities.
- C. The HA will take appropriate affirmative action to assist minority and women's business enterprises and maintain information and reports about such enterprises.
- D. The HA will have a goal to award MBE/WBEs at least ten percent (10%) of the total amount expended for management operations (i.e., expenditures for contracts and purchases for supplies and services, as distinguished from salaries, wages and benefits).

#### MBE/WBE Consideration in Professional Selections.

In furtherance of the stated policy the HA:

1. will give preference points in evaluations;
2. recognizes all related certifications issued by recognized agencies;
3. encourages responses that include consultants and/or joint venture opportunities with MBEs or WBEs;
4. engages in outreach endeavors to encourage MBE/WBE participation in the RFP process.

**MBE/WBE ACTION PLAN NARRATIVES:**

Please give a detailed description in a narrative the efforts you plan to make in order to comply with HHA's hiring and contracting goals with MBE/WBE Contractors.

**Hiring,**

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**Contracting,**

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**Authorized Signature:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**SECTION 3 ACTION PLAN NARRATIVES:**

Please give a detailed description in a narrative the efforts you plan to make in order to comply with HHA's Section 3 hiring and contracting goals.

**Hiring,**

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**Authorized Signature:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**MBE REPORTING - MONTHLY UTILIZATION REPORT**

**Harrisburg Housing Authority**

**351 Chestnut Street**

**Harrisburg PA 17101-2785**

(Please type or print all information clearly)

Name and Address of Prime Contractor: \_\_\_\_\_

Name and Address of Sub-Contractor: \_\_\_\_\_

Employer Identification Number: \_\_\_\_\_ This Report is for the Month and Year of: \_\_\_\_\_

Name and Telephone # of Person Submitting Report: \_\_\_\_\_

Type of Profession, Company or Firm: \_\_\_\_\_

Signature of Company Official and Title:  X \_\_\_\_\_ Date Signed: \_\_\_\_\_

Job Title Trade Or Classification	Minority			Total White	Total Number Employed	Minority (%)	White (%)
	Total Black (Not Hispanic)	Total Hispanic	Total Asian or Pacific				
<b>Grand Total</b>						%	%

\*This report is to be submitted on a monthly basis during the term of your contract with the Harrisburg Housing Authority. It is to be included with your invoicing. If you have subcontractors, please have them also complete & submit this form to this office. Failure to comply with this requirement may result in delays with processing your remittance. Should you need any assistance, please call Gary Deavers (717) 232-6781 ext 8002; fax (717) 963-2600; or e-mail: garyd@harrisburghousing.org

**WBE - MONTHLY UTILIZATION REPORT**

Harrisburg Housing Authority

351 Chestnut Street

Harrisburg PA 17101-2785

(Please type or print all information clearly)

Name and Address of Prime Contractor: \_\_\_\_\_

Name and Address of Sub-Contractor: \_\_\_\_\_

Employer Identification Number: \_\_\_\_\_ This Report is for the Month and Year of: \_\_\_\_\_

Name and Telephone # of Person Submitting Report: \_\_\_\_\_

Type of Profession, Company or Firm: \_\_\_\_\_

Signature of Company Official and Title:  X  \_\_\_\_\_ Date Signed: \_\_\_\_\_

Job Title Trade Or Classification	Total Female	Total Male	Total Number Employed	Female (%)
<b>Grand Total</b>				%

\*This report is to be submitted on a monthly basis during the term of your contract with the Harrisburg Housing Authority. It is to be included with your invoicing. If you have subcontractors, please have them also complete & submit this form to this office. Failure to comply with this requirement may result in delays with processing your remittance. Should you need any assistance, please call Gary Deavers (717) 232-6781 ext 8002; fax (717) 963.2600; or e-mail: gdeavers@harrisburghousing.org

**SECTION 3 - MONTHLY UTILIZATION REPORT**

**Harrisburg Housing Authority**

**351 Chestnut Street**

**Harrisburg PA 17101-2785**

(Please type or print all information clearly)

Name and Address of Prime Contractor: \_\_\_\_\_

Name and Address of Sub-Contractor: \_\_\_\_\_

Employer Identification Number: \_\_\_\_\_ Reporting Period for Attached Invoice: \_\_\_\_\_

Name and Telephone # of Person Submitting Report: \_\_\_\_\_

Type of Profession, Company or Firm: \_\_\_\_\_

Signature of Company Official and Title:  X  Date Signed: \_\_\_\_\_

Job Title Trade Or Classification	Contract number	Trade or Classification	Number of new hires for this Section 3 covered contract	Number of new hires that are Section 3 Residents	% of aggregate number of staff hours of new hires that are Section 3	% of total staff hours for Section 3 Employees & Trainees	Number of Section 3 Employees & Trainees
<b>Grand Total</b>							

\* The current goal of the Harrisburg Housing Authority would be to successfully reach a minimum of 30% participation and to comply with Section 3 of the HUD Act of 1968. This would ensure that employment opportunities generated by HUD assistance and or HUD-assisted projects covered by Section 3, to the greatest extent feasible, be directed to low income persons, particularly those who receive HUD assistance for housing.

\*This report is to be submitted on a monthly basis during the term of your contract with the Harrisburg Housing Authority. It is to be included with your invoicing. If you have subcontractors, please have them also complete & submit this form to this office. Failure to comply with this requirement may result in delays with processing your remittance. Should you need any assistance, please call (717) 232-6781 ext 8002; fax (717) 963-2600; or e-mail: garyd@harrisburghousing.org



## Contractors / Vendors Monthly MBE and WBE Utilization Report

This report should be completed and submitted monthly by each HHA Vendor. Use additional sheets if necessary. Each individual report must have an original signature. Reports should be submitted with each Periodic Estimate for Partial Payment or invoice for payment. **If you have any questions, please contact Gary Deavers at 717-232-6781 ext 8002**

HHA considers the issue of MBE and WBE utilization to be a vital part of economic and community development. Moreover, HHA expects its partners, including but not limited to, its contractors and vendors to work in good-faith with HHA to achieve significant MBE and WBE participation in HHA funded projects. Partners understand that failure to timely provide the required information may result in, but not be limited to, payment delays.

Utilization Goals	MBE: ____% WBE: ____%	Reporting Period (Please check)				
		<input type="checkbox"/> Jan <input type="checkbox"/> Feb <input type="checkbox"/> Mar <input type="checkbox"/> Apr <input type="checkbox"/> May <input type="checkbox"/> June <input type="checkbox"/> July <input type="checkbox"/> Aug <input type="checkbox"/> Sept <input type="checkbox"/> Oct <input type="checkbox"/> Nov <input type="checkbox"/> Dec				
Name of Vendor:		Address:		City:	State:	Zip:
Contact Person:		Title:			Department:	
Phone:		Fax:			Email:	
Name of Project:					Start Date:	End Date:
<b>Total Contract Amount:</b>	\$	<b>Total MBE Amount:</b>	\$	<b>Total WBE Amount:</b>	\$	
<b>Amount Spent This Month:</b>	\$	<b>Amount Spent this Month:</b>	\$	<b>Amount Spent this Month:</b>	\$	
<b>Balance as of this Report:</b>	\$	<b>Balance as of this Report:</b>	\$	<b>Balance as of this Report:</b>	\$	





List all MBE/WBE firms receiving payment on this project	Type of Firm		Total Contract Amount		Payment Information	Balance to be Paid
	MBE	WBE				
Name: Address: City: State:                  Zip:	<input type="checkbox"/>	<input type="checkbox"/>	Contract Amount:	\$ _____	Previous Total: \$ _____	\$ _____
			Adjustments:	\$ _____	Current: \$ _____	
			Rev. Contract Amount:	\$ _____		
Name: Address: City: State:                  Zip:	<input type="checkbox"/>	<input type="checkbox"/>	Contract Amount:	\$ _____	Previous Total: \$ _____	\$ _____
			Adjustments:	\$ _____	Current: \$ _____	
			Rev. Contract Amounts	\$ _____		
Name: Address: City: State:                  Zip:	<input type="checkbox"/>	<input type="checkbox"/>	Contract Amounts:	\$ _____	Previous Total: \$ _____	\$ _____
			Adjustments:	\$ _____	Current: \$ _____	
			Rev. Contracts Amounts:	\$ _____		
Name: Address: City: State:                  Zip:	<input type="checkbox"/>	<input type="checkbox"/>	Contract Amounts:	\$ _____	Previous Total: \$ _____	\$ _____
			Adjustments:	\$ _____	Current: \$ _____	
			Rev. Contract Amounts	\$ _____		
Name: Address: City: State:                  Zip:	<input type="checkbox"/>	<input type="checkbox"/>	Contract Amount:	\$ _____	Previous Total: \$ _____	\$ _____
			Adjustments:	\$ _____	Current: \$ _____	
			Rev. Contracts Amounts:	\$ _____		



Name: Address: City: State:            Zip:	<input type="checkbox"/>	<input type="checkbox"/>	Contract Amount: Adjustments: Rev .Contracts Amounts	\$ _____ \$ _____ \$ _____	Previous Total: \$ Current: \$	
Name: Address: City: State:            Zip:	<input type="checkbox"/>	<input type="checkbox"/>	Contract Amount: Adjustments: Rev. Contracts Amounts:	\$ _____ \$ _____ \$ _____	Previous Total: \$ Current: \$	\$
Name: Address: City: State:            Zip:	<input type="checkbox"/>	<input type="checkbox"/>	Contract Amount: Adjustments: Rev. Contracts Amounts	\$ _____ \$ _____ \$ _____	Previous Total: \$ Current: \$	\$
Name: Address: City: State:            Zip:	<input type="checkbox"/>	<input type="checkbox"/>	Contract Amount: Adjustments: Rev. Contracts Amounts:	\$ _____ \$ _____ \$ _____	Previous Total: \$ Current: \$	\$
<p>I, <i>(insert name and company here)</i>, affirm by my signature below that I am an authorized representative of <i>(insert company name here)</i> and that the information provided on this report is accurate and has not been falsified.</p>						
Signature:				Date:		

# FY 2018 Income Limits Documentation System

Harrisburg-Carlisle, PA MSA										
FY 2018 Income Limit Area	Median Income	FY 2018 Income Limit Category	1 Person	2 Person	3 Person	4 Person	5 Person	6 Person	7 Person	8 Person
Harrisburg-Carlisle, PA MSA	\$75,200	Very Low (50%) Income Limits	\$26,350	\$30,100	\$33,850	\$37,600	\$40,650	\$43,650	\$46,650	\$49,650
		Extremely Low (30%) Income Limits	\$15,800	\$18,050	\$20,780	\$25,100	\$29,420	\$33,740	\$38,060	\$42,380
		Low (80%) Income Limits	\$42,150	\$48,150	\$54,150	\$60,150	\$65,000	\$69,800	\$74,600	\$79,400

The Harrisburg-Carlisle, PA MSA contains the following areas: Cumberland County, PA ; Dauphin County, PA ; and Perry County, PA .

Based on a 40-hour per work week schedule for the year (40 hours per week x 52 weeks = 2,080 hours per year), for a single, head of household, working full-time, this would equate to \$20.26 per hour...



# STATEMENTS OF POLICY

## DEPARTMENT OF GENERAL SERVICES

[ 4 PA. CODE CH. 66 ]

### **Guidelines for Administering and Enforcing the Public Works Employment Verification Act**

[42 Pa.B. 7821]

[Saturday, December 29, 2012]

The Department of General Services (Department) adopts a statement of policy in Chapter 66 (relating to employment verification—statement of policy) to read as set forth in Annex A. Chapter 66 implements the Public Works Employment Verification Act (act) (43 P. S. §§ 167.1—167.11).

Chapter 66 establishes guidelines for administering and enforcing the act, which requires public works contractors and subcontractors performing work on public works projects in this Commonwealth to comply with the Federal E-Verify program to ensure employees are authorized to work in the United States. The E-Verify program is a free Internet-based program operated by the United States Department of Homeland Security that compares information from an employee's Form I-9, Employment Eligibility Verification, to data from the United States Department of Homeland Security and Social Security Administration records to confirm employment eligibility. The purpose of this statement of policy is to establish guidelines for administering and enforcing the act.

#### *Fiscal Impact*

Civil penalties collected in the enforcement of the act will be retained by the Department to offset the costs of administering the Pennsylvania Public Works Employment Verification Program.

#### *Effective Date*

This statement of policy is effective January 1, 2013.

#### *Contact Person*

Specific questions regarding this statement of policy should be directed to the Department of General Services, Public Works Employment Verification Compliance Office, Room 105 Tent Building, Public Works Deputate, 18th and Herr Streets, Harrisburg, PA 17125.

SHERI PHILLIPS,  
Secretary

*(Editor's Note: Title 4 of the Pennsylvania Code is amended by adding statements of policy in §§ 66.1—66.9 to read as set forth in Annex A.)*

**Fiscal Note:** 8-17. This action will not result in a loss of revenue to the Commonwealth or its political subdivisions. This program may increase program costs for the administration and enforcement; however, such costs will be offset by any civil penalties collected through the enforcement of the act.

## **Annex A**

### **TITLE 4. ADMINISTRATION**

#### **PART III. DEPARTMENT OF GENERAL SERVICES**

##### **Subpart C. CONSTRUCTION AND PROCUREMENT**

#### **ARTICLE II. CONSTRUCTION**

##### **CHAPTER 66. EMPLOYMENT VERIFICATION—STATEMENT OF POLICY**

Sec.

- 66.1. Background and purpose.
- 66.2. Scope of work subject to the act.
- 66.3. Definitions.
- 66.4. General requirements for public works contractors and subcontractors.
- 66.5. Specific requirements for public works contractors.
- 66.6. Specific requirements for public works subcontractors.
- 66.7. Public Works Employment Verification Form.
- 66.8. Violations.
- 66.9. Enforcement.

#### **§ 66.1. Background and purpose.**

(a) To prevent unauthorized employment, the Federal government created the EVP system to ensure that companies employ a legal workforce. The EVP system is an Internet-based system operated by the United States Department of Homeland Security that compares information from an employee's Form I-9, Employment Eligibility Verification, to data from United States Department of Homeland Security and Social Security Administration records to confirm employment eligibility.

(b) The purpose of this chapter is to set forth the Department's policy guidelines for the scope, administration and enforcement of the act.

(c) The Department is responsible to implement the Commonwealth's process of notification, investigation and compliance with the act. Contractors and subcontractors performing work on a public works project shall comply with the act as set forth in this chapter by utilizing the EVP.

### **§ 66.2. Scope of work subject to the act.**

(a) The act applies to public works contractors and subcontractors performing on a public works contract paid for in whole or in part out of the funds of a public body when the cost of the total project is in excess of \$25,000.

(b) The cost of the total project must include the sum of prime contracts to be issued by the public body for the project.

(c) To the extent the cost of the total project is in excess of \$25,000, contracts and subcontracts, regardless of value, shall comply with the act.

(d) The act does not apply to work performed under a manpower or rehabilitation training program.

### **§ 66.3. Definitions.**

The following words and terms, when used in this chapter, have the following meanings, unless the context clearly indicates otherwise:

*Act*—The Public Works Employment Verification Act (43 P. S. §§ 167.1—167.11).

*Contract*—A type of written agreement, regardless of what it may be called, for the procurement of construction work.

*Department*—The Department of General Services of the Commonwealth.

*EVP—E-Verify program*—The program operated by the United States Department of Homeland Security that electronically verifies employment eligibility.

*Employee*—An individual hired by a public works contractor or a subcontractor after January 1, 2013, for whom a public works contractor or subcontractor is required by law to file a Form W-2 with the Internal Revenue Service.

*Form*—Public Works Employment Verification Form.

*Maintenance work*—Annual inspection or routine upkeep of an existing facility which does not alter the use or size of the facility.

*Public body*—The Commonwealth of Pennsylvania, its political subdivisions, authorities created by the General Assembly of the Commonwealth and instrumentalities or agencies of the Commonwealth.

*Public works*—

(i) The construction, reconstruction, demolition, alteration or repair work other than maintenance work done under contract and paid for in whole or in part out of the funds of a public body when the estimated cost of the total project is in excess of \$25,000.

(ii) The term does not include work performed under a manpower or rehabilitation training program.

*Public works contractor*—A contractor that provides work under a contract involving public works.

*Secretary*—The Secretary of the Department.

*Subcontractor*—

(i) A person, other than a natural person, including a staffing agency, that performs work for a public works contractor under a contract for public works.

(ii) The term includes subcontractors of every level, that is, sub-subcontractors, sub-sub-subcontractors, and the like.

(iii) The term does not include persons that supply materials for a project.

*Willful*—An action or conduct undertaken intentionally or with reckless disregard for or deliberate ignorance of the requirements and obligations established under the act.

#### **§ 66.4. General requirements for public works contractors and subcontractors.**

(a) Public works contractors and every subcontractor performing work under a public works contract shall utilize the EVP system to verify the employment eligibility of each new employee hired after January 1, 2013.

(b) Public works contractors and every subcontractor performing work under a public works contract shall submit the Form to the contracting public body to ensure compliance with the act.

(c) In addition to the Form, public works contractors and every subcontractor shall maintain documentation of continued compliance with the act by utilizing the EVP for new employees hired throughout the duration of the public work contract.

#### **§ 66.5. Specific requirements for public works contractors.**

(a) As a precondition to the award of a contract for public work, a public works contractor shall submit a completed Form to the public body that is bidding and awarding the public work contract. With respect to a contract that has been awarded but has not been fully executed as of January 1, 2013, a public works contractor is required to submit a completed Form to the contracting public body prior to contract execution. During a public works contract, a new employee hired by a public works contractor, regardless of whether he will be working onsite or offsite of a public work or otherwise, shall be verified within 5 business days of his start date.

(b) Subcontracts between a public works contractor and its subcontractors are required to contain notification of the applicability of the act, information regarding the use of EVP and reference to the Department's web site at [www.dgs.state.pa.us](http://www.dgs.state.pa.us) to obtain a copy of the Form.

(c) A public works contractor shall cooperate with the Department during an investigation or audit arising under the act.

### **§ 66.6. Specific requirements for public works subcontractors.**

(a) Prior to beginning either onsite or offsite work on a public works project when the public works contractor's contract was executed after January 1, 2013, every subcontractor shall submit a completed Form to the contracting public body. During a public works contract, a new employee hired by a public works subcontractor, regardless of whether he will be working onsite or offsite of a public work or otherwise, shall be verified within 5 business days of his start date.

(b) Subcontracts between a subcontractor and its subcontractors are required to contain notification of the applicability of the act, information regarding the use of EVP and reference to the Department's web site at [www.dgs.state.pa.us](http://www.dgs.state.pa.us) to obtain a copy of the Form.

(c) A subcontractor shall cooperate with the Department during an investigation or audit arising under the act.

### **§ 66.7. Public Works Employment Verification Form.**

(a) The Form for use by public bodies, public works contractors and subcontractors is posted on the Department's web site at [www.dgs.state.pa.us](http://www.dgs.state.pa.us). The Form may not be changed or altered.

(b) The Form shall be signed by an authorized representative of the public works contractor or subcontractor. The representative shall have sufficient knowledge to make the representations and certifications in the Form.

(c) The Department may require the public works contractor or subcontractor to provide supporting documentation that the representative signing the Form had authority to legally bind the public works contractor or subcontractor.

(d) The submitted Forms shall be retained by the public body for the duration of the public work contract.

### **§ 66.8. Violations.**

A public works contractor or subcontractor violates the act if it does either of the following:

(1) Fails to verify the employment eligibility of a new employee hired after January 1, 2013, through EVP in accordance with the act and this chapter.

(2) Makes a false statement or misrepresentation in connection with the completion or submission of the Form to a public body.



## § 66.9. Enforcement.

The Department will enforce the act through investigations, audits, sanctions and civil penalties in accordance with the following guidelines.

(1) *Investigations of complaints.* The Department will accept, review and investigate timely and credible complaints filed on the Complaint Form posted on the Department's web site.

(i) A complaint must contain sufficient information to enable the Department to investigate the allegation. The Department reserves the right to reject complaints that do not provide sufficient information. The Department will consider the timeliness of the complaint in assessing its credibility.

(ii) Public bodies, public works contractors and subcontractors shall cooperate with the Department during the investigation of a complaint.

(2) *Audits.* The Department will conduct complaint-based and random audits of public works contractors and subcontractors performing a public works contract for a public body in this Commonwealth. The Department reserves the right to determine the time, place and nature of audits.

(i) Public bodies, public works contractors and subcontractors shall cooperate with the Department during an audit.

(ii) Upon an audit, the Department may request, and the public works contractors and subcontractors shall provide, the following:

(A) Documentation of the date of hire of all employees.

(B) Documentation of compliance with the act through the utilization of EVP.

(C) Other information required by the Department to ensure compliance with the act and utilization of EVP.

(3) *Sanctions.*

(i) If the Department's investigation determines that a public works contractor or subcontractor failed to verify an employee through the use of EVP in accordance with the act and this chapter, the Department will issue sanctions as follows:

(A) *First violation.* The Department will issue a warning letter to the public works contractor or subcontractor detailing the violation. This letter will be posted on the Department's E-Verify web site at [www.dgs.state.pa.us](http://www.dgs.state.pa.us). A violation by a public works contractor or subcontractor that occurs 10 years or more after a prior violation will be deemed to be a first violation for purposes of sanctions.

(B) *Second violation.* The Department will initiate debarment proceedings against the public works contractor or subcontractor. Once final, these proceedings will prevent a public works contractor or subcontractor from submitting a bid or being awarded a contract

or subcontract on a public works contract in this Commonwealth for 30 calendar days from the date of debarment.

(C) *Third and subsequent violations.* The Department will initiate debarment proceedings against the public works contractor or subcontractor. Once final, these proceedings will prevent a public work contractor or a subcontractor from submitting a bid or being awarded a contract or subcontract on a public works contract in this Commonwealth for not less than 180 days and not more than 1 year from the date of debarment.

(ii) *Willful violation.* If the Department investigates and forms a reasonable belief that there has been a willful violation of the act, the Secretary will file a petition in Commonwealth Court seeking the Court to issue a rule to show cause why a public works contractor or subcontractor did not engage in a willful violation of the act. If the Court finds that there was a willful violation, the Department will petition to have the public works contractor or subcontractor debarred from public work contracts for 3 years from the date of the Court's determination.

(4) *Civil penalties.* If the Secretary or a designee makes a written determination that the violation is for failing to submit a complete Form or making a false statement or misrepresentation in the Form, the Department will assess a civil penalty of not less than \$250 and not more than \$1,000 for each violation. The amount of the penalty is at the Department's discretion. The Department will consider the severity of the violation, and prior violations in imposing civil penalties.

(5) *Notice and appeal.* Sanctions or civil penalties imposed by the Department, other than those violations found to be willful, are subject to the notice, appeal and other provisions of 2 Pa.C.S. (relating to administrative law and procedure).

[Pa.B. Doc. No. 12-2525. Filed for public inspection December 28, 2012, 9:00 a.m.]

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COMMONWEALTH OF PENNSYLVANIA

**PUBLIC WORKS EMPLOYMENT VERIFICATION FORM**

Date \_\_\_\_\_

Business or Organization Name (Employer) \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_

Contractor

Contracting Public Body \_\_\_\_\_

Contract/Project No \_\_\_\_\_

Project Description \_\_\_\_\_

Project Location \_\_\_\_\_

As a contractor/subcontractor for the above referenced public works contract, I hereby affirm that as of the above date, our company is in compliance with the Public Works Employment Verification Act ('the Act') through utilization of the federal E-Verify Program (EVP) operated by the United States Department of Homeland Security. To the best of my/our knowledge, all employees hired post January 1, 2013 are authorized to work in the United States.

It is also agreed to that all public works contractors/subcontractors will utilize the federal EVP to verify the employment eligibility of each new hire within five (5) business days of the employee start date throughout the duration of the public works contract. Documentation confirming the use of the federal EVP upon each new hire shall be maintained in the event of an investigation or audit.

I, \_\_\_\_\_, authorized representative of the company above, attest that the information contained in this verification form is true and correct and understand that the submission of false or misleading information in connection with the above verification shall be subject to sanctions provided by law.

\_\_\_\_\_  
Authorized Representative Signature

## SECTION 011000

### SUMMARY

#### PART 1 GENERAL

##### 1.01 SITE LOCATION

- A. Project location is at the Harrisburg Housing Authority's William Howard Day Homes Development located off of Community Drive in Harrisburg, PA. The project includes renovations to Buildings K, L and M and surrounding site as indicated on the Contract Drawings.

##### 1.02 WORK COVERED BY CONTRACT DRAWINGS

- A. The work of the Project has been divided into five (5) prime contracts: Demolition, General Construction, Mechanical Construction, Plumbing Construction and Electrical Construction. All prime contractors are responsible for reviewing and familiarizing themselves with all of the information contained in the Contract Documents which are provided in the Project manual and on the Contract Drawings. The Bidding Requirements, Contract Forms, Project Forms, and Division 1 General Requirements located in the Project Manual are applicable to all prime contracts. The following information describes the scope of work for each of the prime contracts.
- B. Demolition Contract (M201902): The Demolition Contract includes the scope of work defined on Architectural Drawings D101, D102, and D103; mechanical demolition work described below; plumbing demolition work described below; electrical demolition work described below; applicable specification sections; and the hazardous material abatement work defined in the technical specifications and drawings included in Appendix A. The Demolition Contractor is required to provide and implement a Construction Waste Management plan as indicated in Specification Section 017419.  
Note: Site demolition work is to be performed under the General Construction Contract.
  - 1. Mechanical Demolition Work: Remove all mechanical work as described on the Contract Drawings and remove all mechanical work including, but not limited to: steam and condensate piping back to entrance to building (see point of connection on new work plans), radiators, valves, manual air vents, controls, condensate pumps, baseboard, fan coils, hangers and supports.
  - 2. Plumbing Demolition Work: Remove all plumbing work as described on the Contract Drawings, disconnect and remove all gas piping within the building, remove all plumbing work including, but not limited to: domestic cold water piping back to meter, hot water piping, hot water circulating piping, sanitary and waste piping back to entrance to building (point of new connection shown on new work plans), vent piping, pipe insulation, pipe jackets, valves, hangers and supports, sinks, lavatories, faucets, water closets, tubs, and sump pump.
  - 3. Electrical Demolition Work: Disconnect and removal of all existing electrical equipment within and on the buildings. Disconnect and remove all conduits, wiring, wiring devices, switches, receptacles, smoke detectors, surface raceway, telephone and TV cable, panelboards, load centers, screw type fuse boxes, lighting, disconnect switches, starters, door bells and chimes, and all conduit wiring pertaining to mechanical equipment being removed from the project unless noted

otherwise. Disconnect and remove all exterior mounted cable, wire, and conduit, and building mounted light fixtures. Disconnect and remove cable TV termination cabinets, telephone termination cabinets, conduit, and overhead service wiring. Coordinate removal with local utility companies.

- C. General Construction Contract (M-201903): The General Construction Contract includes the scope of work defined on the Civil Drawings (including all site demolition work), Architectural A series drawings, minor demolition work and adjustments to the existing structure as required to make existing structure ready to receive new work, and applicable specification sections. The General Construction Contractor is required to provide and implement a Construction Waste Management plan as indicated in Specification Section 017419.
- D. Mechanical Construction Contract (M-201904): The Mechanical Construction Contract includes the scope of work defined on the Mechanical Drawings, minor demolition work, and applicable specification sections. Mechanical Construction Contract work includes, but is not limited to: heating hot water supply and return piping, steam and condensate piping, pipe insulation, pipe jackets, valves, manual air valves, expansion tanks, air separators, steam traps, fans, heat transfer equipment, terminal heating equipment, pumps, hangers and supports, controls, louvers, ductwork, and testing, adjusting and balancing of systems. The Mechanical Construction Contractor is required to participate in the General Construction Contractor's Waste Management plan as specified in Specification Section 017419.
- E. Plumbing Construction Contract (M-201905): The Plumbing Construction Contract includes the scope of work defined on the Plumbing Drawings, minor demolition work, and applicable specifications. The Plumbing Construction Contract work includes, but is not limited to: domestic cold water, hot water and hot water circulation piping; sanitary, waste, and vent piping; pipe insulation; pipe jackets; valves; backflow preventors; hangers and supports; sinks; faucets; water closets and hardware; tubs; shower valves; sump pumps; and controls. The Plumbing Construction Contractor is required to participate in the General Construction Contractor's Waste Management plan as specified in Specification Section 017419.
- F. Electrical Construction Contract (M-201906): The Electrical Construction Contract includes the scope of work defined on the Electrical Drawings; disconnect and remove existing primary overhead electrical service, service masts, related conduit and wiring (coordinate outages with Owner and utility company); provide excavation, trenching, backfilling and restoration for electrical site work for electrical service utilities, phone utilities, cable TV utilities, grounding and other electrical site work; minor demolition work; and applicable specifications sections. The Electrical Construction Contract scope of work includes, but is not limited to: testing, grounding, conduit, wire and cable, boxes, disconnect switches, light fixtures, receptacles, hangers and supports, doorbell push buttons and chimes, phone outlets, phone jacks, phone cables, cable TV outlets, cable TV jacks, cable TV cable, phone and cable TV termination cabinets, splitters, termination blocks, smoke detectors, loadcenters, metering centers, main service breaker and cable pull section, conduits and wiring for utility services, coordination with utility companies for service requirements and installation

requirements, and final connections to all equipment which is being provided by others including mechanical and plumbing. The Electrical Construction Contractor is required to participate in the General Construction Contractor's Waste Management plan as specified in Specification Section 017419.

### **1.03 PROGRESS OF THE WORK**

- A. Submittals: Submit all shop drawings within forty-five days after Notice To Proceed to allow time for review process and fabrication and delivery of materials so as not to delay the start of construction from the date noted in the Contract.
- B. Building Permits: All Contractors are responsible to obtain appropriate building permits as required by the City of Harrisburg. Owner has submitted two copies of the Contract Documents to the City of Harrisburg for their review and approval. The Contractors will be required to pay for the required building permits. The fee for the building permits will be handled as a pass through change order. Do not include this fee as part of your bid. Once the contracted parties have submitted and paid for the building permits you can submit for a change order. You will need to submit a copy of your receipt of payment from the city and no additional costs can be added to these change orders.
- C. Project Schedule of Work: Demolition Contractor, Mechanical Construction Contractor, Plumbing Construction Contractor, and Electrical Construction Contractor are to submit a proposed project schedule of work to the Architect and General Construction Contractor within twenty-one days after Notice To Proceed for review and comment. The General Construction Contractor will use the other Contracts proposed schedules to create a master project schedule for the overall project. The General Construction Contractor is to coordinate with all other construction contractors and the Architect and submit an overall project schedule to the Architect and Owner within thirty five days after Notice To Proceed for review and comment. After the master project schedule has been accepted by the Architect and Owner, the General Construction Contractor will update the schedule on a monthly basis with input from all other construction contracts.
- D. Schedule of Amounts for Contract Payments: All Contractors are to submit a Schedule of Amounts for Contract Payments (HUD Form 51000) within thirty days from Notice To Proceed to the Architect for review and comment. Once the schedule has been approved by the Architect, the Architect will submit a signed copy to Harrisburg Housing Authority for the final approval.
- E. Periodic Estimate for Partial Payments: All contractors are to submit an electronic copy of the Periodic Estimate of Partial Payment (HUD Form 51001) to the Architect for review and comment. After the Architect has approved or marked revisions on the electronic copy, then the Contractor shall make any necessary revisions and submit a final signed hard copy to the Architect for final approval and signature. With the final signed hard copy of the Periodic Estimate of Partial payments that the Contractor submits, the Contractor must also submit their certified payroll report, utilization reports (included in the Project Forms section of the specifications), and any required release of liens. The Architect will not provide a final review and approval until all of

the forms have been submitted. Once the required documents have been submitted and approved by the Architect, the Architect will submit the documents to the Harrisburg Housing Authority for final review, approval and release of payment.

**1.04 PROTECTION OF PROPERTY**

- A. As stated in the General Conditions of the Contract, all contractors are responsible for providing reasonable protection to prevent damage, injury or loss to the property at the site, landscaping, the building and the building contents.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 013001**  
**SUBMITTALS**

**PART 1 GENERAL**

**1.01 SUBMISSIONS REQUIRED**

- A. General: The descriptions under the SUBMITTALS Article in each Specifications Section indicate the type of submission required. Submissions are to be made electronically (except color charts and samples) to the Architect: KD3 Design Studio, Inc; Dale Hair; email: DRH@KD3designstudio.com; Physical Address: 426 S. Third Street, Suite 101, Lemoyne, PA 17043. Electronic submissions to be PDF files. Physical copies of actual color charts and samples for final color selections are to be sent to the Architect at the address listed above.
- B. Definition: The term shop drawing used throughout this Section includes manufacturer's product data, shop drawings, samples and certificates as required by the Specifications.
  - 1. Product Data: Manufacturer's descriptive literature, product specifications, performance and capacity rating schedules, published details, and installation instructions.
  - 2. Shop Drawings: Contractor or manufacturer prepared, completely dimensioned and annotated detail drawings of the products presented.
    - a. Shop drawings shall include locations of services connections, wiring diagrams, systems connections, anchor bolt layout and details of materials and construction.
    - b. Shop drawings shall include mechanical information such as diameter of shafting, rated horsepower of motors, gear and bearing ratings, service factors and weights of principal parts as well as the completely assembled equipment.
    - c. Shop drawings shall also include Contractor prepared layout and setting drawings as necessary to illustrate the assembly of various elements of the Work.
  - 3. Samples: Contractor or manufacturer prepared and delivered physical samples as requested in the various Specifications Sections.
  - 4. Certificates: Contractor or manufacturer prepared written instruments certifying product compliance with the Project Manual and Drawings.

**1.02 SUBMISSION OF SHOP DRAWINGS**

- A. Within forty five days after Notice To Proceed make the individual Specifications Sections submittals to the Architect for approval.
- B. Each submission of shop drawings shall be accompanied by a letter of transmittal listing the items in the submission. Each shop drawing shall be marked with the name of the Project, the name of the Contractor, and be numbered based on the specification section and submission number.
- C. When making a submission for approval, the Contractor shall do so with the understanding that he is considered to have checked the items in the shop drawing before submitting them and that he is satisfied that, in their present state, they not only



meet the requirements of the Contract Documents, but will present no difficulties in erection and completing his Contract, and shall clearly note his approval on the shop drawings prior to submission to the Architect. Failure of the Contractor to note his approval will be reason for the Architect to return such submission to the Contractor unchecked.

1. If it appears that shop drawings submitted by the Contractor have not been properly checked, even though the Contractor's approval has been noted thereon, it will also be considered reason for the Architect to return such submission to the Contractor unchecked.
  2. Markings, written or otherwise, made by the Contractor or by his suppliers or manufacturers shall be made on the Submittal in a color other than red. RED is reserved for the exclusive use of the Architect in marking Submittals.
- D. If shop drawings show variations from the Contract requirements because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in his letter of submission in order that (if accepted) suitable action may be taken for proper adjustment in the Contract; otherwise the Contractor will not be relieved of the responsibility for executing the Work in accordance with the Contract even though the shop drawings have been approved.
- E. The review and approval of shop drawings by the Architect will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents. The Architect's review and approval shall not extend to means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
- F. The approval of shop drawings by the Architect shall not relieve the Contractor from the responsibility for proper fitting and construction of the Work nor from furnishing materials and work required by the Contract which may not be indicated on the shop drawings when approved.
- G. After review by the Architect, shop drawings will be returned marked as follows: Approved; Approved With Changes Noted; Returned for Correction; or Not Approved.
1. Approved: When shop drawings are returned Approved, it is understood that the shop drawings have been found to be in conformance with the Contract Documents. The Architect's approval of the shop drawings does not relieve the Contractor from responsibility for errors or discrepancies in such shop drawings.
  2. Approved with Changes Noted: When shop drawings are returned Approved With Changes Noted it is understood that the shop drawings have been found to be in conformance with the Contract Documents, provided the changes noted by the Architect are incorporated in the shop drawings. Shop drawings returned Approved With Changes Noted will not require resubmission.
  3. Returned For Correction: When shop drawings are returned noted Returned For Correction it is understood that the Contractor shall make the required corrections and resubmit to the Architect.

4. Not Approved: When shop drawings are returned Not Approved it is understood that the Contractor shall make completely new shop drawings and submit to the Architect for review.
- H. Resubmissions: Make corrections required by the Architect, return copies of corrected shop drawings, and submit as required for new shop drawing review and approval. The Contractor shall direct specific attention in writing to revisions other than the corrections required by the Architect on previous submittals.
- I. Where a shop drawing is required by the Specifications, and related work is performed prior to the Architect's review and approval of the pertinent submission, such work will be the sole responsibility of the Contractor.

### **1.03 OPERATION, MAINTENANCE AND INSTALLATION MANUALS**

- A. Hard Cover binders: Submit manuals bound under hard cover. The following identification shall appear on the cover: EQUIPMENT OPERATION, MAINTENANCE, AND INSTALLATION MANUAL (O & M); the name, location and indication of utility or systems covered. Manuals shall be approximately 8 ½ inches x 11 inches with large sheets folded in and capable of being easily pulled out for reference.
- B. Warning Page: Provide the appropriate warning pages to warn of potential dangers (if they exist), such as high voltage, flammable liquid, carcinogens, high pressures, etc. Place warning pages inside the front cover in front of the title page.
- C. Title Page: The title page shall show the name of the firm (designer or contractor) preparing the manual and the date of publication.
- D. Table of Contents: Provide in accordance with standard commercial practice, a table of contents that lists the separate section headings and their appropriate page number.
- E. Submittal: Submit one electronic version of the O & M manual on a CD with all the documents in PDF format. Submit two hard copies of each O & M manual after the electronic version has been approved. Submit manuals after the project is 95 percent complete and at least 30 days prior to Contract completion or scheduled equipment start-up/testing. The electronic PDF format file should contain a table of contents and the table of contents should be linked to the individual sections with bookmarks for easy referral.
- F. Provide separate sections for each system as requested in the Specifications. Each section shall include under separate headings, as applicable, the following information for each item of equipment:
  1. Approved Shop Drawings: One copy of each shop drawing including wiring diagrams, corrected as installed, along with Contractor's coordination and layout drawings each reflecting as-built conditions.
  2. Catalog Information: Catalog cuts showing applicable information.
  3. System description: Brief description of each system and its components as may be required for the system provided.
  4. Installation, Erection and Start-Up: Installation information showing minimum acceptable requirements for;

5. Erection or installation instructions.
6. System start-up procedures.
7. Operation and Maintenance Requirements: Include adequate illustrative material to identify and locate operating controls, indicating devices and locations of areas or items requiring maintenance.
  - a. Describe in detail, starting and stopping procedures for components, adjustments required to obtain optimum equipment performance, and corrective actions for malfunctions.
  - b. Maintenance instructions describing the nature and frequency of routine maintenance and procedures to be followed. Indicate any special tools, materials, and test equipment that may be required. Include manufacturer's printed operating and maintenance instructions, as applicable.
8. Repair Information: Include diagrams and schematics, guidance for diagnosing problems, and detailed instructions for making repairs. Provide troubleshooting information that includes a statement of the indication or symptoms of trouble and the sequential instructions necessary. Include test hook-ups to determine the cause, special tools and test equipment, and methods for returning the equipment to operating conditions. Information may be in chart form or in tabular format with appropriate headings.
9. Spare Parts: Provide a schedule of recommended spare parts to be stocked, complete with part number, inventory quantity and ordering information.
  - a. Provide names and addresses of nearest parts and service supply agencies.
10. Contact Information: Provide the names and addresses of local manufacturers' representative.

#### **1.04 RECORD DRAWINGS**

- A. Submit Contractors record set of field drawings within 15 days of construction completion. Contractor to submit one hard copy and one scanned electronic version on a CD in PDF format.

#### **1.05 SOLE SOURCE MATERIALS**

- A. The following items are sole source manufacturers for this project. The General Contractor is to provide these manufacturers products as indicated in the specification or drawings: Sargent Locks to match Harrisburg Housing Authority's current master locking system.

### **PART 2 PRODUCTS**

#### **2.01 NOT USED**

### **PART 3 EXECUTION**

#### **3.01 NOT USED**

**END OF SECTION**

**SECTION 013002**  
**PROJECT MEETINGS**

**PART 1 GENERAL**

**1.01 PROGRESS MEETINGS**

- A. **Project Kickoff Meeting:** A project kickoff meeting will be held for the purpose of establishing the work progress schedule, progress payments schedule, and to arrive at an orderly sequence of work operations agreeable to the parties of the Contract.
  - 1. At this meeting the Architect will also discuss the permissible locations of waste containers, temporary services, and matters of similar importance.
  - 2. The Architect will set the date, time and place of the project kickoff meeting following the award of the Contracts.
- B. **Project Manager Meeting:** A project manager meeting that will include the project managers from each contract and their office support staff, including accounting personnel, will be held after the project kickoff meeting. The purpose of this meeting is to review payment application requirements, certified payroll procedures and Owner required monthly reports that are part of the pay application process. The Architect will set a mutually agreed upon date, time and place for this meeting.
- C. **Project Coordination Meeting:** Project coordination meetings will be held bi-weekly at the William Howard Day Homes Community Room. The project coordination meetings are for the purpose of modifying work schedules and to arrive at an orderly sequence of operations agreeable to all parties of the Contract. Meetings will serve to resolve conflicts, adjust work arrangements, etc., so that work stoppages and delays may be avoided. Attendance at meetings by the Contractor's sub-contractors to be determined by the Contractor on an as needed basis. The Architect can require certain sub-contractors to attend the meetings if he feels their attendance is required to address a specific construction related issue.
- D. **Scheduling Additional Meetings:** In addition to the meetings listed above, the Architect and /or Owner may schedule an additional meeting as needed or requested by a Contractor.
- E. **Meeting Requirements:** Each party to the Contract will be represented at such meetings by a person or persons vested with the authority to make necessary decisions on their behalf, and such decisions will commit that party to the agreed procedures, sequence of operations and time schedules.
- F. Where procedures, sequence of operations, time schedules and other matters have been agreed upon by each party concerned, it will become binding upon each party to follow and comply with said procedures, sequence of operations, time schedules, and other matters, both as to time and performance, and no claim of delay or damages by the Contractor if he fails to comply therewith will be entertained by the Owner.
- G. The Architect will provide minutes of each meeting noted above.

**PART 2 PRODUCTS**

**2.01 NOT USED**

**PART 3 EXECUTION**

**3.01 NOT USED**

**END OF SECTION**

**SECTION 015000**  
**TEMPORARY FACILITIES AND CONTROLS**

**GENERAL**

**1.01 RESPONSIBILITIES**

- A. Provide certain temporary facilities and controls (as specified throughout this Section) at the site of the Work until the Project is complete, and the Project facilities are placed under the Owner's operation.
- B. The Contractor is solely responsible for temporary facilities and controls removal and restoration of the affected area when the temporary facilities and controls are no longer needed or required by Contract Time and extensions thereof.
- C. Include in the Bid the costs associated with the temporary facilities and controls for the work of the Contract. The prime contract that is responsible for the temporary facilities and controls is indicated below.

**1.02 TEMPORARY SERVICES**

- A. Temporary Power and Light: Electrical Construction Contractor responsible to provide temporary power and lighting for all contracts, except Demolition Contract. Demolition Contractor is responsible for their temporary power and light for the duration of their contract. Harrisburg Housing Authority is responsible for and will pay all electric costs for the duration of the construction period. Any additional lighting and power required by the prime contractors will need to be provided by each prime contractor. Any exterior electrical power required will be the responsibility of the prime contractor that needs the power.
- B. Temporary Water Supply: Plumbing Construction Contractor responsible to provide temporary water supply for all contracts, except Demolition Contract. Demolition Contractor is responsible for their temporary water supply for the duration of their contract. Contractor may use existing water supply as required during the duration of the project for all interior work. Provide temporary water as required for all exterior work. Harrisburg Housing Authority is responsible for and will pay all water costs for the duration of the construction period.
- C. Temporary Sanitary Facilities: General Construction Contractor responsible to provide temporary sanitary facilities for all contracts, except Demolition Contract. Demolition Contractor is responsible for their temporary sanitary facilities for the duration of their contract. Provide and maintain as required by local laws, temporary sanitary facilities for the workmen on the project. Sanitary facilities shall conform to OSHA requirements.

**1.03 TEMPORARY CONTROLS AND PROTECTION**

- A. Exterior Site Fence: General Construction Contractor is responsible to provide and maintain site fence for all contracts for the duration of the construction project. Provide 6'-0" high chain link construction fence around the perimeter of the work area. Fence shall be anchored into the ground at all locations. Provide minimal gates at locations agreed upon by all prime contractors. Contractor to inspect fence daily and repair as required so that fence is in place at all times throughout the project.

- B. Security: All prime contractors are responsible for the security of the site, all materials and equipment left on the site. General Construction Contractor will be responsible for providing a lock on all gates and making sure they are unlocked as needed at the beginning of the work day and locked at the end of the work day for the duration of the project.

#### **1.04 TEMPORARY FACILITIES**

- A. Temporary Field Offices: Each prime contractor to determine if a field office is required for the project. If any contractor wants to use a trailer for their field office they will be responsible to provide and maintain their own temporary power. Locations of temporary trailers will be mutually decided by the Owner, Architect and prime contractors at the project kickoff meeting.
- B. Contractor Storage and Employee Parking Areas: Contractor storage and employee parking areas will be determined at the project kickoff meeting. There is new site work that will be required and the existing site is tight for space so it is suggested that contractor employees car pool as much as possible to minimize the need for parking spaces.

#### **1.05 PRODUCTS**

#### **1.06 MATERIALS**

- A. Temporary Power Equipment and Extensions: Provide OSHA approved portable power equipment and extension cords, temporary wires, outlets and on/off controls at all locations.
- B. Temporary Lights: Provide portable task lights equipped with crash guards in conformance with OSHA requirements at all locations.

#### **1.07 EXECUTION**

#### **1.08 REMOVAL**

- A. Dismantle (as required) and remove the temporary facilities and controls, and temporary service extensions, when no longer needed on the construction site. Repair existing conditions as required after removal of temporary facilities and controls.

**END OF SECTION**

**SECTION 017000**  
**EXECUTION AND CLOSEOUT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Examination, preparation, and general installation procedures.
  - 2. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
  - 3. Cutting and patching.
  - 4. Surveying for laying out the work.
  - 5. Cleaning and protection.
  - 6. Starting of systems and equipment.
  - 7. Demonstration and instruction of Owner personnel.
  - 8. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- B. Related Sections:
  - 1. Section 017419 - Construction Waste Management: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

**1.02 SUBMITTALS**

- A. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
  - 1. Structural integrity of any element of Project.
  - 2. Integrity of weather exposed or moisture resistant element.
  - 3. Efficiency, maintenance, or safety of any operational element.
  - 4. Visual qualities of sight exposed elements.
  - 5. Work of Owner or separate Contractor.

**1.03 PROJECT CONDITIONS**

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water.
- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
- E. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
  - 1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
- F. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.



- G. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

#### **1.04 COORDINATION**

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

### **PART 2 PRODUCTS**

#### **2.01 PATCHING MATERIALS**

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that demolition is complete in alterations areas and areas are ready for installation of new work.
- C. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- D. Examine and verify specific conditions described in individual specification sections.

- E. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- F. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- G. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

### **3.02 PREPARATION**

- A. Cut, move, or remove items as necessary for access to alterations and renovation work. Replace and restore at completion.
- B. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished work.
- C. Remove debris and abandoned items from area and from concealed spaces.
- D. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity. Insulate ducts and piping to prevent condensation in exposed areas.
- E. Prepare surfaces and remove surface finishes to provide for proper installation of new work and finishes.
- F. Clean substrate surfaces prior to applying next material or substance.
- G. Seal cracks or openings of substrate prior to applying next material or substance.
- H. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

### **3.03 LAYING OUT THE WORK**

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- F. Utilize recognized engineering survey practices.
- G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
  1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
  2. Building foundation, column locations, ground floor elevations.

- H. Periodically verify layouts by same means.
- I. Maintain a complete and accurate log of control and survey work as it progresses.

### **3.04 GENERAL INSTALLATION REQUIREMENTS**

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

### **3.05 ALTERATIONS**

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
  - 1. Verify that construction and utility arrangements are as indicated.
  - 2. Report discrepancies to Architect before disturbing existing installation.
  - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
  - 1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
- C. Remove existing work as indicated and as required to accomplish new work.
  - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
  - 2. Remove items indicated on drawings.
  - 3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
  - 4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- D. Services (Including but not limited to HVAC, Plumbing, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
  - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
  - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.

3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
    - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
    - b. Provide temporary connections as required to maintain existing systems in service.
  4. Remove abandoned pipe, ducts, conduits, and equipment ; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- E. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
  2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  3. Repair adjacent construction and finishes damaged during removal work.
- F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
- G. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
- H. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
- I. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- J. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
- K. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- L. Clean existing systems and equipment.
- M. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- N. Do not begin new construction in alterations areas before demolition is complete.
- O. Comply with all other applicable requirements of this section.

### **3.06 CUTTING AND PATCHING**

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
  1. Complete the work.
  2. Fit products together to integrate with other work.

3. Provide openings for penetration of mechanical, electrical, and other services.
  4. Match work that has been cut to adjacent work.
  5. Repair areas adjacent to cuts to required condition.
  6. Repair new work damaged by subsequent work.
  7. Remove samples of installed work for testing when requested.
  8. Remove and replace defective and non-complying work.
- D. Execute cutting and patching including excavation and fill to complete the work, to uncover work to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit Products together to integrate with other work.
  - E. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing.
  - F. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
  - G. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
  - H. Restore work with new products in accordance with requirements of Contract Documents.
  - I. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
  - J. Patching:
    1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
    2. Match color, texture, and appearance.
    3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.
  - K. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
  - L. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.
  - M. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections. Repair substrate prior to patching finish. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

### **3.07 PROGRESS CLEANING**

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

### **3.08 PROTECTION OF INSTALLED WORK**

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.
- G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- H. Prohibit traffic from landscaped areas.
- I. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

### **3.09 SYSTEM STARTUP**

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

### **3.10 DEMONSTRATION AND INSTRUCTION**

- A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.
- B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.
- E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

### **3.11 ADJUSTING**

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

### **3.12 FINAL CLEANING**

- A. Execute final cleaning prior to final project assessment.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces,
- D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- F. Clean filters of operating equipment.
- G. Clean debris from roofs, gutters, downspouts, and drainage systems.
- H. Clean site; sweep paved areas, rake clean landscaped surfaces.
- I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.
- J. Demolition Contractor is required to provide intermediate cleaning of the buildings before the other contracts begin work unless agreed upon otherwise by the other contractors.
- K. General Construction Contractor is responsible for overall final cleaning for the project. Mechanical, Plumbing and Electrical Construction Contractors are responsible for final cleaning of the items that have been installed as part of their contract.

### **3.13 CLOSEOUT PROCEDURES**

- A. Make submittals that are required by governing or other authorities.

- B. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- C. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.
- D. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- E. Notify Architect when work is considered finally complete.
- F. Complete items of work determined by Architect's final inspection.

**END OF SECTION**



**SECTION 017419**  
**CONSTRUCTION WASTE MANAGEMENT**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This section includes administrative and procedural requirements for the following:
  - 1. Salvaging non-hazardous demolition and construction waste.
  - 2. Recycling non-hazardous demolition and construction waste.
  - 3. Disposing of non-hazardous demolition and construction waste.

**1.02 DEFINITIONS**

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, and repair operations.
- C. Demolition Waste: Solid wastes typically including building materials, trash, debris, and rubble resulting from demolition or selective demolition operations.
- D. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- E. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- F. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- G. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- H. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- I. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- J. Return: To give back reusable items or unused products to vendors for credit.
- K. Reuse: To reuse a construction waste material in some manner on the project site.
- L. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- M. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- N. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- O. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- P. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

- Q. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

### 1.03 PERFORMANCE REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
1. Aluminum and plastic beverage containers.
  2. Corrugated cardboard.
  3. Wood pallets.
  4. Clean dimensional wood: May be used as blocking or furring.
  5. Land clearing debris, including brush, branches, logs, and stumps.
  6. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.
  7. Bricks.
  8. Concrete masonry units.
  9. Asphalt paving.
  10. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
  11. Glass.
  12. Gypsum drywall and plaster.
  13. Plastic buckets.
  14. Asphalt roofing shingles.
  15. Paint.
  16. Plastic sheeting.
  17. Rigid foam insulation.
  18. Windows, doors, and door hardware.
  19. Plumbing fixtures.
  20. Mechanical and electrical equipment.
  21. Fluorescent lamps (light bulbs).
- E. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues.
- F. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.
- G. Methods of trash/waste disposal that are not acceptable are:
1. Burning on the project site.
  2. Burying on the project site.
  3. Dumping or burying on other property, public or private.

4. Other illegal dumping or burying.
- H. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, State and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

#### **1.04 SUBMITTALS**

- A. Submit Waste Management Plan within thirty days after receipt of Notice to Proceed, or prior to any trash or waste removal, whichever occurs sooner; submit projection of all trash and waste that will require disposal and alternatives to landfilling. A minimum of 75% (by weight) of construction and demolition waste is to be diverted from landfill disposal. A Waste Management Plan is required from both the Demolition Contractor and the General Construction Contractor. The mechanical, Plumbing and Electrical Construction Contractors are required to comply with the requirements established in the General Construction Contractor's Waste Management Plan. General Construction Contractor will provide copies of the approved Waste Management Plan to all other prime contractors required to comply with their plan.
- B. Waste Management Plan: Include the following information:
  1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
  2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
  3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
    - a. List each material proposed to be salvaged, reused, or recycled.
    - b. List the local market for each material.
    - c. State the estimated net cost, versus landfill disposal.
  4. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
  5. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
- C. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
  1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
  2. Submit Report on a form acceptable to Owner.
  3. Landfill Disposal: Include the following information:
    - a. Identification of material.

- b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
  - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
  - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
4. Incinerator Disposal: Include the following information:
- a. Identification of material.
  - b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
  - c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
  - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
5. Recycled and Salvaged Materials: Include the following information for each:
- a. Identification of material, including those retrieved by installer for use on other projects.
  - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
  - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
  - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
  - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
6. Material Reused on Project: Include the following information for each:
- a. Identification of material and how it was used in the project.
  - b. Amount, in tons or cubic yards.
  - c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

## **1.05 QUALITY ASSURANCE**

- A. Waste Management Conference: Conduct conference at Project site. Review methods and procedures related to waste management including, but not limited to, the following:
- 1. Review and discuss waste management plan including responsibilities of Waste Management Manager.
  - 2. Review requirements for documenting quantities of each type of waste and its disposition.
  - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
  - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
  - 5. Review waste management requirements for each trade.

## **PART 2 PRODUCTS (NOT USED)**

## **PART 3 EXECUTION**

### **3.01 WASTE MANAGEMENT PLAN IMPLEMENTATION**

- A. The Waste Management Plan is to be implemented by all contracts. Two separate Waste Management Plans will be required for the project. The Demolition Contractor will be required to provide and implement a Waste Management Plan for the demolition portion of the project. The General Construction Contractor will be required to provide and implement a Waste Management Plan for all of the remaining contracts. The Mechanical Construction Contractor, Plumbing Construction Contractor, and the Electrical Construction Contractor are required to participate and follow the Waste Management Plan provided by the General Construction Contractor.
- B. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan. The Mechanical, Plumbing and Electrical Construction Contractors are required to designate a manager that will work with the General Construction Contractor's manager to instruct their contract's workers and oversee that their contract is following the Waste Management Plan.
- C. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect. The General Construction Contractor will distribute copies of the Waste Management Plan to the Mechanical, Plumbing, and Electrical Construction Contractors.
- D. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- E. Meetings: Discuss trash/waste management goals and issues at project meetings.
  - 1. Pre-bid meeting.
  - 2. Pre-construction meeting.
  - 3. Regular job-site meetings.
- F. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
  - 1. As a minimum, provide:
    - a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
    - b. Separate dumpsters for each category of recyclable.
  - 2. Provide containers as required.
  - 3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
  - 4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
  - 5. Locate enclosures out of the way of construction traffic.

6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
  7. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- G. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
  - H. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
  - I. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
  - J. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

**END OF SECTION**

**SECTION 024100**  
**DEMOLITION**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Selective demolition of built site elements.
  - 2. Selective demolition of building elements for alteration purposes.
  - 3. Abandonment and removal of existing utilities and utility structures.
- B. Related Sections:
  - 1. Section 011000 - Summary of Work: Scope of work for separate prime contracts.
  - 2. Section 015000 - Temporary Facilities and Controls: Site fences, security, and protective barriers.
  - 3. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain.
  - 4. Section 017419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
  - 5. Section 312000 - Earth Moving: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

**1.02 REFERENCE STANDARDS**

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

**1.03 SUBMITTALS**

- A. Demolition Plan (Demolition Contract): Submit demolition plan as specified by OSHA and local authorities.
  - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
  - 2. Include a summary of safety procedures.
  - 3. Provide sketch(es) showing proposed temporary weathertight enclosures at door and window openings.
- B. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Fill Material: As specified in Section 312000 - Earth Moving.

**PART 3 EXECUTION**

**3.01 SCOPE**

- A. See Section 011000 - Summary of Work for scope of work for Demolition Contract, General Construction Contract, and other prime contracts in regard to demolition work.

- B. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

### **3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS**

- A. Comply with other requirements specified in Section 017000.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
  - 1. Obtain required permits.
  - 2. Use of explosives is not permitted.
  - 3. Provide, erect, and maintain temporary barriers and security devices.
  - 4. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
  - 5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
  - 6. Do not close or obstruct roadways or sidewalks without permit.
  - 7. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Do not begin removal until specified measures have been taken to protect vegetation to remain.
- E. Protect existing structures and other elements that are not to be removed.
  - 1. Provide bracing and shoring.
  - 2. Prevent movement or settlement of adjacent structures.
  - 3. Stop work immediately if adjacent structures appear to be in danger.
- F. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- G. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.
- H. Perform demolition in a manner that maximizes salvage and recycling of materials.
  - 1. Comply with requirements of Section 017419 - Construction Waste Management.
- I. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

### **3.03 EXISTING UTILITIES**

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.



- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

### **3.04 SELECTIVE DEMOLITION FOR ALTERATIONS**

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
  - 1. Verify that construction and utility arrangements are as indicated.
  - 2. Report discrepancies to Architect before disturbing existing installation.
  - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
- C. Remove existing work as indicated and as required to accomplish new work.
  - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
  - 2. Remove items indicated on drawings.
- D. Services (Including but not limited to HVAC, Plumbing, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
  - 1. Verify that abandoned services serve only abandoned facilities before removal.
  - 2. Remove abandoned pipe, ducts, conduits, and equipment; remove back to source of supply where possible, otherwise cap stub and tag with identification.
- E. Protect existing work to remain.
  - 1. Prevent movement of structure; provide shoring and bracing if necessary.
  - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  - 3. Repair adjacent construction and finishes damaged during removal work.

### **3.05 DEBRIS AND WASTE REMOVAL**

- A. Remove from site all materials not to be reused on site; comply with requirements of Section 017419 - Construction Waste Management.
- B. Leave site in clean condition, ready for subsequent work.

**END OF SECTION**

**SECTION 033000**  
**CAST-IN-PLACE CONCRETE**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Concrete formwork.
  - 2. Floors and slabs on grade.
  - 3. Concrete reinforcement.
  - 4. Joint devices associated with concrete work.
  - 5. Concrete curing.
- B. Related Sections:
  - 1. Section 079200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

**1.02 REFERENCE STANDARDS**

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- C. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
- D. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 2004 (Errata 2007).
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.
- F. ACI 308R - Guide to Curing Concrete; 2001 (Reapproved 2008).
- G. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.
- H. ACI 347R - Guide to Formwork for Concrete; 2014.
- I. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.
- J. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
- K. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.
- L. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.
- M. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.
- N. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.
- O. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.
- P. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

- Q. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2007.
- R. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2014.
- S. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.
- T. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.
- U. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

### **1.03 SUBMITTALS**

- A. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- B. Mix Design: Submit proposed concrete mix design.
  - 1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
- C. Test Reports: Submit report for each test or series of tests specified.

### **1.04 QUALITY ASSURANCE**

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Follow recommendations of ACI 306R when concreting during cold weather.

## **PART 2 PRODUCTS**

### **2.01 FORMWORK**

- A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
  - 1. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
  - 2. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

### **2.02 REINFORCEMENT MATERIALS**

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
  - 1. Type: Deformed billet-steel bars.
  - 2. Finish: Unfinished, unless otherwise indicated.
- B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
  - 1. Form: Coiled Rolls.
  - 2. WWR Style: As indicated on drawings.
- C. Reinforcement Accessories:

1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

### **2.03 CONCRETE MATERIALS**

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
- C. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

### **2.04 ADMIXTURES**

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- D. Water Reducing Admixture: ASTM C494/C494M Type A.

### **2.05 BONDING AND JOINTING PRODUCTS**

- A. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
  1. Material: ASTM D1751, cellulose fiber.

### **2.06 CURING MATERIALS**

- A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
- B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
- C. Moisture-Retaining Sheet: ASTM C171.
  1. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.
  2. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.
- D. Water: Potable, not detrimental to concrete.

### **2.07 CONCRETE MIX DESIGN**

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of trial mixtures, as specified in ACI 301.
  1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- D. Normal Weight Concrete:
  1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4500 pounds per square inch.

2. Water-Cement Ratio: Maximum 45 percent by weight.
3. Total Air Content: 6 percent, determined in accordance with ASTM C173/C173M.
4. Maximum Slump: 3 inches.
5. Maximum Aggregate Size: 5/8 inch.

## **2.08 MIXING**

- A. Transit Mixers: Comply with ASTM C94/C94M.
- B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

### **3.02 PREPARATION**

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- C. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in accordance with bonding agent manufacturer's instructions.

### **3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS**

- A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

### **3.04 PLACING CONCRETE**

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- D. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

- E. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.
- F. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

### **3.05 SLAB JOINTING**

- A. Anchor joint fillers and devices to prevent movement during concrete placement.
- B. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

### **3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES**

- A. Maximum Variation of Surface Flatness:
  - 1. Exposed Concrete Floors: 1/4 inch in 10 feet.
- B. Correct the slab surface if tolerances are less than specified.
- C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

### **3.07 CONCRETE FINISHING**

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
  - 1. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

### **3.08 CURING AND PROTECTION**

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
  - 1. Normal concrete: Not less than seven days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- D. Surfaces Not in Contact with Forms:
  - 1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
    - a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.
    - b. Spraying: Spray water over floor slab areas and maintain wet.
    - c. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.

2. Final Curing: Begin after initial curing but before surface is dry.

### **3.09 FIELD QUALITY CONTROL**

- A. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- B. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- C. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
- D. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- E. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

### **3.10 DEFECTIVE CONCRETE**

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

### **3.11 PROTECTION**

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

**END OF SECTION**

**SECTION 040511**  
**MORTAR AND MASONRY GROUT**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Mortar for masonry.
  - 2. Grout for masonry.
- B. Related Sections:
  - 1. Section 042000 - Unit Masonry: Installation of mortar and grout.
  - 2. Section 047200 - Cast Stone Masonry: Installation of mortar.

**1.02 REFERENCE STANDARDS**

- A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures and Related Commentaries; American Concrete Institute International; 2008.
- B. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; American Concrete Institute International; 2008.
- C. ASTM C33 - Standard Specification for Concrete Aggregates.
- D. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.
- E. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
- F. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- G. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.
- H. ASTM C476 - Standard Specification for Grout for Masonry; 2010.
- I. ASTM C1019 - Standard Test Method for Sampling and Testing Grout; 2013.
- J. Brick Institute of America - Technical Note 8A, Portland Cement - Lime Mortar for Brick Masonry.

**1.03 SUBMITTALS**

- A. Product Data: Include mortar design mix conforming to Property specification of ASTM C270. Also include required environmental conditions and admixture limitations.
- B. Samples: Submit manufacturer's full range of color samples for mortar color selection.
- C. Reports: Submit reports on grout indicating compliance of component grout materials to requirements of ASTM C476 and test and evaluation reports to requirements of ASTM C1019.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Submit packaged dry mortar manufacturer's installation instructions.



#### **1.04 QUALITY ASSURANCE**

- A. Comply with provisions of ACI 530/530.1, except where exceeded by requirements of the contract documents.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

#### **1.06 FIELD CONDITIONS**

- A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530/530.1.

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

- A. Masonry Cement: ASTM C91, Type N.
  - 1. Colored mortar: Premixed cement as required to match Architect's color sample.
    - a. Acceptable product: Lehigh Cement, Riverton, or Approved Equal.
- B. Portland Cement: ASTM C 150, Type I - Normal; color as required to produce approved color sample.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Mortar Aggregate: ASTM C 144, except grading to comply with BIA Technical Note 8A.
- E. Grout Coarse Aggregate: ASTM C 404, up to 3/8-inch diameter.
- F. Grout Fine Aggregate: ASTM C404, fine aggregate.
- G. Water: Clean and potable.
- H. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.
  - 1. Acceptable product: "DRY-BLOCK" by Forrer Industries, "SGS Block-Ade" by Solomon Grind-Chem, Inc., "Rheomix Rheopol" by Master Builders, Inc. or approved equal..

#### **2.02 MORTAR MIXES**

- A. Use masonry cement mortars or portland/lime mortars at the Contractor's option.
- B. Mortar for Unit Masonry: ASTM C270, Property Specification.
  - 1. Masonry below grade and in contact with earth: Type M.
  - 2. Exterior, loadbearing and non-loadbearing masonry: Type S.
  - 3. Exterior, veneer masonry: Type N.
  - 4. Interior, loadbearing and non-loadbearing masonry: Type N.
  - 5. Pointing mortar: Type O .

#### **2.03 MORTAR MIXING**

- A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.
- B. Maintain sand uniformly damp immediately before the mixing process.

- C. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio; mix in accordance with manufacturer's instructions, uniform in coloration.
- D. Add admixtures in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.
- E. Do not use anti-freeze compounds to lower the freezing point of mortar.
- F. If water is lost by evaporation, re-temper only within two hours of mixing.
- G. Use mortar within two hours after mixing at temperatures of 90 degrees F, or two-and-one-half hours at temperatures under 40 degrees F.

## **2.04 GROUT MIXES**

- A. Masonry Walls (Vertical Application): 2500 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M. Water-reducing admixtures not permitted.
  - 1. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
  - 2. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

## **2.05 GROUT MIXING**

- A. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.
- B. Do not use anti-freeze compounds to lower the freezing point of grout.

## **2.06 PRECONSTRUCTION TESTING**

- A. Grout Mixes: Test grout batches in accordance with ASTM C1019 procedures.
  - 1. Test results will be used to establish optimum grout proportions and establish quality control values for construction testing.

## **PART 3 EXECUTION**

### **3.01 APPLICATION**

- A. Use masonry cement mortars or portland/lime mortars at the Contractor's option.

### **3.02 INSTALLATION**

- A. Install mortar and grout to requirements of section(s) in which masonry is specified.
- B. Work grout into masonry cores and cavities to eliminate voids.
- C. Do not install grout in lifts greater than 12 inches without consolidating grout by mechanical vibration during placement and reconsolidate after initial water loss has occurred and before plasticity is lost.
- D. Do not displace reinforcement while placing grout.
- E. Remove excess mortar from grout spaces.

### **3.03 GROUTING**

- A. Perform all grouting by means of low-lift technique. Do not employ high-lift grouting.
- B. Low-Lift Grouting:
  - 1. Limit height of pours to 16 inches.

2. Limit height of masonry to 16 inches above each pour.
3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1 hour. If grout placement is stopped for 1 hour or longer, a horizontal construction joint shall be formed 1 inch below top of block except at top of wall.

#### **3.04 FIELD QUALITY CONTROL**

- A. Test and evaluate grout in accordance with ASTM C1019 procedures.
  1. Test frequency: Take one sample for each 25 cubic yards of grout or fraction thereof being placed each day.

**END OF SECTION**

**SECTION 042000**  
**UNIT MASONRY**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Concrete Block (CMU).
  - 2. Architectural Concrete Masonry Units (ACMU).
  - 3. Clay facing brick.
  - 4. Reinforcement and anchorage.
  - 5. Flashings.
  - 6. Accessories.
- B. Related Sections:
  - 1. Section 040511 - Mortar and Masonry Grout.
  - 2. Section 079200 - Joint Sealants: Sealing control and expansion joints.

**1.02 REFERENCE STANDARDS**

- A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures and Related Commentaries; American Concrete Institute International; 2008.
- B. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; American Concrete Institute International; 2008.
- C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.
- D. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).
- E. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2011.
- F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
- G. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2014.
- H. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2011.
- I. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2014.
- J. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.
- K. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2014.
- L. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units; 2014.
- M. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2012.

- N. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2010.
- O. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2005.
- P. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
- Q. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.
- R. BIA Technical Notes No. 7 - Water Penetration Resistance - Design and Detailing; 2005.

### **1.03 SUBMITTALS**

- A. Product Data: Provide data for masonry units, fabricated wire reinforcement, masonry accessories, and reinforcing steel.
- B. Color Samples: Submit samples of manufacturer's full range of colors for color selection of ACMU and brick.
- C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- D. Manufacturer's Certificate: Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.

### **1.04 QUALITY ASSURANCE**

- A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.

### **1.05 MOCK-UP**

- A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high; include mortar, accessories, structural backup, flashings (with lap joint, corner, and end dam), and cast stone cap in mock-up.
- B. Locate where directed.
- C. Mock-up may not remain as part of the Work.
- D. Do not proceed with masonry work until Architect has approved the panel.
- E. Erect separate panels for each type of masonry work.
- F. Use panels as standard of comparison for all unit masonry work. Do not destroy or move panel until project is completed and accepted by the Architect.

### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

## **PART 2 PRODUCTS**

### **2.01 CONCRETE MASONRY UNITS**

- A. Acceptable Manufacturers:

1. Beavertown Block Co, Inc.
  2. Nitterhouse Masonry Products, LLC.
  3. York Building Products.
  4. Or Approved Equal.
- B. Concrete Block: Comply with referenced standards and as follows:
1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
  2. Special Shapes: Provide non-standard blocks configured for corners.
  3. Load-Bearing Units: ASTM C90, normal weight.
    - a. Hollow block.
    - b. Exposed Faces: Manufacturer's standard color and texture.
  4. Non-Loadbearing Units: ASTM C129.
    - a. Hollow block.
    - b. Normal weight.
- C. Architectural Concrete Masonry Units (ACMU): ASTM C90 and C744, normal weight.
1. Provide special shapes for corners and other special conditions as indicated on the Drawings.
  2. Integral Water Repellant: Provide units made with integral water repellant admixture for exposed exterior units. Manufacturer to be certified by water repellant manufacturer to produce water repellant ACMU. Manufacturer to certify that the ACMU has been manufactured with integral water repellant at dosage rate proportioned per integral water repellant manufacturer's recommendations to achieve moisture control.
  3. Integral Color: ASTM C979. All like units to be supplied from a single run for color consistency. Color to be York Building Products color number YBP-11 or comparable color from other approved manufacturers. Color from other acceptable manufacturers would be selected during submittal approval.
  4. Pattern: Provide smooth face and split face as indicated on the drawings.

## **2.02 BRICK UNITS**

- A. Manufacturers:
1. Boral Bricks, Inc: [www.boralbricks.com](http://www.boralbricks.com).
  2. Glen-Gery.
  3. Or Approved Equal.
- B. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
1. Color and texture: Glen-Gery 250-M or approved equal.
  2. Nominal size: To match existing.
  3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

## **2.03 MORTAR AND GROUT MATERIALS**

- A. Mortar and Grout: As specified in Section 040511.

## 2.04 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; galvanized.
- B. Single Wythe Joint Reinforcement: ASTM A951/A951M.
  - 1. Type: Truss or ladder.
  - 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3.
  - 3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
- C. Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
  - 1. Type: Truss or ladder.
  - 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3.
  - 3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

## 2.05 FLASHINGS

- A. Combination Asphaltic Flashing Materials - Copper:
  - 1. Copper/Asphalt Flashing: 5 oz/sq ft copper sheet bonded between 2 layers asphalt saturated glass fabric.
    - a. Manufacturers:
      - 1) Advanced Building Products, Inc; Copper Fabric Flashing: [www.advancedbuildingproducts.com/#sle](http://www.advancedbuildingproducts.com/#sle).
      - 2) Hohmann & Barnard, Inc: [www.h-b.com/#sle](http://www.h-b.com/#sle).
      - 3) WIRE-BOND: [www.wirebond.com/#sle](http://www.wirebond.com/#sle).
      - 4) Or Approved Equal.

## 2.06 ACCESSORIES

- A. Expansion Joint Material: Preformed extruded closed cell neoprene; oversized 50 percent to joint width; self-expanding; 3/8 inch wide by maximum lengths available.
  - 1. Manufacturers:
    - a. Dur-O-Wal.
    - b. Hohmann & Barnard, Inc.
    - c. Masonry Reinforcing Corporation of America.
    - d. Or Approved Equal.
- B. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
  - 1. Manufacturers:
    - a. Blok-Lok Limited: [www.blok-lok.com](http://www.blok-lok.com).
    - b. Hohmann & Barnard, Inc: [www.h-b.com](http://www.h-b.com).
    - c. WIRE-BOND: [www.wirebond.com/#sle](http://www.wirebond.com/#sle).
    - d. Or Approved Equal.
- C. Weeps:

1. Type: Cotton rope.
- D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

#### **3.02 PREPARATION**

- A. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

#### **3.03 COLD AND HOT WEATHER REQUIREMENTS**

- A. Comply with requirements of ACI 530 and ACI530.1.

#### **3.04 COURSING**

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units and Architectural Concrete Masonry Units:
  1. Bond: Running.
  2. Coursing: One unit and one mortar joint to equal 8 inches.
  3. Mortar Joints: Concave.
- D. Brick Units:
  1. Bond: Running.
  2. Coursing: Three units and three mortar joints to equal 8 inches.
  3. Mortar Joints: Concave.

#### **3.05 PLACING AND BONDING**

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
- F. Interlock intersections and external corners.
- G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.



- I. At brick infill areas, tooth new brick into existing brick coursing to match existing coursing.

### **3.06 WEEPS/CAVITY VENTS**

- A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing at bottom of walls.

### **3.07 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY**

- A. Install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.

### **3.08 REINFORCEMENT AND ANCHORAGES - MULTIPLE WYTHE UNIT MASONRY**

- A. Install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.

### **3.09 MASONRY FLASHINGS**

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
  - 1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at non-masonry construction.
  - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
  - 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Terminate flashing up 8 inches minimum on vertical surface of backing:
  - 1. Apply cap bead of sealant on top edge of self-adhered flashing.
- C. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.

### **3.10 GROUTED AND REINFORCED COMPONENTS**

- A. Provide #4 vertical reinforcing bar at 48" oc in all CMU units 6" or wider. Fill cores with grout full height.
- B. Lap splices minimum 24 bar diameters. Comply with placing reinforcement requirements of ACI 530.1.
- C. Support and secure reinforcing bars from displacement using reinforcing bar positioners. Maintain position within 1/2 inch of dimensioned position.

- D. Place and consolidate grout fill without displacing reinforcing. Do not grout until entire height of masonry has attained enough strength to resist grout pressure.

### **3.11 CONTROL AND EXPANSION JOINTS**

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed expansion and control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.

### **3.12 TOLERANCES**

- A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

### **3.13 CUTTING AND FITTING**

- A. Cut exposed masonry by an approved saw cut method. Do not use chipped or broken masonry units in exposed masonry work.

### **3.14 CLEANING**

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

### **3.15 PROTECTION**

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

**END OF SECTION**

**SECTION 047200**  
**CAST STONE MASONRY**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Architectural cast stone.
  - 2. Units required are:
    - a. Exterior wall units, including wall caps.
- B. Related Requirements:
  - 1. Section 040511 - Mortar and Masonry Grout: Mortar for setting cast stone.
  - 2. Section 042000 - Unit Masonry: Installation of cast stone in conjunction with masonry.

**1.02 REFERENCE STANDARDS**

- A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.
- B. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2009.
- C. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.
- D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
- E. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.
- F. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.
- G. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- H. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.
- I. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2010.

**1.03 SUBMITTALS**

- A. Product Data: Test results of cast stone components made previously by the manufacturer.
- B. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.
- C. Mortar Color Selection Samples.
- D. Verification Samples: Pieces of actual cast stone components not less than 6 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.

## **1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications:
  - 1. A firm with a minimum of 5 years experience producing cast stone of types required for project.
  - 2. Current producer member of the Cast Stone Institute or the Architectural Precast Association.
  - 3. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

## **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.
- B. Number each piece individually to match shop drawings and schedule.
- C. Store cast stone components and installation materials in accordance with manufacturer's instructions.
- D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.
- E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.
- F. Store mortar materials where contamination can be avoided.
- G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Portland Cement: ASTM C150/C150M.
  - 1. For Units: Type I, white or gray as required to match Architect 's sample.
  - 2. For Mortar: Type I or II, except Type III may be used in cold weather.
- B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.
- C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.
- D. Pigments: ASTM C979, inorganic iron oxides; do not use carbon black.
- E. Admixtures: ASTM C494/C494M.
- F. Water: Potable.
- G. Reinforcing Bars: ASTM A615/A615M deformed bars, galvanized.
  - 1. Galvanized in accordance with ASTM A767/A767M, Class I.
- H. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.
- I. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

- J. Mortar: Portland cement-lime, as specified in Section 040511; do not use masonry cement.
- K. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.
- B. Do not begin installation until unacceptable conditions have been corrected.

### **3.02 INSTALLATION**

- A. Install cast stone components in conjunction with masonry, complying with requirements of Section 042000.
- B. Mechanically anchor cast stone units indicated; set remainder in mortar.
- C. Setting:
  - 1. Drench cast stone components with clear, running water immediately before installation.
  - 2. Set units in a full bed of mortar unless otherwise indicated.
  - 3. Fill vertical joints with mortar.
  - 4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

### **3.03 CLEANING**

- A. Clean completed exposed cast stone after mortar is thoroughly set and cured.
  - 1. Wet surfaces with water before applying cleaner.
  - 2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
  - 3. Remove cleaner promptly by rinsing thoroughly with clear water.
  - 4. Do not use acidic cleaners.

### **3.04 PROTECTION**

- A. Protect completed work from damage.
- B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

**END OF SECTION**

**SECTION 047300**  
**SIMULATED STONE**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Thin-Set Stone Veneer.

**1.02 REFERENCE STANDARDS**

- A. ANSI A118.4 - Specifications for Latex-Portland Cement Mortar.
- B. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- C. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
- D. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
- E. ASTM C177 - Standard Test Method for Steady-State Head Flux Measurements and thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
- F. ASTM C207 - Standard Specimen for Hydrated Lime for Masonry Purposes.
- G. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
- H. ASTM C482 - Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement.
- I. ASTM C847 - Standard Specification for Metal Lath.
- J. ASTM C932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.
- K. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
- L. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

**1.03 SUBMITTALS**

- A. Product Data. Provide data for thin-set stone veneer materials.
- B. Samples:
  - 1. Standard sample board consisting of small-scale pieces of veneer units showing full range of textures and colors.
  - 2. Full range of mortar colors for selection during submittal approval.

**1.04 MOCK-UP**

- A. Provide one mock-up, three feet long by three feet wide, illustrating stone and grout installation.
- B. Locate where directed.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to the site following manufacturer's standard instructions.

## **1.06 FIELD CONDITIONS**

- A. Environmental Requirements: When air temperature is 40 degrees F or below, consult local building code for Cold-Weather Construction requirements.

## **1.07 WARRANTY**

- A. Warranty: Manufacturer's standard warranty coverage against defects in materials when installed in accordance with manufacturer's installation instructions.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Quality Stone; stone style: cobblestone; stone color: Ridgewood; mortar color: to be selected.
- B. Or Approved Equal.

### **2.02 MATERIALS**

- A. Veneer Unit Properties:
  - 1. Compressive Strength: ASTM C39, 5 sample average: greater than 1,800 psi.
  - 2. Shear Bond: ASTM C482: 50 psi.
  - 3. Water Absorption: UBC Standard 15-5; Less than 22 percent.
  - 4. Freeze-Thaw Test: ASTM C67: Less than 3 percent weight loss and no disintegration.
  - 5. Thermal Resistance: ASTM C177: 0.473 at 1.387 inches thick.
- B. Moisture Barrier: ASTM D226, Type 1, non-perforated asphalt-saturated felt paper.
- C. Reinforcing: ASTM C847 galvanized expanded metal lath or galvanized rib lath complying with code agency requirements for the type of substrate over which stone veneer is installed.
- D. Mortar:
  - 1. Cement: Any cement complying with ASTM C270.
  - 2. Lime: ASTM C207.
  - 3. Sand: ASTM C144, natural or manufactured sand.
  - 4. Color Pigment: ASTM C979, mineral oxide pigments.
  - 5. Water: Potable.
  - 6. Pre-Packaged Latex-Portland Cement Mortar: ANSI A118.4.
- E. Bonding Agent: Exterior integral bonding agent meeting ASTM C932.
- F. Sealer: Water Based silane or siloxane sealer, clear.

### **2.03 MORTAR MIXES**

- A. Standard Installation (Grouted Joints):
  - 1. Mix mortar in accordance with ASTM C270, Type N or per manufacturer's mortar preparation instructions.
    - a. Add color pigment in grout joint mortar in accordance with pigment manufacturer's instructions.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates upon which work will be installed.
- B. Inform Architect immediately of any unsatisfactory substrates.
- C. Commencement of work by installer is acceptance of substrate.

### **3.02 PREPARATION**

- A. Protection: Protect adjacent work from contact with mortar.
- B. Surface Preparation: Prepare substrate in accordance with manufacturer's installation instructions for the type of substrate being covered.

### **3.03 INSTALLATION**

- A. Install and clean stone in accordance with manufacturer's installation instructions for grouted joint installation.
- B. Apply sealer in accordance with sealer manufacturer's installation instructions.

### **3.04 CLEANING**

- A. Remove protective coverings from adjacent work.
- B. Cleaning Veneer Units:
  - 1. Wash with soft bristle brush and water/granulated detergent solution.
  - 2. Rinse immediately with clean water.
- C. Removing Efflorescence: In accordance with manufacturer's standard instructions.

**END OF SECTION**



**SECTION 055000**  
**METAL FABRICATIONS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Shop fabricated steel items.
  - 2. Prefabricated ladders.
  - 3. Downspout boots.

**1.02 REFERENCE STANDARDS**

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.
- B. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- D. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2012).
- E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.
- G. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.
- H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.
- J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
- K. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

**1.03 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard product data for prefabricated items.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
  - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Store steel above the ground surface on platforms, skids, blocking or other supports.

- B. Protect steel from exposure to conditions that produce rust.
- C. Handle steel so no parts are bent, broken or otherwise damaged and avoid damage to other material and work.
- D. Deliver, store and handle pre-finished aluminum products in a manner that will prevent material damage and deterioration or contamination from the elements.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS - STEEL**

- A. Steel Sections: ASTM A36/A36M.
- B. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
- C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- D. Steel used at exterior locations to be galvanized.
- E. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

### **2.02 FABRICATION**

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

### **2.03 PREFABRICATED LADDERS**

- A. Prefabricated Ship Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
  - 1. Components: Manufacturer's standard rails, rungs, treads, handrails, returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
  - 2. Materials: Aluminum; ASTM B221 (ASTM B221M), 6063 alloy, T52 temper.
  - 3. Incline: 75 degrees.
  - 4. Finish: Manufacturer's standard clear anodized coating, comply with AAMA 611, Class 1.
  - 5. Manufacturers:
    - a. O'Keeffe's Inc; Model 523 with safety post: [www.okeeffes.com/#sle](http://www.okeeffes.com/#sle).
    - b. Or Approved Equal.

## **2.04 DOWNSPOUT BOOTS**

- A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots, integral cleanout, cleanout cover, and tamper proof fasteners.
  - 1. Configuration: Angular.
  - 2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
  - 3. Finish: Manufacturer's standard factory applied powder coat finish.
  - 4. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, integral neoprene gaskets, and rubber coupling.
  - 5. Manufacturers:
    - a. Downspoutboots.com, a division of J. R. Hoe & Sons: [www.downspoutboots.com](http://www.downspoutboots.com).
    - b. Neenah Foundry, a division of Neenah Enterprises, Inc: [www.nfco.com](http://www.nfco.com).
    - c. Or Approved Equal.

## **2.05 FINISHES - STEEL**

- A. Prime paint steel items.
  - 1. Exceptions: Galvanize items to be embedded in concrete and items to be imbedded in masonry.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.
- E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

## **2.06 FABRICATION TOLERANCES**

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.

### **3.02 PREPARATION**

- A. Clean and strip primed steel items to bare metal where site welding is required.

### **3.03 INSTALLATION**

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

- C. Field weld components as indicated on drawings.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed.

#### **3.04 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION**

**SECTION 055213**  
**PIPE AND TUBE RAILINGS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Stair railings and guardrails.
  - 2. Exterior guardrail.
- B. Related Sections:
  - 1. Section 099000 - Painting and Coating: Paint finish.

**1.02 REFERENCE STANDARDS**

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
- C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
- D. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).
- E. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
- F. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

**1.03 SUBMITTALS**

- A. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

**PART 2 PRODUCTS**

**2.01 RAILINGS - GENERAL REQUIREMENTS**

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.
- B. Allow for expansion and contraction of members and building movement without damage to connections or members.
- C. Dimensions: See drawings for configurations and heights.
- D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
  - 1. For anchorage to concrete, provide inserts to be cast into concrete, for welding anchors.
- E. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

## **2.02 STEEL RAILING SYSTEM**

- A. Steel Tube: ASTM A500/A500M, Grade B cold-formed structural tubing. Provide galvanized finish at exterior locations.
- B. Posts and Framing: 16 gauge, 1 inch square steel tubing; welded joints.
- C. Balusters: 16 gauge, 1/2 inch square steel tube.
- D. Cover Rail: 1 3/4 inch molded steel cover rail with lambs tongue handrail ends where indicated on the drawings.
- E. Provide shoe bases.
- F. Provide welded railing system.
- G. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- H. Exposed Fasteners: No exposed bolts or screws.
- I. Straight Splice Connectors: Steel welding collars.
- J. Galvanizing: In accordance with requirements of ASTM A123/A123M.
  - 1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.
- K. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- L. Field Finish Painting: Field finish paint steel railing components per Specification Section 099000 Painting and Coating.

## **2.03 FABRICATION**

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured.
- D. Welded Joints:
  - 1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
  - 2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
  - 3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.

### **3.02 PREPARATION**

- A. Clean and strip primed steel items to bare metal where site welding is required.

- B. Supply items required to be cast into concrete with setting templates, for installation as work of other sections.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- D. Anchor railings securely to structure.
- E. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.
- F. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

### **3.04 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION**

**SECTION 061000**  
**ROUGH CARPENTRY**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Structural dimension lumber framing.
  - 2. Non-structural dimension lumber framing.
  - 3. Rough opening framing for doors, windows, and roof openings.
  - 4. Sheathing.
  - 5. Preservative treated wood materials.
  - 6. Miscellaneous framing and sheathing.
  - 7. Communications and electrical room mounting boards.
  - 8. Concealed wood blocking, nailers, and supports.
  - 9. Miscellaneous wood nailers, furring, and grounds.

**1.02 REFERENCE STANDARDS**

- A. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2015.
- B. AFPA WCO1, "Details for Conventional Wood Frame Construction."
- C. AFPA (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; American Forest and Paper Association; 2012.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- F. ASTM C209 - Standard Test Methods for Cellulosic Fiber Insulation Board; 2015.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- H. AWWPA U1 - Use Category System: User Specification for Treated Wood; 2012.
- I. PS 1 - Structural Plywood; 2009.
- J. PS 20 - American Softwood Lumber Standard; 2010.
- K. SPIB (GR) - Grading Rules; 2014.

**1.03 SUBMITTALS**

- A. Product Data: Provide technical data on wood preservative materials.
- B. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.



## **PART 2 PRODUCTS**

### **2.01 GENERAL REQUIREMENTS**

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
  - 1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
  - 2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee ([www.alsc.org](http://www.alsc.org)) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
  - 3. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.
- B. Lumber fabricated from old growth timber is not permitted.

### **2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS**

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Structural Stud Framing: Species and Grade as indicated on structural drawings.
- E. Stud Framing (2 by 2 through 2 by 6 ):
  - 1. Species: Any allowed under referenced grading rules.
  - 2. Grade: No. 2.
- F. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16 ):
  - 1. Species: Any allowed under grading rules.
  - 2. Grade: No. 1 & Btr.
- G. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
  - 1. Lumber: S4S, No. 2 or Standard Grade.
  - 2. Boards: Standard or No. 3.

### **2.03 ENGINEERED WOOD PRODUCTS**

- A. Laminated-Veneer Lumber (LVL) as indicated on drawings.

### **2.04 CONSTRUCTION PANELS**

- A. Roof Sheathing: Oriented strand board wood structural panel; PS 2.
  - 1. Grade: Structural 1 Sheathing.
  - 2. Bond Classification: Exposure 1.
  - 3. Performance Category: 3/4 PERF CAT.
  - 4. Span Rating: 48/24.
  - 5. Edges: Tongue and groove.
  - 6. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.

7. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.
  8. Warranty: Manufacturer's standard lifetime limited warranty against manufacturing defects and that panels will not delaminate or require sanding due to moisture absorption damage from exposure to weather for up to the stated period.
- B. Wall Sheathing: Plywood, PS 1, Grade C-C, Exterior Exposure.
- C. Wall Sheathing: Oriented strand board wood structural panel; PS 2.
1. Grade: Structural 1 Sheathing.
  2. Bond Classification: Exposure 1.
  3. Performance Category: 1/2 PERF CAT.
  4. Span Rating: 32/16.
  5. Edges: Square.
  6. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
  7. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.
  8. Warranty: Manufacturer's standard lifetime limited warranty against manufacturing defects and that panels will not delaminate or require sanding due to moisture absorption damage from exposure to weather for up to the stated period.
- D. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- E. Other Applications:
1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
  2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
  3. Other Locations: PS 1, C-D Plugged or better.

## 2.05 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacturer.
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 A153A.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the loads imposed when

installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

## **2.06 METAL FRAMING ANCHORS**

- A. Basis of Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meets or exceeds those of basis-of-design products. 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.
- C. Joist Hangers: U-shaped joist hangers with 2 inch long seat and 1 1/4 inch wide nailing flanges at least 85 percent of joist depth.
  1. Thickness: 0.050 inch.
- D. Truss Hold Downs: Bent strap tie for fastening roof trusses to wall studs below, 1 1/2 inches wide by 0.050 inch thick. Tie fastens to side of truss, face of top plates, and side of stud below.

## **2.07 ACCESSORIES**

- A. Fasteners and Anchors:
  1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

## **2.08 FACTORY WOOD TREATMENT**

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
  1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
- B. Preservative Treatment:
  1. Manufacturers:
    - a. Arch Wood Protection, Inc: [www.wolmanizedwood.com](http://www.wolmanizedwood.com).
    - b. Koppers Performance Chemicals, Inc: [www.koppersperformancechemicals.com](http://www.koppersperformancechemicals.com).
    - c. Viance, LLC: [www.treatedwood.com](http://www.treatedwood.com).
    - d. Or Approved Equal.
  2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.

- a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
- b. Treat lumber in other locations as indicated.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Coordinate installation of rough carpentry members specified in other sections.

### **3.02 INSTALLATION - GENERAL**

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Comply with AFPA WCO1.
- D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  1. NES NER-272 for power driven fasteners.
  2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
- E. Use steel common nails unless otherwise indicated. Make tight connections between members. Install fasteners without splitting wood.
- F. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

### **3.03 FRAMING INSTALLATION**

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AFPA Wood Frame Construction Manual.
- E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
- F. Construct double truss headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- G. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.
- H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

### **3.04 BLOCKING, NAILERS, AND SUPPORTS**

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- E. Provide the following specific non-structural framing and blocking:
  - 1. Cabinets and shelf supports.
  - 2. Wall brackets.
  - 3. Handrails.
  - 4. Grab bars.
  - 5. Towel and bath accessories.

### **3.05 INSTALLATION OF CONSTRUCTION PANELS**

- A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
  - 1. At long edges provide solid edge blocking where joints occur between roof framing members.
  - 2. Nail panels to framing; staples are not permitted.
- B. Wall Sheathing: Secure with long dimension parallel to wall studs, with ends over firm bearing and staggered, using nails or screws.
- C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.

### **3.06 TOLERANCES**

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

**END OF SECTION**

**SECTION 061753**  
**SHOP-FABRICATED WOOD TRUSSES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Shop fabricated wood trusses for roof framing.
  - 2. Bridging, bracing, and anchorage.
- B. Related Requirements:
  - 1. Section 061000 - Rough Carpentry: Installation requirements for miscellaneous framing.

**1.02 REFERENCE STANDARDS**

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- B. TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction; 2007 and errata.
- C. TPI BCSI 1 - Building Component Safety Information Booklet: The Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses; 2011.
- D. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses; 1989.

**1.03 SUBMITTALS**

- A. Product Data: Manufacturer's data sheets on plate connectors, bearing plates, and metal bracing components.
- B. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.
  - 1. Include identification of engineering software used for design.
  - 2. Provide shop drawings stamped or sealed by design engineer.

**1.04 QUALITY ASSURANCE**

- A. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- B. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Handle and erect trusses in accordance with TPI BCSI 1.
- B. Store trusses in vertical position resting on bearing ends.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Truss Plate Connectors:
  - 1. Alpine Engineered Products, Inc: [www.alpeng.com](http://www.alpeng.com).
  - 2. MiTek Industries, Inc: [www.mii.com](http://www.mii.com).
  - 3. Truswal Systems: [www.truswal.com](http://www.truswal.com).
  - 4. Or Approved Equal.

### **2.02 TRUSSES**

- A. Wood Trusses: Designed and fabricated in accordance with TPI 1 and TPI DSB-89 to achieve structural requirements indicated.
  - 1. Connectors: Steel plate.
  - 2. Design Roof Loads: 15 lbs/sq ft dead load, 30 lbs/sq ft live load, 60 lbs/sq ft snow load for structures on long axis of building and 105 lbs/sq ft snow load for structures on short axis of building, with total deflection limited to span/240.

### **2.03 MATERIALS**

- A. Lumber:
  - 1. Moisture Content: Between 7 and 9 percent.
  - 2. Lumber fabricated from old growth timber is not permitted.
- B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.
- C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

### **2.04 ACCESSORIES**

- A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: Softwood lumber, any species, construction grade, 19 percent maximum and 7 percent minimum moisture content.
- B. Fasteners: Electrogalvanized steel, type to suit application.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that supports and openings are ready to receive trusses.

### **3.02 PREPARATION**

- A. Coordinate placement of bearing items.

### **3.03 ERECTION**

- A. Install trusses in accordance with manufacturer's instructions and TPI DSB-89 and TPI BCSI 1.
- B. Set members level and plumb, in correct position.

- C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.
- D. Do not field cut or alter structural members without approval of Architect.
- E. Install permanent bridging and bracing.
- F. Install headers and supports to frame openings required.
- G. Frame openings between trusses with lumber in accordance with Section 061000.
- H. Coordinate placement of decking with work of this section.

### **3.04 TOLERANCES**

- A. Framing Members: 1/2 inch maximum, from true position.

**END OF SECTION**



**SECTION 062000**  
**FINISH CARPENTRY**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Finish carpentry items.
  - 2. Wood Door Frame Trim.
  - 3. Wood Casings and Mouldings.
  - 4. Plywood Shelving for Bathrooms, Pantries and Closets.
  - 5. Closet Shelf and Rod Supports and Closet Rods.
  - 6. Hardware and attachment accessories.
- B. Related Sections:
  - 1. Section 099000 - Painting and Coating: Painting and finishing of finish carpentry items.

**1.02 REFERENCE STANDARDS**

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

**1.03 SUBMITTALS**

- A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
  - 1. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- B. Samples:
  - 1. Samples: Submit two samples of wood trim 12 inches long.

**1.04 QUALITY ASSURANCE**

- A. Perform work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Custom grade.
- B. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Protect from moisture damage.

**1.06 PROJECT CONDITIONS**

- A. Coordinate the work with installation of associated and adjacent components.

**PART 2 PRODUCTS**

**2.01 FINISH CARPENTRY ITEMS**

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

## **2.02 WOOD-BASED COMPONENTS**

- A. Wood fabricated from old growth timber is not permitted.

## **2.03 LUMBER MATERIALS**

- A. Hardwood Lumber: Yellow Poplar species, quarter sawn, maximum moisture content of 6 percent; with vertical grain.

## **2.04 SHEET MATERIALS**

- A. Shelving and Ledger Board: Provide softwood plywood with edge band for field paint finish. Provide softwood 1 x 2 for ledger boards.

## **2.05 FASTENINGS**

- A. Fasteners: Of size and type to suit application and substrates.

## **2.06 HARDWARE**

- A. Closet Shelf and Rod Supports: Provide Knape & Vogt Manufacturing Company 1195 (white finish) heavy duty closet shelf and rod support or approved equal.
- B. Closet Rods: Provide Knape & Vogt Manufacturing Company PB-75 Precision Built Tubing or approved equal.

## **2.07 FABRICATION**

- A. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify adequacy of backing and support framing.
- B. Verify building items affecting work of this section are placed and ready to receive this work.

### **3.02 INSTALLATION**

- A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
- D. Install trim with nails at 12 inch on center.

### **3.03 PLYWOOD SHELVING INSTALLATION**

- A. Provide ledger boards on three sides of all shelving with miscellaneous blocking built into walls to support ledger boards.
- B. Bathroom and Pantry Locations: Provide four (4) total shelves. Bottom shelf to be located at 24 inches above finished floor. Remaining shelves to be spaced at 14 inches on center.

- C. Other Locations Indicated on the Drawings to Receive Shelving: Provide four (4) total shelves. Bottom shelf to be located at 24 inches above finished floor. Remaining shelves to be spaced at 14 inches on center.
- D. Closet Rod and Shelving: Provide closet shelf, rod and bracket supports at all bedroom closets. Provide spacing of supports as recommended by manufacturer. Provide shelf on top of supports full length of closet. Provide closet rods full length of closet.
  - 1. Mounting Heights:
    - a. ADA Closets: 48 inches to top of shelf.
    - b. All Other Closets: 60 inches to top of shelf.

### **3.04 PREPARATION FOR SITE FINISHING**

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Site Finishing: See Section 099000.

### **3.05 TOLERANCES**

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

**END OF SECTION**

**SECTION 066001**  
**SOLID SURFACING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Solid surface tub walls.
  - 2. Solid surface window sills.

**1.02 REFERENCE STANDARDS**

- A. ASTM D 570 - Standard Test Method for Water Absorption.
- B. ASTM D 785 - Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials.
- C. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2008.

**1.03 SUBMITTALS**

- A. Product Data: Provide product description, fabrication information and compliance with specified performance requirements.
- B. Shop Drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.
- C. Manufacturer's Instructions: Submit manufacturer's installation instructions. Submit manufacturer's care and maintenance data, including repair and cleaning instructions.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Store surfacing materials to prevent breakage and marring of surfaces in accordance with manufacturer's instructions.

**1.05 WARRANTY**

- A. Provide manufacturer's residential Lifetime Warranty against defect in materials.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS - SOLID SURFACE MATERIALS**

- A. Dupont, Corian.
- B. The Swan Corporation, Swanstone Solid Surfacing Material.
- C. Or Approved Equal.

**2.02 SOLID SURFACE MATERIALS**

- A. Product Description: Homogenous compression molded material composed of acrylic resins or polyester/acrylic resin blend, fire-retardant filler materials, fiber reinforcement, and coloring agents meeting the following requirements:
  - 1. Nominal Sheet Thickness: 0.25 inch.
  - 2. Surface Burning Characteristics: Flame spread index of 15, smoke developed index of 255, when tested in accordance with ASTM E 84.
  - 3. Liquid Absorption, ASTM D 570, for 1/4 inch material thickness: 0.033 percent.

4. Hardness, ASTM D 785, Barcol Impressor: 42.
5. Tub Walls Color: Color to be White.
6. Window Sills Color: Color to be selected from Corian price group 2 or approved equal.

### **2.03 ACCESSORIES**

- A. Adhesive: Provide manufacturer's standard adhesive.

### **2.04 FABRICATION**

- A. Fabricate components in shop to the greatest extent practical to sizes indicated, in accordance with approved shop drawings.
- B. Form joints between components using manufacturers standard joint adhesive. Joints to be inconspicuous in appearance and without voids.
- C. Provide holes and cutouts for plumbing as indicated on the drawings.
- D. Rout and finish component edges to a smooth, uniform finish.
- E. All surfaces to have a uniform finish.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Precondition surfacing materials and surfaces to receive surfacing materials in accordance with manufacturer's printed instructions.

### **3.02 INSTALLATION**

- A. Install components plumb and level in accordance with approved shop drawings and manufacturer's printed installation instructions.
- B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
- C. Remove adhesives, sealants and other stains upon completion of installation per manufacturer's written instructions.
- D. Install in accordance with manufacturer's instructions.

### **3.03 PROTECTION**

- A. Protect installed solid surfaces from subsequent construction operations.

**END OF SECTION**

**SECTION 068000**  
**ARCHITECTURAL COMPOSITE COLUMNS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Load Bearing, fiber-reinforced polymer composite columns.
  - 2. Column decorative capitals and bases.
- B. Related Sections:
  - 1. Section 079200 - Joint Sealants: Field-installed sealants.
  - 2. Section 099000 - Painting and Coating: Painting and finishing of architectural composite columns.

**1.02 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets on each product including preparation instructions and recommendations, storage and handling requirements and recommendations, and installation methods.
- C. Shop Drawings: Indicate dimensions, configuration, anchorage, and installation instructions.
- D. Warranty: Provide manufacturer's standard warranty.

**PART 2 PRODUCTS**

**2.01 BASE BID MANUFACTURER**

- A. HB&G: [www.hbgcolumns.com](http://www.hbgcolumns.com) Model Square PERMACast Columns and PERMA Capitals and Bases.
- B. Or Approved Equal.

**2.02 LOAD BEARING COLUMNS - SQUARE**

- A. Square PERMACast Column:
  - 1. Height: 6 feet, except 8 feet at Porch Type D.
- B. Capitals and Bases:
  - 1. Capital: Provide Tuscan PermaTuff Cap, except provide Beveled Cap at Porch Type D and E.
  - 2. Base: Provide Tuscan PermaTuff Base, except provide Beveled Base at Porch Type D and E.

**2.03 ACCESSORIES**

- A. Adhesive: Construction Adhesive; non-acetone based exterior grade..
- B. Sealant: See Section 079200 - Joint Sealants.
- C. Hardware:
  - 1. Bottom Anchors: Corner irons.
  - 2. Anchor Fasteners: Concrete anchors.
  - 3. Cap and Base Fasteners: Screws.

## **2.04 FIELD FINISHING**

- A. Field Finishing: See Section 099000 - Painting and Coating for field finishing requirements.

## **PART 3 EXECUTION**

### **3.01 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.

### **3.02 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by the manufacturer for achieving the best results for the substrate under the project conditions.
- C. If attaching corner irons, pre-drill holes for screws.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Plumb and level, with 100 percent of bottom contacting substrate and 75 percent of top contacting soffit. Center load over shaft and evenly distribute around bearing surface.

### **3.04 PROTECTION**

- A. Protect installed columns from subsequent construction operations.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION**

**SECTION 071113**  
**BITUMINOUS DAMPPROOFING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Bituminous dampproofing.
  - 2. Protection boards.

**1.02 REFERENCE STANDARDS**

- A. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2011).
- B. ASTM D1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing; 2013.
- C. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

**1.03 SUBMITTALS**

- A. Product Data: Provide properties of primer, bitumen, and mastics.
- B. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

**1.04 FIELD CONDITIONS**

- A. Maintain ambient temperatures above 35 degrees F for 24 hours before and during application until dampproofing has cured.

**PART 2 PRODUCTS**

**2.01 BITUMINOUS DAMPPROOFING**

- A. Bituminous Dampproofing: Cold-applied water-based emulsion; asphalt with mineral colloid or chemical emulsifying agent; with or without fiber reinforcement; asbestos-free; suitable for application on vertical and horizontal surfaces.
  - 1. Composition - Vertical Application: ASTM D1227 Type III or ASTM D1187/D1187M Type I.
  - 2. Composition - Horizontal and Low-Slope Application: ASTM D1227 Type II or III.
  - 3. VOC Content: Not more than permitted by local, State, and federal regulations.
  - 4. Applied Thickness: 1/16 inch, minimum, wet film.
  - 5. Products:
    - a. W.R. Meadows, Inc.; Sealmastic Emulsion Type II (brush/spray-grade): [www.wrmeadows.com](http://www.wrmeadows.com).
    - b. Or Approved Equal.
- B. Primers, Mastics, and Related Materials: Type as recommended by dampproofing manufacturer.

**2.02 ACCESSORIES**

- A. Protection Board: 1/8 inch thick biodegradable hardboard.



## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.
- C. Verify that items penetrating surfaces to receive dampproofing are securely installed.

### **3.02 APPLICATION**

- A. Mechanical Room Foundation Walls: Apply two coats of asphalt dampproofing.
- B. Prime surfaces in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.
- C. Apply bitumen with roller.
- D. Apply dampproofing to concrete in accordance with manufacturer's instructions.
- E. Seal items watertight with mastic, that project through dampproofing surface.
- F. Place protection board directly over dampproofing, butt joints, and adhere to tacky dampproofing.
- G. Backfill within 24-48 hours using care to avoid damaging the dampproofing.

**END OF SECTION**

**SECTION 072119**  
**FOAMED-IN-PLACE INSULATION**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Foamed-in-place insulation.

**1.02 REFERENCE STANDARDS**

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.
- B. ASTM D1622/D1622M - Standard Test Method for Apparent Density of Rigid Cellular Plastics; 2014.
- C. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012.
- D. ASTM D2856 - Standard Test Method for Open-Cell Content of Rigid Plastics by the Air Pycnometer.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

**1.03 SUBMITTALS**

- A. Product Data: Provide product description, insulation properties, and preparation requirements.
- B. Certificates: Certify that products of this section meet or exceed specified requirements.
- C. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience.

**1.05 FIELD CONDITIONS**

- A. Do not install insulation when ambient temperature is lower than 70 degrees F.
- B. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.
- C. Do not apply foam when temperature is within 5 degrees F of dew point.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Foamed-In-Place Insulation:
  - 1. Bio-Based Insulation, LLC: Bio-Based 1701s.
  - 2. Demilec LLC; Heatlok Soy: [www.demilec.com/#sle](http://www.demilec.com/#sle).
  - 3. Or Approved Equal.

### **2.02 MATERIALS**

- A. Spray foam semi-open cell insulation to be spray-applied semi-rigid, low-density, air impenetrable cellular polyurethane foam plastic insulation produced in the field by combining part A polymeric isocyanurate component with part B resin-based component. The material to be job-site mixed in and spray applied by and through equipment designed especially for this purpose.
- B. Insulation: Spray foam, a two part, soy-based product to conform to:
  - 1. Thermal Resistance: R-Value of 15 for 2.5 inches nominal when tested in accordance with ASTM C518.
  - 2. Closed Cell Content: >90% when tested in accordance with ASTM D2856.
  - 3. Core Density (nominal): 1.7 lbs per cubic feet when tested in accordance with ASTM D1622.
  - 4. Flame Spread: <25 when tested in accordance with ASTM E84.
  - 5. Smoke Development Index: <450 when tested in accordance with ASTM E84.
  - 6. Water Vapor Permeability (2.5 inches thick foam): 0.73 perms when tested in accordance with ASTM E96.
  - 7. Water Absorption: 0.2% when tested in accordance with ASTM D2842.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify work within construction spaces or crevices is complete prior to insulation application.
- B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation adhesion.

### **3.02 PREPARATION**

- A. Mask and protect adjacent surfaces from over spray or dusting.

### **3.03 APPLICATION**

- A. Apply insulation in accordance with manufacturer's instructions.
- B. Apply insulation by spray method, to a uniform monolithic density without voids.
- C. Apply to achieve a thermal resistance R-value of 15.0 unless indicated otherwise on the drawings.
- D. Patch damaged areas.

### **3.04 PROTECTION**

- A. Do not permit subsequent construction work to disturb applied insulation.

**END OF SECTION**

**SECTION 073113**  
**ASPHALT SHINGLES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Asphalt shingle roofing.
  - 2. Flexible sheet membranes for eave protection and underlayment.
  - 3. Associated metal flashings and accessories.

**1.02 REFERENCE STANDARDS**

- A. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2009.
- B. ASTM D3161/D3161M - Standard Test Method for Wind-Resistance of Steep Slope Roofing Products (Fan-Induced Method); 2016a.
- C. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules; 2016.
- D. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2011.
- E. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples; 2013.

**1.03 SUBMITTALS**

- A. Product Data: Provide data indicating material characteristics, performance criteria, and limitations.
- B. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern.
- C. Manufacturer's Installation Instructions: Indicate installation criteria and procedures.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.04 FIELD CONDITIONS**

- A. Do not install shingles when surface temperatures are below 45 degrees F.

**1.05 WARRANTY**

- A. Correct defective Work within a 30 year period after Date of Substantial Completion.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Asphalt Shingles:
  - 1. GAF; Timberline Prestique 30 High Definition: [www.gaf.com/#sle](http://www.gaf.com/#sle). New shingles to match existing shingles. Color of existing shingles is Hickory.
  - 2. Or Approved Equal.

## **2.02 ASPHALT SHINGLES**

- A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462.
  - 1. Fire Resistance: Class A, complying with ASTM E108.
  - 2. Wind Resistance: Class A, when tested in accordance with ASTM D3161.
  - 3. Algae Resistant.
  - 4. Self-sealing type.

## **2.03 SHEET MATERIALS**

- A. Underlayment: Asphalt-saturated organic roofing felt, unperforated, complying with ASTM D226/D226M, Type I ("No.15").

## **2.04 ACCESSORIES**

- A. Roofing Nails: Standard round wire shingle type, galvanized steel, minimum 3/8 inch head diameter, 12 gage, 0.109 inch nail shank diameter, 1 inch long and complying with ASTM F1667.

## **2.05 METAL FLASHINGS**

- A. Metal Flashings: Provide sheet metal eave edge, gable edge, and other flashing indicated.
  - 1. Form flashings to protect roofing materials from physical damage and shed water.
  - 2. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
  - 3. Hem exposed edges of flashings minimum 1/4 inch on underside.
  - 4. Coat concealed surfaces of flashings with bituminous paint.
- B. Metal Drip Edge: Bent formed shape of aluminum alloy 5005-H154 in 0.032 thickness; finish white.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions prior to beginning work.
- B. Verify that roof deck is of sufficient thickness to accept fasteners.
- C. Verify deck surfaces are dry, free of ridges, warps, or voids.

### **3.02 PREPARATION**

- A. Seal roof deck joints wider than 1/16 inch as recommended by shingle manufacturer.
- B. Broom clean deck surfaces before installing underlayment or eave protection.
- C. Install eave edge flashings tight with fascia boards, weather lap joints 2 inches and seal with plastic cement, and secure flange with nails spaced 12 inches on center.

### **3.03 INSTALLATION - UNDERLAYMENT**

- A. Underlayment At Roof Slopes Up to 4:12: Install two layers of underlayment over entire roof area, with ends and edges weather lapped minimum 4 inches, stagger end laps of each consecutive layer, and nail in place.

- B. Weather lap and seal watertight with plastic cement any items projecting through or mounted on roof.

### **3.04 INSTALLATION - METAL FLASHING AND ACCESSORIES**

- A. Install flashings in accordance with manufacturer's instructions.
- B. Weather lap joints minimum 2 inches and seal weather tight with plastic cement.
- C. Secure in place with nails at 12 inches on center, and conceal fastenings.

### **3.05 INSTALLATION - SHINGLES**

- A. Install shingles in accordance with manufacturer's instructions manufacturer's instructions.
  - 1. Fasten strip shingles using four nails per strip, or as required by manufacturer and local building code, whichever is greater.
- B. Place shingles in straight coursing pattern with 5 inch weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.
- C. Project first course of shingles 3/4 inch beyond fascia boards.
- D. Extend shingles 1/2 inch beyond face of gable edge fascia boards.
- E. Complete installation to provide weather tight service.

### **3.06 PROTECTION**

- A. Do not permit traffic over finished roof surface.

**END OF SECTION**

**SECTION 074113**  
**METAL ROOF PANELS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Architectural roofing system of preformed aluminum panels.
  - 2. Attachment system.
  - 3. Finishes.
  - 4. Accessories.

**1.02 REFERENCE STANDARDS**

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.
- C. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2009.

**1.03 SUBMITTALS**

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Storage and handling requirements and recommendations.
  - 2. Installation methods.
  - 3. Specimen warranty.
- B. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
  - 1. Show work to be field-fabricated or field-assembled.
- C. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.
- D. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
  - 1. Not less than 5 years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.



## **1.06 WARRANTY**

- A. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of twenty years from Date of Substantial Completion.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Metal Roof Panels:
  - 1. ATAS International, Inc: [www.atas.com](http://www.atas.com).
  - 2. Metl-Span, a Division of NCI Group, Inc: [www.metlspan.com](http://www.metlspan.com).
  - 3. Petersen Aluminum Corporation: [www.pac-clad.com/#sle](http://www.pac-clad.com/#sle).
  - 4. Or Approved Equal.

### **2.02 ARCHITECTURAL METAL ROOF PANELS**

- A. Architectural Metal Roofing: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.
- B. Metal Panels: Factory-formed panels with factory-applied finish.
  - 1. Aluminum Panels:
    - a. Alloy and Temper: Aluminum complying with ASTM B209 (ASTM B209M); temper as required for forming.
    - b. Thickness: Minimum 20 gage (0.032 inch).
  - 2. Profile: Standing seam, with minimum 1.0 inch seam height; concealed fastener system for field seaming with special tool.
  - 3. Texture: Smooth.
  - 4. Length: Full length of roof slope, without lapped horizontal joints.
  - 5. Width: Maximum panel coverage of 20 inches.
  - 6. Color: Petersen Aluminum Corporation, PAC-CLAD Slate Gray or approved equal.

### **2.03 ATTACHMENT SYSTEM**

- A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

### **2.04 FINISHES**

- A. Fluoropolymer Coating System: Manufacturer's standard multi-coat thermocured coating system, including minimum 70 percent fluoropolymer color topcoat with minimum total dry film thickness of 0.9 mil; color and gloss as selected from manufacturer's standards.

## **2.05 ACCESSORIES**

- A. Miscellaneous Sheet Metal Items: Provide flashings, trim, moldings, closure strips, and caps of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.
- B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.
- C. Sealants:
  - 1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
  - 2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
- D. Snow Guards: Provide RTCLSM snow guard as manufactured by Berger Bros Co or approved equal.
- E. Underlayment for Wood Substrate: ASTM D226/D226M roofing felt, perforated type; covered by water-resistant rosin-sized building paper.

## **2.06 FABRICATION**

- A. Panels: Fabricate and finish panels and accessory items at factory, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### **3.02 PREPARATION**

- A. Broom clean wood sheathing prior to installation of roofing system.
- B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.
- C. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.
- D. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

### **3.03 INSTALLATION**

- A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
  - 1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.

2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.
- B. Accessories: Install all components required for a complete roofing assembly, including flashings, trim, moldings, closure strips, caps, rib closures, and ridge closures.
  - C. Install roofing felt and building paper slip sheet on roof deck before installing preformed metal roof panels. Secure by methods acceptable to roof panel manufacturer, minimizing use of metal fasteners. Apply from eaves to ridge in shingle fashion, overlapping horizontal joints a minimum of 2 inches and side and end laps a minimum of 3 inches. Offset seams in building paper and seams in roofing felt.
  - D. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.
    1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by the panel manufacturer.
    2. Install sealant or sealant tape, as recommended by panel manufacturer, at end laps and side joints.

### **3.04 CLEANING**

- A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

### **3.05 PROTECTION**

- A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.
- B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

**END OF SECTION**

**SECTION 074633**  
**PLASTIC SIDING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Vinyl soffit and trim.

**1.02 REFERENCE STANDARDS**

- A. ASTM D4477 - Standard Specification for Rigid (Unplasticized) Poly(Vinyl Chloride) (PVC) Soffit; 2009.

**1.03 SUBMITTALS**

- A. 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.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Not less than three years of experience with products specified.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Alside, Inc: [www.alside.com/#sle](http://www.alside.com/#sle).
- B. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
- C. Ply Gem Industries, Inc: [www.plygem.com/#sle](http://www.plygem.com/#sle).
- D. Or Approved Equal.

**2.02 MATERIALS**

- A. General Requirements:
  - 1. Soffit: Comply with ASTM D4477.
- B. Vinyl Soffit:
  - 1. Profile: Board Style, Double 6-Inch; 6 inches wide, solid and vented; 12 inch exposure. Provide solid material at porch ceilings and vented at all other locations.
  - 2. Thickness: 0.042 inch, minimum.
  - 3. Length: 12 feet, minimum; where available, provide up to 12 foot by 12 foot panels.
  - 4. Nailing Hem: Single layer, with 1-1/8 inch long nail holes at maximum 18 inches on center.
  - 5. Finish: Smooth.

6. Color: White.
- C. Accessories: Provide coordinating accessories made of same material as required for complete and proper installation whether or not specifically indicated on drawings.
  1. Color: Match adjacent siding or soffit panels.
  2. Length:
    - a. Corner Posts: 10 feet, minimum.
    - b. Other Trim: 12.5 feet, minimum.
  3. J-Channel Trim: 3/8 inches.
- D. Fasteners: Aluminum nails, alloy 5056 or 6110, with minimum tensile strength of 63,000 pounds per square inch; length as required to penetrate framing at least 3/4 inch.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine substrate conditions before beginning installation; verify dimensions and acceptability of substrate.
- B. Do not proceed with installation until unacceptable conditions have been corrected.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

#### **3.02 INSTALLATION**

- A. Install siding, soffit, and trim in accordance with manufacturer's printed installation instructions.
- B. Attach securely to framing, not sheathing, with horizontal components true to level and vertical components true to plumb, providing a weather resistant installation.
- C. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on drawings, and provide vent area specified.
- D. Clean dirt from surface of installed products, using mild soap and water.

#### **3.03 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 074646**  
**FIBER-CEMENT SIDING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Fiber-cement siding.
- B. Related Sections:
  - 1. Section 079200 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

**1.02 REFERENCE STANDARDS**

- A. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets; 2008 (Reapproved 2012).

**1.03 SUBMITTALS**

- A. Product Data: Submit manufacturer's data sheets on each product to be used, including:
  - 1. Manufacturer's requirements for related materials to be installed by others.
  - 2. Preparation instructions and recommendations.
  - 3. Storage and handling requirements and recommendations.
  - 4. Installation methods, including nail patterns.
- B. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.
- C. Warranty: Submit copy of manufacturer's warranty, made out in Owner's name, showing that it has been registered with manufacturer.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum three years of experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Store products under waterproof cover and elevated above grade, on a flat surface.

**PART 2 PRODUCTS**

**2.01 FIBER-CEMENT SIDING**

- A. Lap Siding: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying to ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
  - 1. Style: Standard lap style.
  - 2. Texture: Smooth.
  - 3. Length: 12 ft, nominal.
  - 4. Width (Height): 5-1/4 inches.
  - 5. Thickness: 5/16 inch, nominal.
  - 6. Finish: Factory applied topcoat.
  - 7. Color: James Hardie Building Products: Autumn Tan or approved equal.

8. Warranty: 50 year limited; transferable.
9. Manufacturers:
  - a. James Hardie Building Products, Inc: [www.jameshardie.com/#sle](http://www.jameshardie.com/#sle).
  - b. Or Approved Equal.

## **2.02 ACCESSORIES**

- A. Trim: Same material and texture as siding.
- B. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch.
- C. Joint Sealer: As specified in Section 079200.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.
- B. Do not begin until unacceptable conditions have been corrected.
- C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### **3.02 PREPARATION**

- A. Install Sheet Metal Flashing:
  1. Above horizontal trim in field of siding.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions and recommendations.
  1. Read warranty and comply with terms necessary to maintain warranty coverage.
  2. Use trim details indicated on drawings.
  3. Touch up field cut edges before installing.
  4. Pre-drill nail holes if necessary to prevent breakage.
- B. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.
- C. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.
- D. Do not install siding less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.
- E. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.

### **3.04 PROTECTION**

- A. Protect installed products until Date of Substantial Completion.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

**END OF SECTION**

**SECTION 076200**  
**SHEET METAL FLASHING AND TRIM**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Fabricated sheet metal items, including flashings and counterflashings.
  - 2. Sealants for joints within sheet metal fabrications.
- B. Related Sections:
  - 1. Section 079200 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

**1.02 REFERENCE STANDARDS**

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2013.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.
- D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012).
- E. CDA A4050 - Copper in Architecture - Handbook; current edition.
- F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

**1.03 SUBMITTALS**

- A. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- B. Color Samples: Submit manufacturer's standard color charts for final color selection.

**1.04 QUALITY ASSURANCE**

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

**PART 2 PRODUCTS**

**2.01 SHEET MATERIALS**

- A. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 0.040 inch thick; plain finish shop pre-coated with fluoropolymer coating.



1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
2. Color: As selected by Architect from manufacturer's standard colors.

## **2.02 ACCESSORIES**

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Primer: Zinc chromate type.
- C. Sealant: Silicone Sealant as specified in Section 079200.
- D. Plastic Cement: ASTM D4586, Type I.

## **2.03 FABRICATION**

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- F. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

### **3.02 PREPARATION**

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

### **3.03 INSTALLATION**

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Seal metal joints watertight.

**END OF SECTION**

**SECTION 077123**  
**MANUFACTURED GUTTERS AND DOWNSPOUTS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Pre-finished aluminum gutters and downspouts.
  - 2. Precast concrete splash pads.

**1.02 REFERENCE STANDARDS**

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2013.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

**1.03 SUBMITTALS**

- A. Product Data: Provide data on prefabricated components.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.
- B. Prevent contact with materials that could cause discoloration, staining, or damage.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Pre-Finished Aluminum Sheet: ASTM B209 (ASTM B209M); 0.032 inch thick.
  - 1. Finish: Plain, shop pre-coated with modified silicone coating.
  - 2. Color: White.

**2.02 COMPONENTS**

- A. Gutters: K-Style rectangular style profile. Provide 5 inch gutters at all locations.
- B. Downspouts: SMACNA Rectangular profile. Provide 3 inch by 4 inch downspouts at all locations.

**2.03 ACCESSORIES**

- A. Splash Pads: Precast concrete type, size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment. Provide at existing downspout locations.
- B. Downspout Boots: Cast iron; ASTM A48. Provide at all new porch roof downspout locations.

**2.04 FABRICATION**

- A. Form gutters and downspouts of profiles and sizes indicated.

- B. Fabricate with required connection pieces.
- C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- D. Hem exposed edges of metal.
- E. Fabricate gutter and downspout accessories; seal watertight.

## **2.05 FINISHES**

- A. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that surfaces are ready to receive work.

### **3.02 PREPARATION**

- A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

### **3.03 INSTALLATION**

- A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.
- B. Slope gutters 1/4 inch per foot.
- C. Connect downspouts to downspout boots at 12 inches above grade. Grout connection watertight.

**END OF SECTION**

**SECTION 078400**  
**FIRESTOPPING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Firestopping systems.
  - 2. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

**1.02 REFERENCE STANDARDS**

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.
- B. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.
- C. ITS (DIR) - Directory of Listed Products; current edition.
- D. FM (AG) - FM Approval Guide; current edition.
- E. FA (AG) - FM Approval Guide; Factory Mutual Research Corporation; current edition.
- F. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.
- G. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
- H. UL (FRD) - Fire Resistance Directory; current edition.

**1.03 SUBMITTALS**

- A. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- B. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- C. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

**1.04 QUALITY ASSURANCE**

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
  - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
  - 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at [www.icc-es.org](http://www.icc-es.org) will be considered as constituting an acceptable test report.

- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
  - 1. Verification of minimum three years documented experience installing work of this type.

### **1.05 FIELD CONDITIONS**

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Manufacturers:
  - 1. 3M Fire Protection Products: [www.3m.com/firestop](http://www.3m.com/firestop).
  - 2. Hilti, Inc: [www.us.hilti.com/#sle](http://www.us.hilti.com/#sle).
  - 3. Specified Technologies, Inc.: [www.stifirestop.com](http://www.stifirestop.com).
  - 4. Or Approved Equal.
- B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- C. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in South Coast Air Quality Management District (SCAQMD); Rule 1168.

### **2.02 FIRESTOPPING SYSTEMS**

- A. Firestopping: Any material meeting requirements.
  - 1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify openings are ready to receive the work of this section.

### **3.02 PREPARATION**

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to prevent liquid material from leakage.

### **3.03 INSTALLATION**

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Install labeling required by code.

**3.04 CLEANING**

A. Clean adjacent surfaces of firestopping materials.

**3.05 PROTECTION**

A. Protect adjacent surfaces from damage by material installation.

**END OF SECTION**

## **SECTION 079200 JOINT SEALANTS**

### **PART 1 GENERAL**

#### **1.01 SUMMARY**

- A. Sections Includes:
  - 1. Nonsag gunnable joint sealants.
  - 2. Self-leveling pourable joint sealants.
  - 3. Joint backings and accessories.

#### **1.02 REFERENCE STANDARDS**

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2006 (Reapproved 2011).
- B. ASTM C834 - Standard Specification for Latex Sealants; 2014.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
- E. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

#### **1.03 SUBMITTALS**

- A. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
  - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
  - 2. List of backing materials approved for use with the specific product.
  - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
  - 4. Substrates the product should not be used on.
  - 5. Substrates for which use of primer is required.
  - 6. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
  - 7. Sample product warranty.
  - 8. Certification by manufacturer indicating that product complies with specification requirements.
- B. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

#### **1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

- B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

## **1.05 WARRANTY**

- A. Correct defective work within a five year period after Date of Substantial Completion.
- B. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

## **PART 2 PRODUCTS**

### **2.01 JOINT SEALANTS - GENERAL**

- A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

### **2.02 NONSAG JOINT SEALANTS**

- A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Class 50, Uses NT, G, O, M and A; single component, neutral curing, non-sagging, non-staining, non-bleeding.
  - 1. Movement Capability: Plus and minus 50 percent, minimum.
  - 2. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
  - 3. Color: To be selected by Architect from manufacturer's standard range.
  - 4. Cure Type: Single-component, neutral moisture curing.
  - 5. Service Temperature Range: Minus 65 to 180 degrees F.
  - 6. VOC Content: VOC content maximum of 45 g/l.
  - 7. Applications: Use for all exterior structure joints as indicated on the Drawings and such joints not indicated, to render the structure leak free from wind, water, dust and weather.
  - 8. Manufacturers:
    - a. Pecora Corporation; 860: [www.pecora.com](http://www.pecora.com).
    - b. Bostik Inc; Product Chem-Calk 1200; [www.bostik-us.com](http://www.bostik-us.com).
    - c. Or Approved Equal.
- B. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
  - 1. Color: To be selected by Architect from manufacturer's standard range.
  - 2. Movement Capability: 7.5 percent.
  - 3. Shore A Hardness: 15 to 40.
  - 4. VOC Content: VOC content maximum 35 g/l.
  - 5. Applications: Use for all interior vertical and horizontal joints.
  - 6. Manufacturers:
    - a. Pecora Corporation; AC-20 + Silicone Acrylic Latex Caulking Compound: [www.pecora.com/#sle](http://www.pecora.com/#sle).
    - b. Dap, Inc; Dap Alex Plus Acrylic Latex Caulk plus Silicone.
    - c. Or Approved Equal.

### **2.03 INSULATING FOAM SEALANT**

- A. Polyurethane Foam Sealant: Provide one component polyurethane foam sealant that conforms to ASTM E2112 and AAMA 812-04.



- B. VOC Content: VOC content maximum of 165 g/l.
- C. Applications: Use to fill voids between materials around perimeter at all exterior door and window locations.
- D. Provide Greenguard Certified product.
- E. Products:
  1. Dow Chemical Company; Product Great Stuff Pro Window & Door Insulating Foam Sealant; [www.dowbuildingsolutions.com](http://www.dowbuildingsolutions.com).
  2. Fomo Products, Inc; Product Hand-Foam Window and Door Foam Sealant; [www.fomo.com](http://www.fomo.com).
  3. Or Approved Equal.

#### **2.04 SELF-LEVELING SEALANTS**

- A. Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M and A; multicomponent; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
  1. Movement Capability: Plus and minus 50 percent, minimum.
  2. Hardness Range: 25 to 35, Shore A, when tested in accordance with ASTM C661.
  3. Color: To be selected by Architect from manufacturer's standard range.
  4. Service Temperature Range: Minus 40 to 180 degrees F.
  5. VOC Content: VOC content maximum of 45 g/l.
  6. Applications: Use for exterior trafficked and non-trafficked horizontal working joints and interior trafficked horizontal working joints.
  7. Manufacturers:
    - a. Bostik Inc; Product Bostik 555 SL: [www.bostik-us.com](http://www.bostik-us.com).
    - b. Pecora Corporation: Product NR-200: [www.pecora.com](http://www.pecora.com).
    - c. BASF Construction Chemicals-Building Systems: Product Sonolastic SL2; [www.chemrex.com](http://www.chemrex.com).
    - d. Or Approved Equal.

#### **2.05 ACCESSORIES**

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- D. Primers: Type recommended by sealant manufacturer to suit application; non-staining. VOC Content maximum of 50 g/l.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that joints are ready to receive work.

- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

### **3.02 PREPARATION**

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

### **3.03 INSTALLATION**

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- D. Install bond breaker backing tape where backer rod cannot be used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

**END OF SECTION**

**SECTION 081111**  
**STEEL ENTRANCE DOORS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Steel Entrance doors.
- B. Related Sections:
  - 1. Section 087100: Door Hardware.

**1.02 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard details, installation instructions, and hardware and anchor recommendations.
- B. Shop Drawings: Show layout and profiles; include assembly methods.
  - 1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns and textures.
  - 2. Indicate door elevations, sections, materials, gauges, finishes, and location of door hardware by dimension.
- C. Verification Samples: Submit door surface samples for each finish specified, 10 inch by 10 inch in size, illustrating finishes, color and textures.
- D. Maintenance Data: Include instructions for repair of minor scratches and damage.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.03 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver doors in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store doors under cover and elevated above grade.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. JELD-WEN Exterior Doors: Contours Steel; design CT-680.
- B. Or Approved Equal.

**2.02 STEEL ENTRANCE DOORS**

- A. Provide door with 24 gauge steel facing, polystyrene core, 1 inch laminated veneer lumber stiles and rails with 24 gauge steel facing edges and steel bottom rail. Provide smooth face door in configuration shown on drawings. Provide doors with manufacturer's standard painted finish, color to be Miliken Millwork Softer Tan or approved equal.

### **2.03 ACCESSORIES**

- A. Hardware: As specified in Section 087100.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that the jamb is prepared to properly receive the door.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Set doors plumb, level and true-to-line, without warping or racking doors, and with specified clearances; anchor in place..

### **3.03 ADJUSTING**

- A. Lubricate, test and adjust doors to operate easily, free from warp, twist, or distortion, and to fit watertight for entire perimeter.
- B. Adjust hardware for smooth and quiet operation.
- C. Adjust doors to fit snugly and close without sticking or binding.

### **3.04 PROTECTION**

- A. Protect installed doors from subsequent construction operations.

**END OF SECTION**

**SECTION 081180**  
**METAL STORM DOORS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Metal Storm Doors and Frames.

**1.02 SUBMITTALS**

- A. Product Data: Provide Provide manufacturer's standard literature that shows doors and frames meet the specifications and is available in sizes required for the project.
- B. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.03 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver doors and frames to project site in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store doors and frames under cover and elevated above grade.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Emco by Anderson Doors and Windows.
- B. Or Approved Equal.

**2.02 METAL STORM DOORS AND FRAMES**

- A. Provide solid wood core door covered with aluminum, factory painted white. Provide door with aluminum frame, factory painted white. Provide manufacturer's standard black push button handset and closers. Provide glass and screen configured as shown on the drawings. Provide manufacturer's standard safety chain.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verification of Conditions: Verify that door jamb is in place and acceptable to receive storm door frame.

**3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.

**3.03 PROTECTION**

- A. Protect installed storm door and frame from subsequent construction operations.

**END OF SECTION**

**SECTION 081210  
CARVED WOOD DOORS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Carved interior MDF doors.
- B. Related Sections:
  - 1. Section 087100 - Door Hardware: Door hardware.
  - 2. Section 099000 - Paints and Coatings: Field finish painting for doors.

**1.02 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard details and installation instructions.
- B. Shop Drawings: Indicate layout and profiles.
- C. Certificate: Certify that doors meet or exceed specified requirements.
- D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.03 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

**1.04 WARRANTY**

- A. Provide five year manufacturer warranty for defects in materials and workmanship.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. eccodoors Stile and Rail MDF Doors: [www.eccodoors.com](http://www.eccodoors.com).
- B. Or Approved Equal.

**2.02 CARVED INTERIOR MDF DOORS**

- A. Provide doors carved from medium density fiberboard (MDF) with a minimum 75% recycled content. Doors to be buffed to a smooth finish. Doors to stile and rail construction with doweled joints. Provide solid perimeter blocking. Provide doors with no added urea formaldehyde.
- B. All composite wood products must be certified as compliant with California 93120 Phase 2. If using a composite wood product that does not comply with California 93120 Phase 2, all exposed edges and sides must be sealed with low VOC sealants with a VOC content of 250 g/l or less.
- C. Door Designs: Provide Ecco Door style indicated below or approved equal. Provide all doors with standard sticking option "E" and panel option "A" unless indicated otherwise.
  - 1. 2 Panel Door: E2000.

- D. Doors to be factory machined for hinges and cylinder locks. Coordinate with hardware supplier for templates for machining doors.
- E. Doors to be factory primed per manufacturer's standard priming.
- F. Doors to be field finish painted, see Section 099000 - Paints and Coatings.

### **2.03 ACCESSORIES**

- A. Hardware: As specified in Section 087100.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Set doors plumb, level, and true-to-line, without warping or racking doors, and with specified clearances.
- C. Field finish paint doors including all edges per requirements of Section 099000.

### **3.02 ADJUSTING**

- A. Adjust doors to operate easily, free from warp, twist, or distortion.
- B. Adjust Hardware for smooth and quiet operation.

### **3.03 PROTECTION**

- A. Protect installed doors from subsequent construction operations.

**END OF SECTION**

**SECTION 081613**  
**FIBERGLASS DOORS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Fiberglass doors.
  - 2. Fiberglass door frames.
  - 3. Accessories.
- B. Related Sections:
  - 1. Section 087100 - Door Hardware: Door hardware.

**1.02 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard details, installation instructions, hardware and anchor recommendations.
- B. Shop Drawings: Indicate layout and profiles; include assembly methods.
  - 1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns, and textures.
  - 2. Indicate wall conditions, door and frame elevations, sections, materials, gages, finishes, location of door hardware by dimension, and details of openings; use same reference numbers indicated on drawings to identify details and openings.
- C. Verification Samples: Submit door surface samples for each finish specified, 10 inch by 10 inch in size, illustrating finishes, colors, and textures.
- D. Maintenance Data: Include instructions for repair of minor scratches and damage.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer; include detailed terms of warranty.

**1.03 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Mark doors with location of installation, door type, color, and weight.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store materials in original packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.
  - 1. Store at temperature and humidity conditions recommended by manufacturer.
  - 2. Do not use non-vented plastic or canvas shelters.
  - 3. Immediately remove wet wrappers.
- D. Store in position recommended by manufacturer, elevated minimum 4 inch above grade, with minimum 1/4 inch space between doors.



## **1.05 WARRANTY**

- A. Provide twenty-five (25) year manufacturer warranty covering materials and workmanship.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. JELD WEN Exterior Doors; Smooth-Pro Door and Tecton Frame.
- B. Plastpro 2000.
- C. Or Approved Equal.

### **2.02 FIBERGLASS DOOR**

- A. Provide door with fiberglass facing and polystyrene or polyurethane core with LVL stiles and rails. All stile and rails composite capped. Provide smooth face door. Provide factory finished door. Color to be Miliken Millwork Softer Tan or approved equal.

### **2.03 FIBERGLASS FRAME**

- A. Provide pultruded fiberglass frame with factory finish. Color to match door.

### **2.04 ACCESSORIES**

- A. Hardware: As specified in Section 087100.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify actual dimensions of openings by field measurements before door fabrication; show recorded measurements on shop drawings.
- B. Do not begin installation until substrates have been properly prepared.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### **3.02 PREPARATION**

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- B. Clean and prepare substrate in accordance with manufacturer's directions.
- C. Protect adjacent work and finish surfaces from damage during installation.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions; do not penetrate frames with anchors.
- B. Install exterior doors in accordance with ASTM E2112.
- C. Install door hardware as specified in Section 087100.
- D. Set units plumb, level, and true-to-line, without warping or racking doors, and with specified clearances; anchor in place.

- E. In masonry walls, install frames prior to laying masonry; anchor frames into masonry mortar joints; fill jambs with grout as walls are laid up.
- F. Repair or replace damaged installed products.

#### **3.04 ADJUSTING**

- A. Lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion, and to fit watertight for entire perimeter.
- B. Adjust hardware for smooth and quiet operation.
- C. Adjust doors to fit snugly and close without sticking or binding.

#### **3.05 CLEANING**

- A. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.

#### **3.06 PROTECTION**

- A. Protect installed products from damage until Date of Substantial Completion.

**END OF SECTION**

**SECTION 083100**  
**ACCESS DOORS AND PANELS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Floor access door and frame units, exterior.

**1.02 SUBMITTALS**

- A. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- B. Manufacturer's Installation Instructions: Indicate installation requirements.

**1.03 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

**PART 2 PRODUCTS**

**2.01 FLOOR ACCESS UNITS**

- A. Manufacturers:
  - 1. BILCO Company; Type JD-3AL with drainage, aluminum: [www.bilco.com/#sle](http://www.bilco.com/#sle).
  - 2. Or Approved Equal.
- B. Floor Access Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
  - 1. Size: 48 inches by 72 inches.
  - 2. Hardware: Steel, hot-dipped galvanized.
    - a. Hinges: Non-removable pin.
    - b. Lock: Cylinder lock with latch, two keys for each unit.
- C. Exterior Floor Access Units: Aluminum, minimum 1/4 inch thick.
  - 1. Design Load: Design to support live load of 300 lb/sq ft with deflection not to exceed 1/180 of span.
  - 2. Operation: Manual opening, and manual closing.
  - 3. Frame Configuration: Drainage channel with drain coupling.
  - 4. Cover Pattern: Diamond tread plate.
  - 5. Finish: Mill finish.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that rough openings are correctly sized and located.

**3.02 PREPARATION**

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

### **3.03 INSTALLATION**

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

**END OF SECTION**

**SECTION 085413**  
**FIBERGLASS WINDOWS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Factory fabricated fiberglass windows with fixed and operating sash.
  - 2. Glazed by factory.
  - 3. Operating hardware.
  - 4. Insect screens.
- B. Related Sections:
  - 1. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

**1.02 REFERENCE STANDARDS**

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2011.
- B. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2013, Including All Amendments and Errata.

**1.03 SUBMITTALS**

- A. Product Data: Provide component dimensions, anchors, fasteners, glass, and internal drainage details.
- B. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, installation requirements.
- C. Manufacturer's Certificate: Certify that products of this section meet or exceed specified requirements.
- D. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
  - 1. Evidence of AAMA Certification.
  - 2. Evidence of WDMA Certification.
  - 3. Evidence of CSA Certification.
  - 4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

## **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.
- B. Jig, brace, and box the window frame assemblies for transport to minimize flexing of members or joints.

## **1.06 WARRANTY**

- A. Correct defective Work within a ten year period after Date of Substantial Completion.
- B. Provide twenty year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same. Include coverage for degradation of color finish.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Fiberglass Windows:
  - 1. Pella Corporation; Pella Impervia | Windows: [www.pellacommercial.com/#sle](http://www.pellacommercial.com/#sle). Provide Energy Star certified windows.
  - 2. Or Approved Equal.

### **2.02 WINDOW UNITS**

- A. Fiberglass Windows: Hollow, tubular, multi-layer fiber reinforced material; factory fabricated; with vision glass, related flashings, anchorage and attachment devices.
  - 1. Configuration: As indicated on drawings .
  - 2. Product Type: H - Hung window, vertically sliding in accordance with AAMA/WDMA/CSA 101/I.S.2/A440. All windows to be single hung.
  - 3. Color: White.
  - 4. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
  - 5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
  - 6. Thermal Movement: Design to accommodate thermal movement caused by 100 degrees F temperature change without buckling stress on glass, joint seal failure, damaging loads on structural elements, damaging loads on fasteners, reduction in performance or other detrimental effects.

### **2.03 PERFORMANCE REQUIREMENTS**

- A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
  - 1. Performance Class (PC): LC.
- B. Fenestration Assembly Thermal Transmittance (U-value): Comply with ASHRAE Std 90.1 I-P for building envelope requirements for applicable climate zone.

### **2.04 COMPONENTS**

- A. Frames: 3 inch wide by 3 inch deep profile; flush glass stops of screw fastened type.
  - 1. Type: Block type (for replacement windows).

- 2. Frame Corners: Mitered and joined with nylon corner locks.
- B. Insect Screen Frame: Rolled aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.
- C. Insect Screens: 14/18 mesh, steel strands.
  - 1. Color: Black.
- D. Operable Sash Weather Stripping: Wool pile; permanently resilient, profiled to effect weather seal.
- E. Fasteners: Stainless steel.
- F. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

## **2.05 GLASS AND GLAZING MATERIALS**

- A. Float Glass: ASTM C1048, Quality 1.
- B. Type: 11/16 inch Advanced Low-E with argon, 2.5 mm glass with foam insulation.

## **2.06 HARDWARE**

- A. Double Hung Sash: Metal and nylon spiral friction slide cylinder, each sash, each jamb.
  - 1. Sash Lock: Self-aligning, cam-action lock.
- B. Finish For Exposed Hardware: Match window finish.

## **2.07 FABRICATION**

- A. Fabricate framing, mullions and sash members with fusion welded corners and joints, in a rigid jig. Supplement frame sections with internal reinforcement where required for structural rigidity.
- B. Form sills in one piece. Slope sills for wash.
- C. Form snap-in glass stops, closure molds, weather stops, and flashings for tight fit into window frame section.
- D. Form weather stop flange to perimeter of unit.
- E. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- F. Arrange fasteners to be concealed from view.
- G. Permit internal drainage weep holes and channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through weep holes.
- H. Assemble insect screen frame, miter and reinforced frame corners. Fit mesh taut into frame and secure. Fit frame with four spring loaded steel pin retainers.
- I. Double weatherstrip operable units.
- J. Factory glaze window units.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine areas to receive windows. Notify Architect of conditions that would adversely affect installation or subsequent use.

- B. Acceptance of Conditions: Beginning of installation confirms acceptance of existing conditions.

### **3.02 INSTALLATION**

- A. Install windows in accordance with manufacturer's instructions.
- B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- D. Set sill members and sill flashing in continuous bead of sealant.
- E. Place interior seal around perimeter to maintain continuity of building thermal and air barrier using Polyurethane Foam Sealant, see Section 079200 - Joint Sealants.
- F. Seal windows on interior between window frame and gypsum wallboard and solid surface window sill, see Section 079200 - Joint Sealants.
- G. Seal window to exterior wall cladding with sealant and related backing materials at perimeter of assembly, see Section 079200 - Joint Sealants.
- H. Install operating hardware.

### **3.03 TOLERANCES**

- A. Maximum Variation from Level or Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

### **3.04 ADJUSTING**

- A. Adjust hardware for smooth operation and secure weathertight closure.

### **3.05 CLEANING**

- A. Remove protective material from pre-finished surfaces.
- B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

**END OF SECTION**



**SECTION 087100**  
**DOOR HARDWARE**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Hardware for steel entrance, carved wood, and fiberglass doors.
  - 2. Thresholds.
  - 3. Weatherstripping, seals and door gaskets.
- B. Related Sections:
  - 1. Section 081111 – Steel Entrance Doors.
  - 2. Section 081210 – Carved Wood Doors.
  - 3. Section 081613 - Fiberglass Doors.

**1.02 REFERENCE STANDARDS**

- A. 36 CFR 1191 – Americans with Disabilities Act Accessibility Guidelines for
  - 1. Buildings and Facilities; Final Rule; current edition; (ADA Standards for Accessible
  - 2. Design).
- B. ANSI/ICC A117.1 – American National Standard for Accessible and Usable
  - 1. Buildings and Facilities; International Code Council; 2009.
- C. BHMA A156.1 – American National Standard for Butts and Hinges; Builders
  - 1. Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.1).
- D. BHMA A156.2 – American National Standard for Bored and Preassembled Locks &
  - 1. Latches; Builders Hardware Manufacturers Association; 2011 (ANSI/BHMA
  - 2. A156.2).
- E. BHMA A156.6 – American National Standard for Architectural Door Trim; Builders
  - 1. Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.6).
- F. BHMA A156.7 – American National Standard for Template Hinge Dimensions;
  - 1. Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.7).
- G. BHMA A156.18 – American National Standard for Materials and Finishes; Builders
  - 1. Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.18).
- H. BHMA A156.21 – American National Standard for Thresholds; Builders Hardware
  - 1. Manufacturers Association; 2009 (ANSI/BHMA A156.21).
- I. BHMA A156.22 – American National Standard for Door Gasketing and Edge Seal
  - 1. Systems, Builders Hardware Manufacturers Association; 2012 (ANSI/BHMA
  - 2. A156.22).
- J. BHMA A156.115 – Hardware Preparation in Steel Doors and Steel Frames; 2006.
- K. BHMA A156.115W – Hardware Preparation in Wood Doors with Wood or Steel
  - 1. Frames; 2006.
- L. DHI (LOCS) – Recommended Locations for Architectural Hardware for Standard

1. Steel Doors and Frames; Door and Hardware Institute; 2004.
- M. DHI WDHS.3 – Recommended Locations for Architectural Hardware for Flush
  1. Wood Doors; Door and Hardware Institute; 1993; also in WDHS-1/WDHS-5 Series, 1996.

### **1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.
- B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- C. Convey Owner's keying requirements to manufacturers.
- D. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by all affected installers.
- E. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

### **1.04 SUBMITTALS**

- A. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.
- B. Shop Drawings:
  1. Indicate locations and mounting heights of each type of hardware, schedules, catalog cuts, electrical characteristics and connection requirements.
  2. Submit manufacturer's parts lists and templates.
- C. Hardware Schedule: Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents.
- D. Keying Schedule: Submit for approval of Owner.
- E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- F. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.
- G. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- H. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.
- I. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

### **1.05 QUALITY ASSURANCE**

- A. Perform work in accordance with the following requirements:
  1. NFPA 101.
  2. NFPA 80.

- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- C. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with three years of documented experience.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.
- B. Deliver, store, and handle packaged hardware to prevent damage to finishes, and deterioration in the product from the elements.

#### **1.07 COORDINATION**

- A. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.
- B. Furnish templates for door and frame preparation.
- C. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- D. Coordinate Owner's keying requirements during the course of the Work.

#### **1.08 MAINTENANCE PRODUCTS**

- A. Provide special wrenches and tools applicable to each different or special hardware component.
- B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS – BASIS OF DESIGN**

- A. As listed in the hardware schedule.
- B. Or Approved Equal.

#### **2.02 DOOR HARDWARE – GENERAL**

- A. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.
- B. Provide all items of a single type of the same model by the same manufacturer.
- C. Provide products that comply with the following:
  - 1. Applicable provisions of federal, state, and local codes.
  - 2. ADA Standards for Accessible Design
  - 3. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
  - 4. Applicable provisions of NFPA 101, Life Safety Code.
- D. Function: Lock and latch function numbers and descriptions of manufactures series as listed in hardware schedule.
- E. Finishes: Identified in schedule.

## **2.03 LOCKS AND LATCHES**

- A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
  - 1. Hardware Sets indicate locking functions required for each door.
  - 2. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
  - 3. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.
- B. Lock Cylinders: Manufacturer's standard tumbler type, six-pin standard core.
  - 1. Provide cams and/or tailpieces as required for locking devices required.
- C. Latches: Provide a latch for every door that is not required to lock, unless specifically indicated "push/pull" or "not required to latch".

## **2.04 KEYING**

- A. Keying to match Owner's existing Sargent Mfg Company system.
- B. Door Locks: Grand master keyed to Owner's existing keying system.
  - 1. Include construction keying and control keying with removeable core cylinders.
- C. Owner to provide additional information on keying system and number of keys required during submittal approval.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that doors and frames are ready to receive work and dimensions are as instructed by the manufacturer.

### **3.02 INSTALLATION**

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Do not install surface mounted items until finishes applied to substrate are complete.
- D. Mounting heights for hardware from finished floor to center line of hardware item:
  - 1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."
  - 2. For wood doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."

### **3.03 ADJUSTING**

- A. Adjust hardware for smooth operation.
- B. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

### **3.04 CLEANING**

- A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

### **3.05 PROTECTION**

- A. Do not permit adjacent work to damage hardware or finish.

### **3.06 SCHEDULE**

#### **A. Set No. 1 - Entrance Doors**

1. 3 Hinges: Stanley FBB168 4" x 4" x US26D
2. 1 Latchset: Sargent 11U15 x EB x US26D
3. 1 Deadbolt: Sargent 475 x US26D
4. 1 Door Viewer: Rockwood #620 x US26D
5. 1 Mail Slot with Internal Hood (at front doors only): HB Ives 620 x US26D and Houst of Antique Hardware solid brass mail slot hood in satin chrome finish
6. 1 Threshold: Pemko 2005AT
7. 1 Weatherseals: Pemko 303AS (head and jambs)

#### **B. Set No. 2 - Shed Doors**

1. 3 Hinges: Stanley FBB168 4 ½" x 4 ½"x US26D
2. 1 Latchset: Sargent 11U15 x US26D
3. 1 Deadbolt: Sargent 475 x US26D

#### **C. Set No. 3 - Bathroom and Bedroom Doors**

1. 3 Hinges: Stanley FBB168 4 ½" x 4 ½" x US26D
2. 1 Lockset: Sargent 11U65 x EB x US26D
3. 1 Door Stop (Bedroom Doors Only): Rockwood #505 x US26D (mount on door)

#### **D. Set No. 4 - Closet Doors**

1. 3 Hinges: Stanley FBB168 4 ½" x 4 ½" x NRP x US26D
2. 1 Latchset: Sargent 11U15 x EB x US26D

#### **E. Set No. 5 - Utility Room Doors**

1. 6 Hinges: Stanley FBB168 4 ½" x 4 ½" x NRP x US26D
2. 1 Latchset: Sargent 11U15 x US26D
3. 1 Deadbolt: Sargent 475 x US26D
4. 2 Surface Bolts: Rockwood 580-8 x US26D
5. 2 Surface Mounted Slide Stops: Rockwood x US26D

**END OF SECTION**

**SECTION 092116**  
**GYPSUM BOARD ASSEMBLIES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Gypsum wallboard.
  - 2. Joint treatment and accessories.
- B. Related Sections:
  - 1. Section 061000 - Rough Carpentry: Building framing and sheathing.
  - 2. Section 078400 - Firestopping: Top-of-wall assemblies at fire rated walls.
  - 3. Section 092216 - Non-Structural Metal Framing.

**1.02 REFERENCE STANDARDS**

- A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
- B. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.
- C. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.
- D. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.
- E. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
- F. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.
- G. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- I. GA-216 - Application and Finishing of Gypsum Board; 2013.
- J. UL (FRD) - Fire Resistance Directory; current edition.

**1.03 SUBMITTALS**

- A. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum \_\_\_ years of experience, with minimum 5 years of documented experience.

## **PART 2 PRODUCTS**

### **2.01 GYPSUM BOARD ASSEMBLIES**

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
  - 1. See PART 3 for finishing requirements.

### **2.02 BOARD MATERIALS**

- A. Manufacturers - Gypsum-Based Board:
  - 1. Georgia-Pacific Gypsum: [www.gpgypsum.com](http://www.gpgypsum.com).
  - 2. National Gypsum Company: [www.nationalgypsum.com](http://www.nationalgypsum.com).
  - 3. USG Corporation: [www.usg.com](http://www.usg.com).
  - 4. Serious Energy, Inc: [www.QuietRock.com](http://www.QuietRock.com).
  - 5. Or Approved Equal.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
  - 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
  - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
    - a. Mold resistant board is required where moisture resistant gypsum board is indicated on the Drawings, in the bathrooms.
  - 3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
  - 4. Thickness:
    - a. Vertical Surfaces: 1/2 inch or 5/8 inch as indicated on the drawings or as indicated as required in the UL assembly.
    - b. Ceilings: 1/2 inch.
- C. Fire Rated Sound Reducing Gypsum Board: Provide Serious Energy QuietRock ES, or approved equal, gypsum board where indicated on the drawings.
  - 1. Thickness: 5/8 inch.
  - 2. Edges: Tapered.

### **2.03 GYPSUM WALLBOARD ACCESSORIES**

- A. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
  - 1. Types: As detailed or required for finished appearance.
  - 2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
- B. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
  - 1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners.
  - 2. Ready-mixed vinyl-based joint compound.
- C. Screws for Fastening of Gypsum Panel Products to Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.

- D. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.
- E. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that project conditions are appropriate for work of this section to commence.

### **3.02 BOARD INSTALLATION**

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- C. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- D. Installation on Metal Framing: Use screws for attachment of gypsum board.
- E. Installation on Wood Framing: For non-rated assemblies, install as follows:
  - 1. Single-Layer Applications: Screw attachment.

### **3.03 INSTALLATION OF TRIM AND ACCESSORIES**

- A. Corner Beads: Install at external corners, using longest practical lengths.
- B. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

### **3.04 JOINT TREATMENT**

- A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
  - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
  - 2. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
  - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
  - 2. Taping, filling, and sanding is not required at surfaces behind fixed cabinetry.

### **3.05 TOLERANCES**

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

**END OF SECTION**



**SECTION 092216**  
**NON-STRUCTURAL METAL FRAMING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Metal partition, ceiling, and soffit framing.
  - 2. Framing accessories.

**1.02 REFERENCE STANDARDS**

- A. ASTM C635 - Standard Specification for Metal Suspension Systems.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014.
- D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2015.
- E. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.
- F. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

**1.03 SUBMITTALS**

- A. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.
- B. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Metal Framing, Connectors, and Accessories:
  - 1. ClarkDietrich Building Systems: [www.clarkdietrich.com/#sle](http://www.clarkdietrich.com/#sle).
  - 2. Marino: [www.marinoware.com/#sle](http://www.marinoware.com/#sle).
  - 3. Or Approved Equal.

**2.02 FRAMING MATERIALS**

- A. Fire Rated Assemblies: Comply with applicable code and as indicated on drawings.

- B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
  - 1. Studs: C shaped with flat or formed webs with knurled faces.
  - 2. Runners: U shaped, sized to match studs.
  - 3. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
  - 4. Resilient Furring Channels: Single leg configuration; 1/2 inch channel depth.
- C. Partition Head to Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and braced with continuous bridging on both sides.
- D. Tracks and Runners: Same material and thickness as studs, bent leg retainer notched to receive studs with provision for crimp locking to stud.
- E. Furring and Bracing Members: Of same material as studs; thickness to suit purpose; complying with applicable requirements of ASTM C754.
- F. Fasteners: ASTM C1002 self-piercing tapping screws.
- G. Anchorage Devices: Powder actuated.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

## **2.03 FABRICATION**

- A. Fabricate assemblies of framed sections to sizes and profiles required.
- B. Fit, reinforce, and brace framing members to suit design requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that rough-in utilities are in proper location.

### **3.02 INSTALLATION OF STUD FRAMING**

- A. Comply with requirements of ASTM C754.
- B. Extend partition framing to structure in all locations.
- C. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs as indicated.
- D. Align and secure top and bottom runners at 16 inches on center.
- E. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- F. Install studs vertically at spacing indicated on drawings.
- G. Align stud web openings horizontally.
- H. Secure studs to tracks using crimping method. Do not weld.
- I. Fabricate corners using a minimum of three studs.

- J. Double stud at wall openings, door and window jambs, not more than 2 inches from each side of openings.
- K. Coordinate erection of studs with requirements of door frames; install supports and attachments.
- L. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.
- M. Blocking: Use wood blocking secured to studs. Provide blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, and opening frames.
- N. Furring: Install at spacing and locations shown on drawings. Lap splices a minimum of 6 inches.

### **3.03 CEILING AND SOFFIT FURRING**

- A. Comply with requirements of ASTM C754.
- B. Install framing after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
- C. Install framing independent of walls, columns, and above-ceiling work.
- D. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated.

### **3.04 TOLERANCES**

- A. Maximum Variation From True Position: 1/8 inch in 10 feet.
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

**END OF SECTION**

**SECTION 096500**  
**RESILIENT FLOORING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Luxury vinyl tile flooring.
  - 2. Resilient base.
  - 3. Resilient stair accessories.
  - 4. Installation accessories.

**1.02 REFERENCE STANDARDS**

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.
- B. ASTM F1700 - Standard Specification for Solid Vinyl Tile; 2013a.
- C. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012).
- D. BAAQMD 8-51 - Bay Area Air Quality Management District Regulation 8, Rule 51, Adhesive and Sealant Products; www.baaqmd.gov; 2002.
- E. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

**1.03 SUBMITTALS**

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- B. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- C. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to the site in manufacturer's original, unopened containers with labels indicating brand names, colors and patterns and quality designations legible and intact. Handle flooring products with extreme care when ambient temperatures are below 55 degrees F.

**1.06 FIELD CONDITIONS**

- A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

- B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

### **1.07 EXTRA MATERIALS**

- A. Provide 40 sq ft of flooring, 20 lineal feet of base, and 5 percent of installed stair materials of each type and color specified.

## **PART 2 PRODUCTS**

### **2.01 SHEET FLOORING**

### **2.02 TILE FLOORING**

- A. Luxury Vinyl Tile 1: Provide commercial luxury vinyl tile flooring with the following characteristics:
1. Basis of Design: Novalis Innovative Flooring DSGN or approved equal; local contact: Spartan Surfaces, Doug Fulmer, cell 717-945-4010.
  2. Overall Thickness: 2.5 mm.
  3. Wearlayer Thickness: 20.0 mil.
  4. Finish: Urethan CeramGlaz PU.
  5. Plank Size: 6 inches by 48 inches.
  6. Edge: MicroBevel.
  7. Floor Score Certified.
  8. Stain and Chemical Resistance - ASTM F925: Excellent.
  9. Static COF for Polished Surfaces - ASTM D2047: Exceeds Industry Standard.
  10. Critical Radiant Flux - ASTM E648-06: Class 1.
  11. Smoke Density - ASTM E662: Passes.
  12. Solid Vinyl Floor Tile - ASTM F1700-13: Class III, Type B.
  13. Warranty: 10 year commercial warranty.
  14. Color: Selected from manufacturer's full range of colors.
- B. Luxury Vinyl Tile 2: Provide commercial luxury vinyl tile flooring with the following characteristics:
1. Basis of Design: Floorfolio Stone or approved equal; [www.floorfolio.com](http://www.floorfolio.com)
  2. Overall Thickness: 2.0 mm.
  3. Wearlayer Thickness: 8 mil.
  4. Finish: Polyurethane surface coating.
  5. Tile Size: 18 inches by 18 inches.
  6. Floor Score Certified.
  7. Stain and Chemical Resistance - ASTM F925: Passes.
  8. Coefficient of Friction - ASTM D2047: Passes.
  9. Critical Radiant Flux - ASTM E648: Passes.
  10. Smoke Density - ASTM E662: Class 1.
  11. Solid Vinyl Floor Tile - ASTM F1700-13: Class III, Type A or B, passes.
  12. Warranty: 5 year warranty (limited).
  13. Color: Selected from manufacturer's full range of colors.

## **2.03 STAIR COVERING**

- A. Provide Floor Score certified materials.
- B. Stair Treads and landings: Rubber; full width and depth of stair tread and landing in one piece; tapered thickness; nosing not less than 1-5/8 inch deep. Nosing can be separate piece at landing edges as needed.
  - 1. Nominal Thickness: 0.250 inch.
  - 2. Nosing: Round.
  - 3. Style: Contrasting color abrasive grit strips full width.
  - 4. Color: Solid.
  - 5. Manufacturers:
    - a. Johnsonite, a Tarkett Company: [www.johnsonite.com](http://www.johnsonite.com).
    - b. Roppe Corp: [www.roppe.com](http://www.roppe.com).
    - c. Or Approved Equal.
- C. Stair Risers: Full height and width of tread in one piece, matching treads in material and color.
  - 1. Thickness: 0.080 inch.
  - 2. Manufacturers:
    - a. Johnsonite, a Tarkett Company: [www.johnsonite.com](http://www.johnsonite.com).
    - b. Roppe Corp: [www.roppe.com](http://www.roppe.com).
    - c. Or Approved Equal.

## **2.04 RESILIENT BASE**

- A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; Style B, Cove, and as follows:
  - 1. Height: 4 inch.
  - 2. Thickness: 0.125 inch.
  - 3. Finish: Satin.
  - 4. Length: Roll.
  - 5. Color: Color as selected from manufacturer's standards.
  - 6. Accessories: Premolded external corners.

## **2.05 ACCESSORIES**

- A. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
  - 1. Provide only products having lower volatile organic compound (VOC) content than required by the more stringent of the South Coast Air Quality Management District Rule No.1168 and the Bay Area Air Quality Management District Regulation 8, Rule 51.
- B. Moldings, Transition and Edge Strips: Same material as flooring.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds,

surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

- B. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive resilient flooring.
- C. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- D. Verify that concrete sub-floor surfaces are ready for resilient flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

### **3.02 PREPARATION**

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- C. Prohibit traffic until filler is fully cured.
- D. Clean substrate.
- E. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

### **3.03 INSTALLATION - GENERAL**

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Fit joints and butt seams tightly.
- E. Set flooring in place, press with heavy roller to attain full adhesion.
- F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
- H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

### **3.04 INSTALLATION - TILE FLOORING**

- A. Install in accordance with manufacturer's instructions.
- B. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Set flooring in place, press with heavy roller to attain full adhesion.
- E. Lay flooring with joints and seams parallel.

- F. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.
- G. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

### **3.05 INSTALLATION - RESILIENT BASE**

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

### **3.06 INSTALLATION - STAIR COVERINGS**

- A. Install stair coverings in one piece for full width and depth of tread.
- B. Install stringers configured tightly to stair profile.
- C. Adhere over entire surface. Fit accurately and securely.

### **3.07 CLEANING**

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

### **3.08 PROTECTION**

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

**END OF SECTION**



**SECTION 099000**  
**PAINTING AND COATING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Surface preparation.
  - 2. Field application of paints and other coatings.
  - 3. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished
  - 4. Do Not Paint or Finish the Following Items:
    - a. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
    - b. Items indicated to receive other finishes.
    - c. Items indicated to remain unfinished.
    - d. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
    - e. Floors, unless specifically so indicated.
    - f. Glass.
    - g. Concrete Masonry, Exterior, pre-colored.
    - h. Concealed pipes, ducts, and conduits.

**1.02 REFERENCE STANDARDS**

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.
- C. GreenSeal GS-11 - Paints and Coatings; 2013.
- D. SSPC (PM1) - Good Painting Practice: SSPC Painting Manual, Vol. 1; Society for Protective Coatings; Fourth Edition.

**1.03 SUBMITTALS**

- A. Schedule: Submit paint schedule in same format as the paint schedule herein, and indicate which if the selected manufacturer's products are intended for use. Do not perform painting or coating without Architect's approval of the submitted paint schedule.
- B. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years documented experience.

## **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

## **1.06 FIELD CONDITIONS**

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions except for specialty coating.
- B. Paints:
  - 1. Base Manufacturer: Sherwin-Williams Company: [www.sherwin-williams.com](http://www.sherwin-williams.com).
  - 2. Glidden Professional, a product of PPG Architectural Coatings: [www.gliddenprofessional.com](http://www.gliddenprofessional.com).
  - 3. Benjamin Moore & Co: [www.benjaminmoore.com/#sle](http://www.benjaminmoore.com/#sle).
  - 4. PPG Paints: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
  - 5. Or approved equal.
- C. Primer Sealers: Same manufacturer as top coats.
- D. Block Fillers: Same manufacturer as top coats.

### **2.02 PAINTS AND COATINGS - GENERAL**

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
  - 1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
  - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

3. Supply each coating material in quantity required to complete entire project's work from a single production run.
  4. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
1. Interior Paints: All interior paints to have a 0 grams/liter emitted VOC for all coating types. All interior paints must meet or exceed the chemical component limits of Green Seal's Standard GS-11 requirements.
  2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Colors: To be selected from manufacturer's full range of available colors.
1. Selection to be made by Architect after award of contract.
  2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

### **2.03 PAINT SYSTEMS - EXTERIOR**

- A. Paint CE-OP-2L - Masonry/Brick, Opaque, Acrylic Latex, 2 Coat:
1. Satin: Two coats of acrylic latex enamel; Duration Exterior Acrylic Latex.
- B. Paint ME-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:
1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
  2. Gloss: Two coats of latex enamel; Duration Exterior Latex Gloss Coating.
- C. Paint PE-OP-3L - Composite Columns, Unprimed, Acrylic Latex, 3 Coat:
1. One coat concrete primer as recommended by paint manufacturer.
  2. Low-Lustre: Two coats of acrylic latex enamel; Duration Exterior Acrylic Latex.

### **2.04 PAINT SYSTEMS - INTERIOR**

- A. Paint WI-OP-2L - Wood, Opaque, Latex, 2 Coat:
1. One coat of latex primer sealer.
  2. Semi-gloss: One coat of latex enamel; ProMar 200 Zero VOC Interior Latex, Semi-Gloss, B31-2600 Series.
  3. Flat: One coat of latex enamel; ProMar 200 Zero VOC Interior Latex, Flat, B30-2600 Series.
- B. Paint MI-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
1. One coat of latex primer; Multi-Purpose Zero VOC Primer.
  2. Semi-gloss: Two coats of latex enamel; ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series.
- C. Paint GI-OP-2L - Gypsum Board/Plaster, Latex, 2 Coat:
1. One coat of latex primer sealer. ProMar 200 Zero VOC Wall Primer.
  2. Eggshell: One coat of latex enamel; ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-2600 Series.
  3. Flat: One coat of latex enamel; ProMar 200 Zero VOC Interior Latex Flat, B30-2600 Series.

## **2.05 ACCESSORY MATERIALS**

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
  - 1. Gypsum Wallboard: 12 percent.
  - 2. Plaster and Stucco: 12 percent.
  - 3. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
  - 4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

### **3.02 PREPARATION**

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing coatings that exhibit surface defects.
- D. Remove surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- H. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- I. Plaster Surfaces to be Painted: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

- J. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand or power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- K. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
- L. Interior Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- M. MDF Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with tinted primer.

### **3.03 APPLICATION**

- A. Apply products in accordance with manufacturer's instructions.
- B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance.
- E. Sand wood and metal surfaces lightly between coats to achieve required finish.
- F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

### **3.04 CLEANING**

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

### **3.05 PROTECTION**

- A. Protect finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.

### **3.06 SCHEDULE - PAINT SYSTEMS**

- A. Masonry/Brick: Finish all surfaces indicated on elevations.
  - 1. Exterior: CE-OP-2L, satin.
- B. Composite Columns: Finish all surfaces exposed to view.
  - 1. Exterior: PE-OP-3L, low-lustre.
- C. Gypsum Board and Plaster: Finish all surfaces exposed to view.
  - 1. Interior Ceilings and Bulkheads: GI-OP-2L, flat.

2. Interior Walls: GI-OP-2L, egg-shell.
- D. Wood: Finish all surfaces exposed to view.
  1. Interior trim and frames: WI-OP-2L, semi-gloss.
  2. Interior Shelving: WI-OP-2L, flat.
  3. Interior MDF Doors: WI-OP-2L, semi-gloss.
- E. Steel Fabrications: Finish all surfaces exposed to view.
  1. Exterior: ME-OP-2L, gloss.
  2. Interior Unprimed Items: MI-OP-3L, semi-gloss.

### **3.07 WASTE MANAGEMENT**

- A. Do not use kerosene or any such organic solvents to thin or clean up water based paints.
- B. Do not dispose of paints or solvents by pouring on the ground. Place in designated containers for proper disposal.
- C. Where paint recycling is available, collect all waste by paint type and provide for delivery to recycling or collection facility.

**END OF SECTION**

**SECTION 102810  
TOILET ACCESSORIES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Bathroom Accessories.
  - 2. Medicine Cabinets.

**1.02 REFERENCES**

- A. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines; US Architectural and Transportation Barriers Compliance Board; 2004.
- B. ASTM A 554 - Standard Specification for Welded Stainless Steel Mechanical Tubing; 2003.
- C. ASTM F 446 - Standard Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area; 1985 (Reapproved 2004).

**1.03 SUBMITTALS**

- A. Product Data: Manufacturer's product data for products specified, indicating selected options and accessories.
- B. Quality Assurance Submittals:
  - 1. Manufacturer's printed installation instructions for each specified product.
- C. Closeout Submittals: Warranty documents, issued and executed by manufacturer of products of this section, and countersigned by Contractor.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Minimum five (5) years of documented experience producing products of the types specified in this section.
- B. Regulatory Requirements: Conform to ADA and Commonwealth of Pennsylvania requirements.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Factory-apply strippable protective vinyl coating to sight-exposed surfaces after finishing of products; ship products in manufacturer's standard protective packaging.
- B. Storage and Protection: Store products in manufacturer's protective packaging until installation.

**1.06 WARRANTY**

- A. Manufacturer's standard warranty against defects in product workmanship and materials.
- B. Manufacturer's 15-year warranty against silver spoilage of mirrors.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Basis of Design Manufacturers: Basis of design manufacturers are listed below with each accessory.
- B. Other Acceptable Manufacturers:
  - 1. Bobrick Washroom Equipment, Inc.
  - 2. Bradley Corporation.
  - 3. Or Approved Equal.

### **2.02 TOILET ACCESSORIES**

- A. Toilet Paper Holder: American Specialties, Inc; Model 7305-S.
  - 1. Stainless steel alloy 18-8, type 304.
  - 2. Post: 1/2 inch by 1 inch rectangular tubing.
  - 3. Mounting Plates: 18 gauge.
  - 4. Roller to be chrome-plated high impact resistant ABS plastic.
- B. Shower Curtain Rod : American Specialties, Inc; Model 1204.
  - 1. Extra-heavy duty shower curtain rod with flanges shall be fabricated of alloy 18-8 stainless steel, type 304.
  - 2. Tubing shall be 18 gauge, 1 1/4 inch outside diameter with a satin finish.
  - 3. Length as required, see contract drawings.
  - 4. Flanges shall be fabricated of 20 gauge stainless steel with a satin finish. Flanges shall have three countersunk holes to accept screws.
- C. Towel Ring: American Specialties, Inc: Model 7385.
  - 1. Surface Mounted.
  - 2. Post: Fabricated of triple chrome plated rust proof Zamak.
  - 3. Swiveling D-ring to be chrome plated aluminum.

### **2.03 GRAB BARS**

- A. Grab Bars - Basic Requirements: Fabricated to comply with ASTM F 446 and to withstand a 900 pound force, from ASTM A 554 stainless steel tubing, 0.050 inch, Type 304, 18-8 alloy; formed 1-1/2 inch radius return to wall at each end; each end heliarc-welded to minimum 11 gage stainless steel circular flange; welds finished to match tube finish.
- B. Grab Bars: American Specialties, Inc; Series 3200.
  - 1. Peened finish.
  - 2. Sizes and configurations: As indicated on drawings.
- C. Grab Bar Concealed Mounting Flanges: Stainless steel, 3 inch diameter by 1/2 inch deep, with 0.0897 inch steel tenon plate for concealed attachment, using three set screws.

### **2.04 MEDICINE CABINETS**

- A. Provide surface mounted cabinet with the following characteristics:
  - 1. Painted steel body.



2. Size: 18 inches x 36 1/8 inches x 4 3/4 inches.
3. Three adjustable steel shelves.
4. Piano hinge with 90 degree stop.
5. Stainless steel framed exterior mirror.
6. Reversible for left or right hand opening.

B. Provide

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

A. Verification of Conditions:

1. Reinforcement and anchoring devices are correct type and are located in accordance with manufacturer's requirements.

B. Installer's Examination:

1. Have installer of this section examine conditions under which construction activities of this section are to be performed, then submit written notification if such conditions are unacceptable.
2. Transmit two copies of installer's report to Architect within 24 hours of receipt.
3. Beginning construction activities of this section before unacceptable conditions have been corrected is prohibited.
4. Beginning construction activities of this section indicates installer's acceptance of conditions.

#### **3.02 INSTALLATION**

A. Install toilet accessories plumb and level in accordance with manufacturer's printed installation instructions.

B. Locate toilet accessories at heights specified by Americans with Disabilities Act (ADA) and Commonwealth of Pennsylvania requirements.

#### **3.03 CLEANING**

A. Remove manufacturer's protective vinyl coating from sight-exposed surfaces 24 hours before final inspection.

B. Clean surfaces in accordance with manufacturer's recommendations.

#### **3.04 PROTECTION OF INSTALLED PRODUCTS**

A. Protect products from damage caused by subsequent construction activities.

B. Field repair of damaged product finishes is prohibited; replace products having damaged finishes caused by subsequent construction activities.

**END OF SECTION**

**SECTION 113013**  
**RESIDENTIAL APPLIANCES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
1. Residential Unit Kitchen Appliances.

**1.02 REFERENCE STANDARDS**

- A. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

**1.03 SUBMITTALS**

- A. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
- B. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.04 QUALITY ASSURANCE**

- A. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

**1.05 WARRANTY**

- A. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

**PART 2 PRODUCTS**

**2.01 KITCHEN APPLIANCES**

- A. Refrigerator: Free-standing, top-mounted freezer, with reversible doors.
1. Capacity: 15.0 cubic feet.
  2. Finish: Textured steel cabinet, color white.
  3. Energy Star certified.
  4. Manufacturer: Provide Frigidaire Model FFHT1521QW or approved equal.
- B. Range: Electric, free-standing, with plug-in heating elements and removable drip pans.
1. Size: 30 inches.
  2. Oven: Manual cleaning.
  3. Elements: Four (4).
  4. Controls: Push to turn knobs. Provide up-front controls.
  5. Features: Include storage drawer.
  6. Finish: Porcelain enameled steel, color white.
  7. ADA Compliant.
  8. Provide anti-tip device.
  9. Manufacturer: Provide Frigidaire Model FFEF3009PW or approved equal.
- C. Cooking Exhaust: Range hood.
1. Size: 30 inches.
  2. Fan: Two-speed, 190 cfm
  3. Exhaust: Recirculating.

4. Features: Include cooktop light.
5. Finish: Painted steel, color white.
6. Manufacturer: Provide Broan Model 413004 or approved equal.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify utility rough-ins are provided and correctly located.

#### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install anti-tip device on all ranges.
- C. Anchor built-in equipment in place.

#### **3.03 ADJUSTING**

- A. Adjust equipment to provide efficient operation.

#### **3.04 CLEANING**

- A. Remove packing materials from equipment and properly discard.
- B. Wash and clean equipment.

**END OF SECTION**

**SECTION 123530**  
**RESIDENTIAL CASEWORK**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Residential kitchen cabinets and countertops.
  - 2. Vanity cabinets and countertops.
  - 3. Casework hardware.
  - 4. Residential kitchen wall backsplashes.

**1.02 REFERENCE STANDARDS**

- A. KCMA A161.1 - Performance and Construction Standard for Kitchen and Vanity Cabinets; 2012.
- B. KCMA (DIR) - Directory of Certified Cabinet Manufacturers; current edition, online.

**1.03 SUBMITTALS**

- A. Product Data: Provide component dimensions and construction details.
- B. Shop Drawings: Indicate casework locations, large scale plans, elevations, clearances required, rough-in and anchor placement dimensions and tolerances.
- C. Color Samples: Submit manufacturer's standard range of colors for selection of all material colors during submittal approval.

**1.04 QUALITY ASSURANCE**

- A. Products: Complying with KCMA A161.1 and KCMA Certified.
- B. Manufacturer: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Residential Casework:
  - 1. Basis of Design:
    - a. Advanta Cabinets, Coronet style, Chestnut finish.
  - 2. Other Acceptable Manufacturers:
    - a. Evans Cabinet Corporation, Lancaster Style, Birchtone finish.
    - b. Or Approved Equal.
  - 3. Note: Provide model numbers indicated on Drawings.

**2.02 COMPONENTS**

- A. Cabinet Construction: Must meet HUD Severe Use specifications.
- B. All composite wood products must be certified as compliant with California 93120 Phase 2. If using a composite wood product that does not comply with California 93120 Phase 2, all exposed edges and sides must be sealed with a low VOC sealant with a VOC content of 250 g/l or less.

- C. Countertops: Homogenous compression molded material composed of acrylic resins or polyester/acrylic resin blend, fire-retardant filler materials, fiber reinforcement, and coloring agents.
  - 1. Provide 4" high backsplash on all sides of cabinetry that are adjacent to walls.
  - 2. Residential kitchen countertops: Color Group B.
  - 3. Residential bathroom vanity countertops: Color Group A; color: White. Provide integral sink with countertop, color to be white.
- D. Wall Backsplash:
  - 1. Kitchens: Provide plastic laminate adhered to gypsum board.
  - 2. Kitchens at ranges: Provide stainless steel splash, width to match width of range, with satin brushed finish.

### **2.03 HARDWARE**

- A. Hardware: Manufacturer's standard.
- B. Door and Drawer Pulls: Brush chrome wire pulls, 4 inches wide. Provide pulls at all drawer and door locations.

### **2.04 FABRICATION**

- A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- B. Fabricate corners and joints without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
- C. Provide cutouts for plumbing fixtures and fixtures and fittings. Prime paint contact surfaces of cut edges.
- D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install casework, components and accessories in accordance with manufacturer's instructions.
- B. Use anchoring devices to suit conditions and substrate materials encountered.
- C. Set casework items plumb and square, securely anchored to building structure.
- D. Close ends of units, back splashes, shelves and bases.
- E. Install stainless steel splash tight to bottom of range hood and adhere to wall.

### **3.02 ADJUSTING**

- A. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly.

### **3.03 CLEANING**

- A. Clean casework, countertops, shelves, and hardware.

### **3.04 PROTECTION**

- A. Do not permit finished casework to be exposed to continued construction activity.

**END OF SECTION**

## **SECTION 23 00 00**

### **BASIC MATERIAL AND METHODS**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all division sections for coordination items and related work execution that develops standards of construction performance for installation.

##### **1.02 SUMMARY**

- A. Section includes:
  1. Shop Drawings
  2. Rough patch Materials
  3. Piping materials and installation instructions common to most piping systems.
  4. Transition fittings.
  5. Dielectric fittings.
  6. Mechanical sleeve seals.
  7. Sleeves.
  8. Escutcheons.
  9. Mechanical demolition.
  10. Equipment installation requirements common to equipment sections.
  11. Painting and finishing.
  12. Concrete bases.
  13. Anchorages.
  14. Access doors.
  15. Installation coordination drawings.

##### **1.03 DEFINITIONS**

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

- F. Rough Patching: Patching material for opening created by removal of piping, conduit, etc. to close off opening with-in 1/16 inch of flush surface. Patching material to be compatible with existing construction.
- G. The following are industry abbreviations for plastic materials:
  - 1. CPVC: Chlorinated polyvinyl chloride plastic.
  - 2. PE: Polyethylene plastic.
  - 3. PVC: Polyvinyl chloride plastic.
- H. The following are industry abbreviations for rubber materials:
  - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
  - 2. NBR: Acrylonitrile-butadiene rubber.

#### **1.04 SUBMITTALS**

- A. Product Data: For the following:
  - 1. Transition fittings.
  - 2. Dielectric fittings.
  - 3. Mechanical sleeve seals.
  - 4. Escutcheons.
  - 5. Fire rated premanufactured sleeves
  - 6. Fire stop penetration materials
- B. Welding certificates.

#### **1.05 QUALITY ASSURANCE**

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- C. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
- D. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- E. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.



## **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

## **1.07 COORDINATION**

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- B. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified or approved equal.

### **2.02 PIPE, TUBE, AND FITTINGS**

- A. Refer to individual Division 230000 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

### **2.03 JOINING MATERIALS**

- A. Refer to individual Division 230000 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
  - 2. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
  - 3. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 4. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAgl, silver alloy for refrigerant piping, unless otherwise indicated.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements for Joining Plastic Piping:
  - 1. CPVC Piping: ASTM F 493.
  - 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

#### **2.04 TRANSITION FITTINGS**

- A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
  - 1. Manufacturers:
    - a. Cascade Waterworks Mfg. Co.
    - b. Dresser Industries, Inc.; DMD Div.
    - c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
    - d. JCM Industries.
    - e. Smith-Blair, Inc.
    - f. Viking Johnson.
    - g. approved equal
  - 2. Aboveground Pressure Piping: Pipe fitting.
- B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
  - 1. Manufacturers:
    - a. Eslon Thermoplastics.
    - b. approved equal.
- C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
  - 1. Manufacturers:
    - a. Thompson Plastics, Inc.
    - b. approved equal.

## 2.05 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
  - 1. Manufacturers:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company.
    - c. Eclipse, Inc.
    - d. EpcO Sales, Inc.
    - e. Hart Industries, International, Inc.
    - f. Watts Industries, Inc.; Water Products Div.
    - g. Zurn Industries, Inc.; Wilkins Div.
    - h. approved equal.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
  - 1. Manufacturers:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company.
    - c. EpcO Sales, Inc.
    - d. Watts Industries, Inc.; Water Products Div.
    - e. approved equal.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
  - 1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Central Plastics Company.
    - d. Pipeline Seal and Insulator, Inc.
    - e. approved equal.
  - 2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
  - 1. Manufacturers:
    - a. Calpico, Inc.
    - b. Lochinvar Corp.
    - c. approved equal.

- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F .
  - 1. Manufacturers:
    - a. Perfection Corp.
    - b. Precision Plumbing Products, Inc.
    - c. Sioux Chief Manufacturing Co., Inc.
    - d. Victaulic Co. of America.
    - e. approved equal.

## **2.06 MECHANICAL SLEEVE SEALS**

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
  - 1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.
    - e. approved equal.
  - 2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - 3. Pressure Plates: Stainless steel, Include two for each sealing element.
  - 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## **2.07 SLEEVES**

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
- E. Underdeck Clamp: Clamping ring with set screws.
- F. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- G. PVC Pipe: ASTM D 1785, Schedule 40.
- H. Molded PE: Reusable, PE, tapered-cup shaped and smooth-outer surface with nailing flange for attaching to wooden forms.

## **2.08 ESCUTCHEONS**

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
  - 1. Finish: Polished chrome-plated or rough brass.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
  - 1. Finish: Polished chrome-plated or rough brass.
- E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Type: With hinge, set screw or spring clips, and chrome-plated finish.
- G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

## **2.09 ACCESS DOORS**

- A. Provide the following:
  - 1. Manufacturer: Milcor or approved equal.
  - 2. Door for drywall style DS, key locked with door to match fire rating in partition or ceiling where installed.

## **PART 3 EXECUTION**

### **3.01 MECHANICAL DEMOLITION**

- A. Refer to demolition notes on the drawings.
  - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
  - 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.

4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged by new construction work in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.
- D. Cutting and patching of walls, floors, roofs, or other surfaces to be coordinated with other Divisions in this specification.
1. Where demolition or repair of walls or other surfaces are noted on Architectural drawings then coordinate work.
  2. Where piping, conduits or equipment is removed and walls or other surfaces is to be patched and not indicated on Architectural drawings; this contractor to patch surface. The patch material to be coordinated with other division contractor which would be acceptable for finishing materials.
    - a. Submit to Architect proposal rough patching materials.
    - b. Concealed patch above ceilings does not require final patch finishing.
    - c. Exposed patch to receive final patching and paint such that final work will match adjacent surfaces in every respect.

### **3.02 PIPING SYSTEMS - COMMON REQUIREMENTS**

- A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.

- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors. Provide chrome plated finish in finished areas and rough brass at concealed area or mechanical room spaces. Provide according to the following:
  - 1. New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
    - f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
    - g. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
    - h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type with rough-brass finish.
    - i. Permanent sleeves are not required for holes formed by removable PE sleeves where sleeve extends (1) one inch above finished floor.
- M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
  - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

- N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
  - 2. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- P. Verify final equipment locations for roughing-in.
- Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### **3.03 PIPING JOINT CONSTRUCTION**

- A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.



2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
  - H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
  - I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
    1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
    2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
    3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
    4. PVC Nonpressure Piping: Join according to ASTM D 2855.
    5. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
  - J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
  - K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
  - L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
    1. Plain-End Pipe and Fittings: Use butt fusion.
    2. Plain-End Pipe and Socket Fittings: Use socket fusion.

### **3.04 PIPING CONNECTIONS**

- A. Make connections according to the following, unless otherwise indicated:
  1. Install unions, in piping NPS 2" and smaller, adjacent to each valve and at final connection to each piece of equipment.
  2. Install flanges, in piping NPS 2-1/2" and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### **3.05 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS**

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations
- D. Install equipment to allow right of way for piping installed at required slope.
- E. Coordinate with other Division 15 Sections and group valves, dampers, sensors, etc. requiring access from a single door. Size door large enough to service or remove items.

### **3.06 PAINTING**

- A. Damage and Touchup: Repair Equipment marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### **3.07 CONCRETE BASES**

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
  - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
  - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
  - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
  - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
  - 7. Use 3000-psi 28-day compressive-strength concrete and reinforcement.

**END OF SECTION**

## SECTION 23 05 13

### MOTORS

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Review all division sections for coordination items and related work execution that develops standards of construction performance for installation.

##### 1.02 SUMMARY

- A. This Section includes basic requirements for factory-installed motors.
- B. Related Sections include the following:
  - 1. Division 15 Sections for application of motors and reference to specific motor requirements for motor-driven equipment.

##### 1.03 DEFINITIONS

- A. Factory-Installed Motor: A motor installed by motorized-equipment manufacturer as a component of equipment.

#### PART 2 PRODUCTS

##### 2.01 MOTOR REQUIREMENTS

- A. Motor requirements apply to factory-installed motors except as follows:
  - 1. Different ratings, performance, or characteristics for a motor are specified in another Section.
  - 2. Manufacturer for a factory-installed motor requires ratings, performance, or characteristics, other than those specified in this Section, to meet performance specified.

##### 2.02 MOTOR CHARACTERISTICS

- A. Motors 1/2 HP and Larger: Three phase, unless noted otherwise on equipment schedule
- B. Motors Smaller Than 1/2 HP: Single phase, unless noted otherwise on equipment schedule.
- C. Frequency Rating: 60 Hz.
- D. Voltage Rating: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.
- E. Service Factor: 1.15 for open drip proof motors; 1.0 for totally enclosed motors.

- F. Duty: Continuous duty at ambient temperature of 105 deg F at altitude of 3300 feet above sea level.
- G. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
- H. Enclosure: Refer to motor types and requirements where motor is furnished as a portion of equipment.

### **2.03 SINGLE-PHASE MOTORS**

- A. Type: One of the following, to suit starting torque and requirements of specific motor application:
  - 1. Permanent-split capacitor.
  - 2. Split-phase start, capacitor run.
  - 3. Capacitor start, capacitor run.
- B. Shaded-Pole Motors: For motors 1/20 hp and smaller only.
- C. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.
- D. Bearings: Ball type for belt-connected motors and other motors with high radial forces on motor shaft; sealed, prelubricated-sleeve type for other single-phase motors.

## **PART 3 EXECUTION**

### **3.01 CLEANING**

- A. After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
- B. Clean motors, on completion of installation, according to manufacturer's written instructions.

**END OF SECTION**

## SECTION 23 05 19

### MECHANICAL HYDRONIC SPECIALTIES

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### 1.02 SUMMARY

- A. Section Includes:
  - 1. Pressure gages.
  - 2. Pressure gage taps.
  - 3. Thermometers.
  - 4. Thermometer supports.
  - 5. Test plugs.
  - 6. Flexible connectors.
  - 7. Diaphragm-type expansion tanks.
  - 8. Air vents.
  - 9. Air separators.
  - 10. Strainers.
  - 11. Flow controls.
  - 12. Relief valves.

##### 1.03 REFERENCES

- A. American Society of Mechanical Engineers:
  - 1. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.
  - 2. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.
- B. ASTM International:
  - 1. ASTM E1 - Standard Specification for ASTM Thermometers.
  - 2. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.

##### 1.04 PERFORMANCE REQUIREMENTS

- A. Flexible Connectors: Provide at or near large base mounted and location as noted on drawings.

##### 1.05 SUBMITTALS

- A. Product Data: Submit for manufactured products and assemblies used in this Project.
  - 1. Manufacturer's data [and list] indicating use, operating range, total range, accuracy, and location for manufactured components.

2. Submit product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes.
  3. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each piping specialty.
  4. Submit electrical characteristics and connection requirements.
- B. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures, application, selection, and hookup configuration. Include pipe and accessory elevations.
- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

#### **1.06 CLOSEOUT SUBMITTALS**

- A. Project Record Documents: Record actual locations of components and instrumentation, flow controls, gauges, test plugs, etc.
- B. Operation and Maintenance Data: Submit instructions for calibrating instruments, installation instructions, assembly views, servicing requirements, lubrication instruction, and replacement parts list.

#### **1.07 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Accept piping specialties on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Protect systems from entry of foreign materials by temporary covers, caps and closures, completing sections of the work, and isolating parts of completed system until installation.

#### **1.09 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install instruments when areas are under construction, except rough in, taps, supports and test plugs.

#### **1.10 FIELD MEASUREMENTS**

- A. Verify field measurements before fabrication.

## **1.11 EXTRA MATERIALS**

- A. Furnish one pressure gauge with pulsation damper and thermometers of each scale as used on this project for test plug wells.

## **PART 2 PRODUCTS**

### **2.01 PRESSURE GAGES**

- A. Manufacturers:
  - 1. Ashcroft.
  - 2. Ametek/US Gauge.
  - 3. Weksler Glass Thermometer Corporation.
  - 4. H. O. Trerice Company.
  - 5. Substitutions: Division 1: Products Requirements.
  
- B. Gage: ASME B40.1, UL 393 or UL 404 with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
  - 1. Case: Cast aluminum.
  - 2. Bourdon Tube: Brass, Phosphor bronze or Type 316 stainless steel.
  - 3. Dial Size: 2-1/2 inch diameter.
  - 4. Mid-Scale Accuracy: One percent.
  - 5. Scale: Psi.

### **2.02 PRESSURE GAGE TAPS**

- A. Manufacturers:
  - 1. Ashcroft.
  - 2. Ametek/US Gauge.
  - 3. Weksler Glass Thermometer Corporation.
  - 4. H. O. Trerice Company.
  - 5. approved equal.
  
- B. Needle Valve: Brass or Stainless Steel, 1/4 inch NPT for minimum 300 psi.
  
- C. Ball Valve: Brass for 250 psi.
  
- D. Pulsation Damper: Pressure snubber, brass with 1/4 inch NPT connections.
  
- E. Siphon: Steel, Schedule 40, Brass, Iron or Stainless Steel, 1/4 inch NPT angle or straight pattern.

### **2.03 STEM TYPE THERMOMETERS**

- A. Manufacturers:
  - 1. Ashcroft.
  - 2. Ametek/US Gauge.
  - 3. Weksler Glass Thermometer Corporation.

4. H. O. Trerice Company.
  5. approved equal.
- B. Thermometer: ASTM E1, red appearing mercury, lens front tube, cast aluminum case with enamel finish.
1. Size: 9 inch scale.
  2. Window: Clear Lexan.
  3. Stem: Brass, 3/4 inch NPT, 3-1/2 inch long.
  4. Accuracy: ASTM E77 2 percent.
  5. Calibration: Both degrees F and degrees C.

#### **2.04 THERMOMETER SUPPORTS**

- A. Socket: Brass separable sockets for thermometer stems with or without extensions.
- B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

#### **2.05 TEST PLUGS**

- A. Manufacturers:
1. Peterson Equipment Company (Pete's Plug).
  2. Substitutions: Division 1 - Product Requirements.
- B. 1/4 inch NPT or 1/2 inch NPT brass or stainless steel fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with: Nordel core for temperatures up to 350 degrees F.
- C. Test Kit:
1. Carrying case, internally padded and fitted containing:
    - a. One 2-1/2 inch diameter pressure gages.
    - b. Scale range: 0 to 150 psi.
    - c. Two gage adapters with 1/8 inch probes.
    - d. Two 1-1/2 inch dial thermometers.
      - (1) Scale range: 0 to 220 degrees F.

#### **2.06 FLEXIBLE CONNECTORS**

- A. Manufacturers:
1. Flexonix.
  2. Flex-Hose.
  3. Metraflex.
  4. approved equal.
- B. Corrugated stainless steel or bronze hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure 300 psig.



## **2.07 DIAPHRAGM-TYPE EXPANSION TANKS**

- A. Manufacturers:
  - 1. Amtrol.
  - 2. ITT Bell & Gosset
  - 3. PACO
  - 4. approved equal.
- B. Construction: Welded steel, tested and stamped in accordance with ASME Section VIII; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel support stand.
- C. Accessories: Pressure gage and air-charging fitting, tank drain; pre-charge to 12 psig.
- D. Automatic Cold Water Fill Assembly: Pressure reducing valve, double check back flow prevention device, test cocks, strainer, vacuum breaker, and by-pass valves.
- E. Capacity: As noted in the drawings.

## **2.08 AIR VENTS**

- A. Manufacturers:
  - 1. Armstrong
  - 2. ITT Bell & Gosset.
  - 3. Hoffman Speciality.
  - 4. Spirax Sarco
  - 5. approved equal.
- B. Manual Type: Short vertical sections of pipe, with 1/8 inch brass needle valve and chamber with threaded cap.

## **2.09 AIR SEPARATORS**

- A. Manufacturers:
  - 1. Armstrong
  - 2. Amtrol.
  - 3. ITT-Bell & Gosset.
  - 4. PACO.
  - 5. TACO.
  - 6. approved equal.
- B. Dip Tube Fitting: For 125 psig operating pressure; to prevent free air collected in boiler from rising into system.
- C. In-line Air Separators, or air Purger: Cast iron for sizes 1-1/2 inch and smaller, or steel for sizes 2 inch and larger; tested and stamped in accordance with ASME Section VIII; for 125 psig operating pressure.

## 2.10 STRAINERS

- A. Manufacturers:
  - 1. Armstrong Machine Works.
  - 2. Hoffman Specialty - ITT Fluid H.
  - 3. Metraflex Co.
  - 4. Spirax Sarco.
  - 5. Mueller Steam Specialty.
  - 6. Victaulic.
  - 7. Nibco.
  - 8. approved equal.
- B. Size 2 inch and Smaller:
  - 1. Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
- C. Size 2-1/2 inch to 6 inch:
  - 1. Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.
- D. Size 8 inch and Larger:
  - 1. Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

## 2.11 FLOW CONTROLS (BALANCING VALVE, CALIBRATED)

- A. Manufacturers:
  - 1. Armstrong
  - 2. Bell & Gossett
  - 3. Tour and Anderson.
  - 4. approved equal.
- B. Calibrated, plug type balancing valve with precision-machined orifice, readout valves equipped with integral check valves and caps with gaskets, calibrated nameplate and indicating pointer.
- C. Cast iron, wafer type, orifice insert flow meter for 250 psig working pressure, with read-out valves equipped with integral check-valves and caps with gaskets.
- D. Orifice type by-pass circuit with direct reading gage, soldered or flanged piping connections for 125 psig working pressure, with shut off valves, and drain and vent connections.
- E. Cast iron or bronze, globe style, balancing valve with hand wheel with vernier type ring setting and memory stop, drain connection, readout valves equipped with integral check valves and caps with gaskets.
- F. Calibration: Control within 5 percent of design flow over entire operating pressure.

- G. Accessories: memory stop.
- H. Leak tight design for use as balancing and shutoff valve.

## **2.12 RELIEF VALVES**

- A. Manufacturers:
  - 1. Kunkle.
  - 2. Spence.
  - 3. Cash-Acme.
  - 4. approved equal.
- B. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.

## **2.13 PUMPING SUCTION FITTINGS**

- A. Manufacturers:
  - 1. Bell and Gossett
  - 2. Taco
  - 3. Vitaulic Company of America
  - 4. approved equal.
- B. Fitting: Angle pattern, cast-iron body. Threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger. Rated for 175 psig working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable fine mesh strainer to fit over cylinder strainer, and permanent magnet located in flow stream and removable for cleaning.
- C. Accessories: Adjustable foot support, blow-down tapping in bottom, gage tapping in side.

## **2.14 COMBINATION PUMP DISCHARGE VALVES**

- A. Manufacturers:
  - 1. Bell and Gossett
  - 2. Taco
  - 3. Vitaulic Company of America
  - 4. approved equal.
- B. Valves: Straight or angle pattern, flanged cast-iron valve body with bolt-on bonnet for 175 psig operating pressure, non-slam check valve with spring-loaded bronze disc and seat, stainless steel stem, and calibrated adjustment permitting flow regulation.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION - THERMOMETERS AND GAGES**

- A. Install one pressure gage for each pump, locate taps on suction and discharge of pump; pipe to gage.
- B. Install gage taps in piping
- C. Install pressure gages with pulsation dampers. Provide needle valve or ball valve to isolate each gage. Extend nipples to allow clearance from insulation.
- D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Allow clearance from insulation.
  - 1. Provide scale range of :       0 - 120 for cold water system
  - 2.                                       0 - 180 for domestic hot water
  - 3.                                       30 - 220 for heating systems
- E. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets.
- F. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- G. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- H. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

### **3.02 INSTALLATION - HYDRONIC PIPING SPECIALTIES**

- A. Locate test plugs as indicated on Drawings.
- B. Install manual air vents at all system high points and where piping is trapped due to rise and drops in pipe work.
- C. Provide air separator on suction side of system circulation pump, with an automatic large capacity air vent.
- D. Provide drain and hose connection with valve on strainer blow down connection.
- E. Provide relief valves on pressure tanks, low-pressure side of reducing valves, and locations as noted on the drawings.
- F. Select system relief valve capacity greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

- G. Pipe relief valve outlet to sump pit.
- H. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.
- I. Provide pump suction fitting on suction side of base mounted centrifugal pumps. Remove temporary strainers after cleaning systems.
- J. Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps in lieu of shut-off and check valve.

### **3.03 PROTECTION OF INSTALLED CONSTRUCTION**

- A. Do not install hydronic pressure gauges until after systems are pressure tested.

### **3.04 DEMONSTRATIONS**

- A. Demonstrate to owner's maintenance personnel the connections and operations of flow meter(s).
- B. Demonstrate to owners maintenance personnel the checking of the following items:
  - 1. Test plugs
  - 2. Expansion tank along with air charging of tank fittings
  - 3. Manual air vents:
    - a. Include locations at high points on system.
  - 4. Strainers and blow down valve operation

**END OF SECTION**

## SECTION 23 05 29

### HANGERS AND SUPPORTS

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.
- B. Ductwork Supports are included in HVAC Ductwork Section.
- C. Equipment Supports are identified on structured drawings.
  - 1. Exception is minor equipment where this contractor to support equipment from existing structure. Provide supplemental steel according to *Industry Standards Handbooks*.

##### 1.02 SUMMARY

- A. Section Includes:
  - 1. Pipe hangers and supports.
  - 2. Hanger rods.
  - 3. Inserts.
  - 4. Sleeves
  - 5. Mechanical sleeve seals.
  - 6. Formed steel channel.
  - 7. Firestopping
  - 8. Firestopping accessories.
  - 9. Equipment bases and supports.

##### 1.03 REFERENCES

- A. American Society of Mechanical Engineers:
  - 1. ASME B31.1 - Power Piping.
  - 2. ASME B31.9 - Building Services Piping.
- B. ASTM International:
  - 1. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
  - 2. ASTM E119 - Method for Fire Tests of Building Construction and Materials.
  - 3. ASTM E814 - Test Method of Fire Tests of Through Penetration Firestops.
  - 4. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
- C. American Welding Society:
  - 1. AWS D1.1 - Structural Welding Code - Steel.

- D. FM Global:
  - 1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research for Property Conservation.
- E. Manufacturers Standardization Society of the Valve and Fittings Industry:
  - 1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
  - 2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
  - 3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
- F. Underwriters Laboratories Inc.:
  - 1. UL 263 - Fire Tests of Building Construction and Materials.
  - 2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
  - 3. UL 1479 - Fire Tests of Through-Penetration Firestops.
  - 4. UL - Fire Resistance Directory.

#### **1.04 DEFINITIONS**

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

#### **1.05 SYSTEM DESCRIPTION**

- A. Firestopping Materials: ASTM E119, ASTM E814, UL 263, and UL 1479 to achieve fire ratings of adjacent construction in accordance with, UL Design Numbers noted on the Architectural Drawings.
- B. Surface Burning: ASTM E84 or UL 723 with maximum flame spread / smoke developed rating of 25/450.
- C. Firestop interruptions to fire rated assemblies, materials, and components.

#### **1.06 PERFORMANCE REQUIREMENTS**

- A. Firestopping: Conform to UL for fire resistance ratings and surface burning characteristics.

#### **1.07 SUBMITTALS**

- A. Shop Drawings: Indicate system layout with location including critical dimensions, sizes, and pipe hanger and support locations and detail of trapeze hangers.
- B. Product Data:
  - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.

2. Firestopping: Submit data on product characteristics, performance and limitation criteria.

C. Manufacturer's Installation Instructions:

1. Hangers and Supports: Submit special procedures and assembly of components.
2. Firestopping: Submit preparation and installation instructions.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

## **1.08 QUALITY ASSURANCE**

- A. Perform Work in accordance with State of Pennsylvania standard.
- B. Perform Work in accordance with applicable authority and AWS D1.1 for welding hanger and support attachments to building structure.
- C. Maintain one copy of each document on site.

## **1.09 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

## **1.10 DELIVERY, STORAGE, AND HANDLING**

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- B. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

## **1.11 ENVIRONMENTAL REQUIREMENTS**

- A. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F.
- B. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.
- C. Provide ventilation in areas to receive solvent cured materials.
- D. Verify field measurements prior to fabrication.

## **1.12 FIELD MEASUREMENTS**

- A. Verify Field measurements prior to fabrication.



## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
1. Pipe Hangers:
    - a. AAA Technology and Specialties Co., Inc.
    - b. B-Line Systems, Inc.
    - c. Globe Pipe Hanger Products, Inc.
    - d. Grinnell Corp.
    - e. Michigan Hanger Co. Inc,
    - f. National Pipe Hanger Corp.
    - g. PHD Manufacturing, Inc.
    - h. PHS Industries, Inc.
    - i. Piping Technology & Products, Inc.
  2. Channel Support Systems:
    - a. B-Line Systems, Inc.
    - b. Grinnell Corp.; Power-Strut Unit
    - c. GS Metals Corp.
    - d. Michigan Hanger Co. Inc.; O - Strut Div.
    - e. National Pipe Hanger Corp.
    - f. Unistrut Corp.
  3. Thermal - Hanger Shield Inserts:
    - a. Carpenter & Patterson, Inc.
    - b. Michigan Hanger Co. Inc
    - c. PHS Industries, Inc.
    - d. Pipe Shields, Inc.
    - e. Rilco Manufacturing Co., Inc.
    - f. Value Engineered Products, Inc.

### **2.02 MANUFACTURED UNITS**

- A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components. Refer to "Hanger and Support Applications" Article in Part 3 for where to use specific hanger and support types.
1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
  2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.

1. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
  2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- C. Thermal-Hanger Shield Inserts: 100-psi minimum compressive-strength insulation, encased in sheet metal shield.
1. Material for Cold Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
  2. Material for Cold Piping: ASTM C 552, Type I cellular glass with vapor barrier.
  3. Material for Cold Piping: Water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.

### **2.03 SLEEVES**

- A. Sleeves for Pipes through Non-fire Rated Floors: 18 gage thick galvanized steel.
- B. Sleeves for Pipes through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- C. Sleeves for pipes through fire rated floor, walls, etc.: Schedule 40 steel pipe with clearance required for fire caulking.

### **2.04 MECHANICAL SLEEVE SEALS**

- A. Manufacturers:
  1. Thunderline Link-Seal, Inc.
  2. NMP Corporation
  3. approved equal.
- B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

### **2.05 FIRESTOPPING**

- A. Manufacturers:
  1. Dow Corning Corp.
  2. Fire Trak Corp.
  3. Hilti Corp.
  4. International Protective Coating Corp.
  5. 3M fire Protection Products
  6. Pro Set Systems, Inc.
  7. approved equal.

- B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
1. Silicone Firestopping Elastomeric Firestopping: Component silicone elastomeric compound and compatible silicone sealant.
  2. Foam Firestopping Compounds: Component foam compound.
  3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
  4. Fiber Stuffing and Sealant Firestopping: Composite of stuffing insulation with silicone elastomer for smoke stopping.
  5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
  6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
  7. Firestop Pillows: Formed mineral fiber pillows.
  8. Pre-manufactured sleeves and fire stop systems.
- C. Color: As selected from manufacturer's full range of colors.
- D. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
- E. General:
1. Furnish UL listed products or products tested by independent testing laboratory.
  2. Select products with rating not less than rating of wall or floor being penetrated.
- F. Non-Rated Surfaces:
1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.
  2. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop type wall sleeve.
- G. Pre-manufactured Firestop Penetrators:
1. Provide ProSet Systems, or equal, fire rated sleeve coupling penetrator for each pipe penetration or plumbing fixture opening passing through floors, walls, partitions or floor ceiling assemblies. All penetrators passing through fire rated construction must comply with ASTM E-814, UL 1479 or CSA/ULC CAN S-115 fire test standards.
  2. Sleeve Penetrators shall have built in anchoring ring for waterproofing and anchoring into concrete pours. For cored holes use the special tight fitted ProSet Cored Hole Penetrator for cored holes.
  3. Piping shall have one ProSeal Plug or a Riser Clamp on the top side of the penetrator or alternate types of ProSet Penetrators for various piping materials that comply with ASTM E-814 fire testing as shown below.
    - a. Insulated or uninsulated pipe - Use System "A"

- b. Cast Iron Pipe - Use System "B"
  - c. PVC waste & vent piping - Use System "C"
  - d. Polypropylene acid waste piping - Use System "C"
  - e. EMT or Electrical Conduit - Use System "A"
4. All above Systems are to be installed in strict accordance with manufacturer's instructions.
  5. Alternate Firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed firestop products and their uses and the Contractor shall assume all risk and liabilities whatsoever in connection therewith.

## **PART 3 EXECUTION**

### **3.01 HANGER AND SUPPORT APPLICATIONS**

- A. Specific hanger requirements are specified in Sections specifying equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.
- C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
  1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
  2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
  3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
  4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
  5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
- D. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
  1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
  2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.
- E. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
  1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.

2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
  3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
  4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
- F. Building Attachments: Unless otherwise indicated and except as specified in Piping System, Specification Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
  2. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  3. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  4. C-Clamps (MSS Type 23): For structural shapes.
  5. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
  6. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where head room is limited.
- G. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Pipe-Covering Protection Saddles (MSS Type 39): Fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.
  3. Insulation Shield Inserts: For supporting insulated pipe, 180 to 360-degree insert of high-density, 100-psi minimum compressive-strength, water-repellent-treated calcium silicate or cellular-glass pipe insulation, same thickness as adjoining insulation with vapor barrier and support in sheet metal protection shield. Insert to be covered with vapor barrier jacketing metal.

### **3.02 HANGER AND SUPPORT INSTALLATION**

- A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems. Provide pip and insulation protection and alignment guides to maintain clearance between piping.
1. Field assemble and install according to manufacturer's written instructions.
- C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes.
1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
- D. Install building attachments within concrete slabs. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts and install reinforcing bars through openings at top of inserts.
  - E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
  - F. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
  - G. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
  - H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," are not exceeded.
  - I. Insulated Piping: Pipe 2 inch size and above. Comply with the following:
    1. Pipe hanger location.
      - a. Piping Operating above Ambient Air Temperature: Pipe may be supported through insulation.
      - b. Piping Operating below Ambient Air Temperature: Use insulation shield insert, vapor barrier jacketing and sheet metal shield. Install sheet metal shield between vapor barrier and hanger.
      - c. Do not exceed pipe stress limits according to ASME B31.9.
    2. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
      - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
    3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.
      - a. Option: insulation-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

Shield Dimensions for Pipe: Not less than the following:

    - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    - b. NPS 4: 12 inches long and 0.06 inch thick.
    - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
    5. Insert Material: Length at least as long as protective shield.

6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### **3.03 EQUIPMENT SUPPORTS**

- A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor. Anchor supports to comply with shop drawings provided for equipment requirements.
- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

### **3.04 METAL FABRICATION**

- A. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations
- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and 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. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

### **3.05 ADJUSTING**

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe

### **3.06 PAINTING**

- A. Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 Section "Painting."

- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

### **3.07 INSTALLATION - INSERTS**

- A. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- B. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.
- C. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- D. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

### **3.08 INSTALLATION - EQUIPMENT BASES AND SUPPORTS**

- A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment.
- B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

### **3.09 INSTALLATION - SLEEVES**

- A. Exterior watertight entries: Seal with mechanical sleeve seals.
- B. Set sleeves in position in forms. Provide reinforcing around sleeves.
- C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.
- E. Where piping penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with stuffing and firestopping insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- F. Install chrome plated steel escutcheons at finished surfaces and galvanized iron or brass at non-finished surfaces where exposed. Escutcheons are not required where concealed by ceiling.

### **3.10 INSTALLATION - FIRESTOPPING**

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping and other items, requiring firestopping.



- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating.
- D. Fire Rated Surface:
  - 1. Seal opening at floor, wall, partition, ceiling, and roof as follows:
    - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
    - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
    - c. Pack void with backing material.
    - d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
    - e. Install premanufactured sleeves in strict compliance with manufacturer's details and instructions.
- E. Non-Rated Surfaces:
  - 1. Seal opening through non-fire rated wall, partition, floor, ceiling, and roof opening as follows:
    - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
    - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
    - c. Install type of fill material recommended by manufacturer.

### **3.11 HANGER SPACING SCHEDULE**

- A. Hanger spacing is based on individual clevis hangers. Provide intermediate supports for trapeze hangers for smaller pipes or space trapeze for pipe line with smallest required spacing between hangers. Install supplemental seismic supports according to "Seismic Bracing and Equipment Anchoring" section. Provide hanger spacing per MSS-SP 69 and guidelines.
- B. Cast Iron Pipe (Sanitary, Storm and Vent)
  - 1. Provide hanger with-in 18 inches of all joints and minimum of two hangers on each pipe length. Exceptions: Threaded piping for vent line may comply with steel pipe schedule: pipe lengths less than 36" can be supported with a single centered hanger.

PIPE SIZE	MAXIMUM HANGER SPACING	ROD DIAMETER
1-1/2 to 2 inches	60 inches	3/8 inch
3 inches	60 inches	1/2 inch

C. Copper Tubing (Domestic Water, Refrigerant or Hydronic Service Soldered or Brazed Joints).

1. Refer to steel pipe schedule for copper pipe with grooved joints for hanger spacing.

PIPE SIZE	MAXIMUM HANGER SPACING	ROD DIAMETER
1/2 to 3/4 inches	60 inches	3/8 inch
1 to 1/4 inches	72 inches	3/8 inch
1-1/2 to 2 inches	96 inches	3/8 inch
2-1/2 inches	108 inches	1/2 inch
3 inches	120 inches	1/2 inch

D. Steel pipe schedule 40 (Hydronic Service - Threaded or Welded Joints)

PIPE SIZE	MAXIMUM HANGER SPACING	ROD DIAMETER
1/2 to 1-1/4 inches	84 inches	3/8 inch
1-1/2 inches	108 inches	3/8 inch
2 inches	120 inches	3/8 inch
2-1/2 inches	132 inches	1/2 inch
3 inches	144 inches	1/2 inch

E. Steel Pipe Schedule 40 (Grooved Coupling)

1. Spacing provided to be maximum support per pipe length taking weight and stress off of coupling at joints. Schedule also applies for copper pipe with grooved couplings.
2. Refer to coupling manufacturer's installation and spacing requirements for additional information.
3. Install pipe clamps to pipe work at changes of direction per coupling manufacturer's installation requirements.
4. Where spacing noted in this schedule, conflicts with coupling manufacturer's criteria, space to the shortage distance required between the two conflicting requirements.

PIPE SIZE	PIPE LENGTH	MAXIMUM DISTANCE TO COUPLING	NUMBER OF HANGERS	ROD DIAMETER
3/4 to 1 inch	120 inches	30 inches	2	3/8 inch
1-1/4 to 2 inches	120 inches	30 inches	2	3/8 inch
2-1/2 to 4 inches	120 inches	30 inches	1	1/2 inch

F. PVC Pipe Schedule 40 (Sanitary, Waste, or Vent).

PIPE SIZE	MAXIMUM HANGER SPACING	ROD DIAMETER
1 1/4 to 1 1/2 inches	60 inches	3/8 inch
2 to 2 1/2 inches	60 inches	3/8 inch
3 inches	60 inches	3/8 inch
4 inches	60 inches	3/8 inch

G. PVC Pipe Schedule 40 (Pipe temperature to 120 degrees F)

PIPE SIZE	MAXIMUM HANGER SPACING	ROD DIAMETER
1/2 to 3/4 inches	36 inches	3/8 inch
1 to 1 1/2 inches	42 inches	3/8 inch
2 to 2 1/2 inches	48 inches	3/8 inch
3 inches	54 inches	3/8 inch
4 inches	60 inches	3/8 inch

**END OF SECTION**

## **SECTION 23 05 53**

### **MECHANICAL IDENTIFICATION**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### **1.02 SUMMARY**

- A. Section includes:
  - 1. Nameplates.
  - 2. Tags.
  - 3. Pipe markers.
  - 4. Ceiling tacks.
  - 5. Labels.
  - 6. Lockout Devices.

##### **1.03 REFERENCES**

- A. American Society of Mechanical Engineers:
  - 1. ASME A13.1 - Scheme for the Identification of Piping Systems.

##### **1.04 SUBMITTALS**

- A. Division 1 - Submittal procedures.
- B. Product Data: Submit manufacturers catalog literature for each product required.
- C. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Samples: Submit equipment, piping, valve tags, tags, labels and pipe markers size used on project.
- E. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

##### **1.05 CLOSEOUT SUBMITTALS**

- A. Division 1 - Execution Requirements: Closeout procedures.

- B. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

## **1.06 QUALITY ASSURANCE**

- A. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.
- B. Maintain one copy of each document on site.

## **1.07 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

## **1.08 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

## **PART 2 PRODUCTS**

### **2.01 NAMEPLATES**

- A. Manufacturers:
  - 1. Craftmark Identification Systems
  - 2. Safety Sign Co.
  - 3. Seton Identification Products
  - 4. Brady (W.H.) Company, Sign Mark Division
- B. Product Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

### **2.02 TAGS**

- A. Plastic or Metal Tags:
  - 1. Manufacturers:
    - a. Allen Systems, Inc.
    - b. Brandy (W.H.) Company, Sign Mark Division
    - c. Seton Name Plate corporation
    - d. Substitutions: Division 1- Product Requirements.
  - 2. Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches diameter.
  - 3. Brass or Aluminum with stamped letters; tag size minimum 1-1/2 inches with finished edges.
- B. Tag Chart: Typewritten letter size list of applied tags and location in anodized aluminum frame. Mount frame in boiler room.

## **2.03 PIPE MARKERS**

- A. Color and Lettering: Conform to ASME A13.1.
- B. Markers:
  - 1. Manufacturers:
    - a. Allen Systems, Inc.
    - b. Brady (W.H.) Company, Sign Mark Division.
    - c. Seton Name Plate Corporation.
    - d. Substitutions: Division 1 - Product Requirements.
  - 2. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.
  - 3. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
  - 4. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Degrease and clean surfaces to receive adhesive for identification materials.

### **3.02 INSTALLATION**

- A. Install identifying devices after completion of coverings and painting.
- B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive on equipment.
- C. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels. Applies to pipe services.
- D. Install tags using corrosion resistant chain. Number tags consecutively by location, system with color coding.
- E. Identify pumps, heat transfer equipment, tanks and water treatment devices with plastic or metal nameplates. Identify in-line pumps and other small devices with tags.
- F. Identify control panels and major control components outside panels with plastic nameplates.
- G. Identify valves in main and branch piping with tags. Color code tags for different piping systems and provide valve charts in holders in maintenance area.
- H. Tag automatic controls, instruments, and relays.

- I. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 25 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

**END OF SECTION**

## **SECTION 23 05 93**

### **TESTING, ADJUSTING, AND BALANCING**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all division sections for coordination items and related work execution that develops standards of construction performance for installation.

##### **1.02 SUMMARY**

- A. Section Includes:
  - 1. Testing adjusting and balancing of air systems.
  - 2. Testing adjusting and balancing of hydronic and steam systems.

##### **1.03 REFERENCES**

- A. Associated Air Balance Council:
  - 1. AABC MN-1 - National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
  - 1. ASHRAE 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems.
- C. Natural Environmental Balancing Bureau:
  - 1. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

##### **1.04 SUBMITTALS**

- A. Prior to commencing Work, submit proof of latest calibration date of each instrument.
- B. Test Reports: Indicate data on AABC MN-1 National Standards for Total System Balance forms, forms prepared following ASHRAE 111 or NEBB Report forms.
- C. Field Reports: Indicate deficiencies preventing proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- D. Prior to commencing Work, submit report forms or outlines indicating adjusting, balancing, and equipment data required. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty or Copy of NEBB Certificate of Conformance Certification.
- E. Submit draft copies of report for review prior to final acceptance of Project.



- F. Furnish reports in hard or soft cover or 3-ring binder manuals, complete with table of contents page and indexing tabs, with cover identification at front and side. Include set of reduced size drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

#### **1.05 CLOSEOUT SUBMITTALS**

- A. Project Record Documents: Record actual locations of flow measuring stations, balancing valves and rough setting.
- B. Operation and Maintenance Data: Furnish final copy of testing, adjusting, and balancing report inclusion in operating and maintenance manuals.

#### **1.06 QUALITY ASSURANCE**

- A. Perform Work in accordance with AABC MN-1 National Standards for Field Measurement and Instrumentation, Total System Balance, ASHRAE 111 or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.
- B. Maintain one copy of each document on site.
- C. Prior to commencing Work, calibrate each instrument to be used. Upon completing Work, recalibrate each instrument to assure reliability.

#### **1.07 QUALIFICATIONS**

- A. Agency: Company specializing in testing, adjusting, and balancing of systems specified in this section with minimum three years documented experience certified by AABC or NEBB.
- B. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor or registered professional engineer experienced in performance of this Work and licensed at place where Project is located.

#### **1.08 PRE-INSTALLATION MEETINGS**

- A. Convene minimum one week prior to commencing work of this section.

#### **1.09 SEQUENCING**

- A. Sequence balancing between completion of systems tested and Date of Substantial Completion.

#### **1.10 SCHEDULING**

- A. Schedule and provide assistance in final adjustment and test of life safety with Fire Authority.

## **PART 2 PRODUCTS**

### **2.01 Not Used.**

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify systems are complete and operable before commencing work. Verify the following:
  - 1. Systems are started and operating in safe and normal condition.
  - 2. Temperature control systems are installed complete and operable.
  - 3. Proper thermal overload protection is in place for electrical equipment.
  - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  - 5. Duct systems are clean of debris.
  - 6. Fans are rotating correctly.
  - 7. Duct system leakage is minimized.
  - 8. Hydronic systems are flushed, filled, and vented.
  - 9. Pumps are rotating correctly.
  - 10. Proper strainer baskets are clean and in place or in normal position.
  - 11. Service and balancing valves are open.

### **3.02 PREPARATION**

- A. Furnish instruments required for testing, adjusting, and balancing operations.
- B. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

### **3.03 INSTALLATION TOLERANCES**

- A. Exhaust Systems: Adjust to within plus or minus 5 percent of design.
- B. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

### **3.04 ADJUSTING**

- A. Verify recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.
- D. Report defects and deficiencies noted during performance of services, preventing system balance.

- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- F. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner, Architect or his representatives.
- G. Check and adjust systems approximately six months after final acceptance and submit report.

### **3.05 AIR SYSTEM PROCEDURE**

- A. Make air quantity measurements in main ducts by Pitot tube traverse of entire cross sectional area of duct.
- B. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes to vary fan speed.
- C. Measure static air pressure conditions on air exhaust unit, including filter pressure drops, and total pressure across fan. Make allowances for 50 percent loading of filters.

### **3.06 WATER SYSTEM PROCEDURE**

- A. Use calibrated balancing valves and fittings or pressure gauges to determine flow rates for system balance. Where flow-metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in system.
- B. Adjust systems to obtain specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- C. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

### **3.07 SCHEDULES**

- A. Equipment Requiring Testing, Adjusting, and Balancing:
  - 1. Hot water Circulator Pumps.
  - 2. Fin tube radiation
  - 3. Panel Radiators.
  - 4. Fans.
  - 5. Heat Exchangers.
  - 6. Unit heaters.
  - 7. Other locations as shown on the drawings
- B. Report Forms
  - 1. Title Page:
    - a. Name of Testing, Adjusting, and Balancing Agency

- b. Address of Testing, Adjusting, and Balancing Agency
  - c. Telephone and facsimile numbers of Testing, Adjusting, and Balancing Agency
  - d. Project name
  - e. Project location
  - f. Project Architect
  - g. Project Engineer
  - h. Project Contractor
  - i. Report date
2. Summary Comments:
    - a. Design versus final performance
    - b. Notable characteristics of system
    - c. Description of systems operation sequence
    - d. Summary of outdoor and exhaust flows to indicate building pressurization
    - e. Nomenclature used throughout report
    - f. Test conditions
  3. Instrument List:
    - a. Instrument
    - b. Manufacturer
    - c. Model number
    - d. Serial number
    - e. Range
    - f. Calibration date
  4. Electric Motors:
    - a. Manufacturer
    - b. Model/Frame
    - c. HP/BHP and kW
    - d. Phase, voltage, amperage; nameplate, actual, no load
    - e. RPM
    - f. Service factor
    - g. Starter size, rating, heater elements
    - h. Sheave Make/Size/Bore
  5. Pump Data:
    - a. Identification/number
    - b. Manufacturer
    - c. Size/model
    - d. Impeller
    - e. Service
    - f. Design flow rate, pressure drop, BHP and kW
    - g. Actual flow rate, pressure drop, BHP and kW
    - h. Discharge pressure
    - i. Suction pressure
    - j. Total operating head pressure
    - k. Shut off, discharge and suction pressures
    - l. Shut off, total head pressure
  6. Heat Exchanger:

- a. Identification/number
  - b. Location
  - c. Service
  - d. Manufacturer
  - e. Model number
  - f. Serial number
  - g. Steam pressure, design and actual
  - h. Water entering temperature, design and actual
  - i. Water leaving temperature, design and actual
  - j. Water flow, design and actual
  - k. Water pressure drop, design and actual
7. Exhaust Fan Data:
- a. Location
  - b. Manufacturer
  - c. Model number
  - d. Serial number
  - e. Air flow, specified and actual
  - f. Total static pressure (total external), specified and actual
  - g. Inlet pressure
  - h. Discharge pressure
  - i. Sheave Make/Size/Bore
  - j. Number of Belts/Make/Size
  - k. Fan RPM
8. Unit Heaters:
- a. Identification/number
  - b. Location
  - c. Service
  - d. Manufacturer
  - e. Model number
  - f. Serial number
  - g. Water flow, specified and actual
  - h. Water entering temperature, design and actual
  - i. Water leaving temperature, design and actual
  - j. Water pressure drop, design and actual
9. Fin Tube Radiation:
- a. Identification/number
  - b. Location
  - c. Service
  - d. Manufacturer
  - e. Model number
  - f. Serial number
  - g. Water flow, specified and actual
  - h. Water entering temperature, design and actual
  - i. Water leaving temperature, design and actual
  - j. Water pressure drop, design and actual
10. Panel Radiators:

- a. Identification/number
- b. Location
- c. Service
- d. Manufacturer
- e. Model number
- f. Serial number
- g. Water flow, specified and actual
- h. Water entering temperature, design and actual
- i. Water leaving temperature, design and actual
- j. Water pressure drop, design and actual

**END OF SECTION**

## SECTION 23 07 00

### MECHANICAL INSULATION

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance for installation.

##### 1.02 SUMMARY

- A. Section Includes:
  - 1. Piping system insulation.
  - 2. Equipment insulation.
  - 3. Pipe insulation jackets.
  - 4. Equipment insulation jackets.
  - 5. Insulation accessories including vapor retarders and accessories.
  - 6. Insulation accessories including vapor retarders, jackets and accessories.

##### 1.03 REFERENCES

- A. ASTM International:
  - 1. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - 2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - 3. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
  - 4. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
  - 5. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
  - 6. ASTM C518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
  - 7. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
  - 8. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
  - 9. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
  - 10. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.
  - 11. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for commercial and Industrial Applications.
  - 12. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type).

13. ASTM C610 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation.
14. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
15. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
16. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
17. ASTM C1071 - Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material).
18. ASTM C1126 - Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
19. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
20. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
21. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
22. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
23. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
24. ASTM E162 - Standard Test method for Surface Flammability of Materials Using a Radiant Heat Energy Source.
25. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

#### **1.04 SUBMITTALS**

- A. Division: Submittal procedures.
- B. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.
- C. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

#### **1.05 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Division 1: Product Requirements: Requirements for transporting, handling, storing, and protecting products.



- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

### **1.07 ENVIRONMENTAL REQUIREMENTS**

- A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
- B. Maintain temperature during and after installation for products requiring temperature conditions for drying and service.

### **1.08 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

### **1.09 WARRANTY**

- A. Division 1: Execution and Closeout Requirements.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Manufacturers:
  - 1. Armocell
  - 2. Aeroflex
  - 3. Certain Teed
  - 4. Childers
  - 5. Foster
  - 6. Knauf FiberGlass GmbH.
  - 7. Owens-Corning Fiberglass Corp.
  - 8. Schuller International, Inc.
  - 9. Johns Mansville, Inc.
  - 10. Pittsburg Corning, Inc.
  - 11. approved equal

### **2.02 MAN MADE MINERAL FIBER**

- A. Insulation: ASTM C547 Mineral Fiber Pipe Insulation, Type I, 850 degrees F, Type II, 1200 degrees F, Type III, 1200 Degrees F. Conform to ASTM C795 for application on Austenitic stainless steel.
- B. Insulation: ASTM C795: semi-rigid, noncombustible, end grain adhered to jacket.
  - 1. "K" factor: ASTM C177, 0.24 at 75 degrees F.
  - 2. Maximum service temperature: 650 degrees F.

- 3. Maximum moisture absorption: 0.2 percent by volume.
- C. Vapor Retarder Lap Adhesive:
  - 1. ASTM C921, White Kraft paper with glass fiber yarn, bonded to aluminized film.
  - 2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.
- D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- E. Vapor Retarder Lap Adhesive:
  - 1. Compatible with insulation.
- F. Insulating Cement/Mastic:
  - 1. ASTM C195; hydraulic setting on mineral wool.
- G. Glass Fiber Fabric:
  - 1. Blanket: 1.0 lb/cu ft density.

### **2.03 MAN MADE MINERAL FIBER, FLEXIBLE BLANKET OR BATTS**

- A. Insulation: ASTM C1290; Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
  - 1. Operating Temperatures: 250 degrees F.
  - 2. Density: 0.75 lb/cu ft.
  - 3. 'K' ('ksi') factor: ASTM C518, 0.30 at 75 degrees F.
- B. Vapor Retarder Jacket: ASTM 1136, Type II Flexible and Low Permeance Vapor Retarders for Thermal Insulation.
  - 1. For systems operating at temperatures below ambient, close and secure seams, and joints. When outward clinching staples are used, seal penetrations.
- C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- D. Vapor Retarder Lap Adhesive:
  - 1. Compatible with insulation.
- E. Insulating Cement/Mastic:
  - 1. ASTM C195; hydraulic setting on mineral wool.

### **2.04 MINERAL FIBER, FLEXIBLE**

- A. Insulation: ASTM C553 Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications, Type II.
- B. Vapor Retarder Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture vapor transmission: ASTM E96; 0.02 perm.
  - 3. Secure with pressure sensitive tape.

- C. Vapor Retarder Tape:
  - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- D. Outdoor Vapor Retarder Mastic:
  - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- E. Tie Wire: Annealed steel, 16 gauge.

## **2.05 MINERAL FIBER, RIGID**

- A. Insulation: ASTM C612 Mineral Fiber Block and Board Insulation, Type IA
- B. Vapor Retarder Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture vapor transmission: ASTM E96; 0.04 perm.
  - 3. Secure with pressure sensitive tape or two coats of vapor barrier mastic and glass tape.
- C. Vapor Retarder Tape:
  - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- D. Indoor Vapor Retarder Finish:
  - 1. Cloth: Untreated; 9 oz/sq yd weight, glass fabric.
  - 2. Vinyl emulsion type acrylic, compatible with insulation.

## **2.06 CELLULAR GLASS**

- A. Insulation: ASTM C552, Type II - pipe and tubing insulation, Class 2 - Jacketed.
  - 1. 'K' ('ksi') factor: ASTM C177 or ASTM C518, 0.29 at 75 degrees F.

## **2.07 HYDROUS CALCIUM SILICATE**

- A. Calcium Silicate Block and Pipe Thermal Insulation: ASTM C533, Type II for use on surfaces up to 1200 degree F.
- B. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- C. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement:
  - 1. ASTM C449/C449M.

## **2.08 CELLULAR PHENOLIC FOAM**

- A. Faced or Unfaced Rigid Cellular Phenolic Pipe and Board Thermal Insulation, ASTM C1126, Type II and Type III.

## 2.09 ELASTOMERIC CELLULAR FOAM

- A. Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular form: ASTM C534; Type I, Tubular form.
- B. Elastomeric Foam Adhesive:
  - 1. Air dried, contact adhesive, compatible with insulation.

## 2.10 PIPE AND EQUIPMENT JACKETS

- A. PVC Plastic Pipe Jacket:
  - 1. Product Description: ASTM D1784, One piece molded type fitting covers and sheet material, off-white color.
  - 2. Thickness: 30 mil.
  - 3. Connections: Brush on welding adhesive or Pressure sensitive color matching vinyl tape.
- B. PVC Plastic Equipment Jacket:
  - 1. Product Description: Sheet material, off-white color.
  - 2. Minimum Service Temperature: -40 degrees F.
  - 3. Maximum Service Temperature: 150 degrees F.
  - 4. Moisture Vapor Transmission: ASTM E96; 0.002 perm-inches.
  - 5. Thickness: 30 mil.
  - 6. Connections: Brush on welding adhesive or Pressure sensitive color matching vinyl tape.
- C. Covering Adhesive Mastic:
  - 1. Compatible with insulation.
- D. Canvas Equipment Jacket:
  - 1. UL listed.
  - 2. Fabric: 6 oz/sq yd, plain weave cotton.
  - 3. Fire retardant lagging adhesive. Composite of insulation, jacket and lagging adhesive having flame spread index not greater than 25 and smoke developed index not greater than 50 when tested to ASTM E84.
- E. Lagging Adhesive:
  - 1. Compatible with insulation.
- F. Aluminum Pipe Jacket:
  - 1. Manufacturers:
    - a. Childers, Inc.
    - b. approved equal.
  - 2. ASTM B209.
  - 3. Thickness: 0.040 inch thick sheet.
  - 4. Finish: Embossed.
  - 5. Joining: Longitudinal slip joints and 2 inch laps.

6. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
7. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

G. Stainless Steel Pipe Jacket:

1. Manufacturers:
  - a. Childers.
  - b. approved equal.
2. ASTM A167 Type 302, 304, 316 stainless steel.
3. Thickness: 0.018 inch thick.
4. Finish: Smooth or Corrugated.
5. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify piping and equipment has been tested before applying insulation materials.
- B. Verify surfaces are clean and dry, with foreign material removed.

### **3.02 INSTALLATION**

- A. Exposed Piping: Locate insulation and cover seams in least visible locations.
- B. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- C. Man made mineral fiber insulated pipes conveying fluids below ambient temperature:
  1. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
  2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.
- D. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- E. Man made mineral fiber insulated pipes conveying fluids above ambient temperature:
  1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
  2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

- F. Inserts and Shields:
1. Application: Piping or Equipment 2 inches diameter or larger.
  2. Shields: Galvanized steel between pipe hangers or pipe hanger rollers and pipe insulation.
  3. Insert location: Between hanger support shield and insulation finished vapor jacket.
  4. Insert configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
  5. Insert material: Compression resistant insulating material suitable for planned temperature range and service. (Cellular Glass or Rigid Calcium Silicate)
  6. Refer to Section 15060 for additional insert and shield requirements.
- G. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions.
- H. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces less than 7 feet above finished floor: Finish all insulated piping with PVC jacket and fitting covers, to protect insulation for maintenance and service damage.
- I. Exterior Applications: Provide vapor retarder jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with aluminum jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal equipment.
- J. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size insulation large enough to enclose pipe and heat tracer. Cover with aluminum or stainless steel jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water.
- K. Factory Insulated Equipment: Do not insulate.
- L. Exposed Equipment: Locate insulation and cover seams in least visible locations.
- M. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
- N. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
- O. Insulated equipment containing fluids below ambient temperature: Insulate entire system.

- P. Mineral fiber insulated equipment containing fluids below ambient temperature: Provide vapor retarder jackets, factory-applied or field-applied. Finish with glass-cloth and vapor barrier adhesive.
- Q. For hot equipment containing fluids over 140 degrees F, insulate flanges and unions with removable sections and jackets.
- R. Mineral fiber insulated equipment containing fluids above ambient temperature: Provide standard jackets, with or without vapor retarder, factory-applied or fieldapplied. Finish with glass cloth and adhesive.
- S. Finish insulation at supports, protrusions, and interruptions.
- T. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with canvas covers or PVC jacket, paint all canvas jackets.
- U. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.
- V. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.

### 3.03 SCHEDULES

#### A. Plumbing Systems (within building crawl space/basement):

1. Domestic Cold Water: Man Made Mineral Fiber, Phenolic Foam or Elastomeric Insulation:

Fluid Temp	Pipe Size	Insulation Thickness
50 to 70 F	All	1/2"

2. Domestic Hot Water Supply and re-circulating: Man made fiber insulation:

Fluid Temp	Pipe Size	Insulation Thickness
120 F and below	less than 2"	1"
2 1/2 and above	2"	

3. Sanitary, waste and vent piping: Pipe is not insulated.

#### B. Plumbing Systems (risers within building):

1. Domestic Cold Water: Man Made Mineral Fiber, Phenolic Foam or Elastomeric Insulation:

Fluid Temp	Pipe Size	Insulation Thickness
50 to 70 F	All	1/2"

2. Domestic Hot Water Supply and re-circulating: Man made fiber insulation:

Fluid Temp	Pipe Size	Insulation Thickness
120 F and below	less than 2"	1/2"

3. Sanitary, waste and vent piping: Pipe is not insulated.

- C. Heating Piping Systems (within building crawl space/basement): Applies to all services and insulation thickness is for the fluid temperature range noted. Mineral fiber Insulation with appropriate temperature rating for the recommended service.

<u>Fluid Temp</u>	<u>Pipe Size</u>	<u>Insulation Thickness</u>
201 to 250	Up to 1¼”	2”
1 ½ and larger	2”	
106 to 200	Up to 1¼”	1½”
1 1/2” & Up	2”	

1. Heating Supply and Return: (106 to 200)
2. Low Pressure Steam Piping: (201 to 250)
3. Low Pressure Steam Condensate: (201 to 250)
4. Pumped Steam Condensate: (201 to 250)

D. Heating Piping Systems (risers within the building): Applies to all services and insulation thickness is for the fluid temperature range noted. Mineral fiber Insulation with appropriate temperature rating for the recommended service.

<u>Fluid Temp</u>	<u>Pipe Size</u>	<u>Insulation Thickness</u>
100 to 169	1” and down	1½”

E. Heating Systems Equipment: Provide lagging and canvas jacketing over insulation and finish in a smooth, flat surface. Paint cover for protection in type and coats as recommended by the manufacture. Provide cut away exaction or removable insulation at pump impeller housings, hand hole, clean outs, etc.

1. General:
  - a. Mineral Fiber Board Insulation: 2 inches thick.
  - b. Hydrous Calcium Silicate Insulation: 2 inches thick.
  - c. Glass Fiber, Rigid Insulation: 2 inches thick.



2. Pump Bodies:
    - a. Mineral Fiber Board Insulation: 2 inches thick.
    - b. Hydrous Calcium Silicate Insulation: 2 inches thick.
    - c. Glass Fiber, Rigid Insulation: 2 inches thick.
  3. Air Separators
    - a. Mineral Fiber Board Insulation: 2 inches thick.
    - b. Hydrous Calcium Silicate Insulation: 2 inches thick.
    - c. Glass Fiber, Rigid Insulation: 2 inches thick.
  4. Expansion Tanks: Not insulated
- F. Exhaust Ductwork
1. Enclosed within conditioned building and concealed above finished surfaces.
    - a. Not insulated
- G. Dryer Vent
1. Enclosed within conditioned building and concealed above finished surface.
    - a. Not insulated

**END OF SECTION**

## **SECTION 23 09 00**

### **HEATING AND VENTILATING FIELD WIRING AND CONTROLS**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. The specifications sections “General Conditions”, “Special Requirements” and “General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

##### **1.02 SUMMARY**

- A. This Section includes control equipment for heating and ventilation systems and components, including control components for terminal heating units supplied with field wired controls to a building remote located control panels or controllers and sensors.

##### **1.03 SUBMITTALS**

- A. Product Data: Include manufacturer's technical literature for each control device indicated, labeled with setting or adjustable range of control. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 1. Schematic flow diagrams showing heat exchanger, control valve pumps and sensors.
  - 2. Schematic flow diagram showing fans and control devices.
  - 3. Wiring Diagrams: Power, signal, and control wiring.
- C. Field quality-control test reports.
- D. Operation and maintenance data.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

##### **1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: A qualified installer who is an authorized representative or a certified installer of the automatic control system manufacturer for both installation and maintenance of units required for this Project.

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilation Systems."

## **1.05 COORDINATION**

- A. Coordinate location of thermostats and other exposed control sensors with plans and room details before installation.
- B. Coordinate power locations with electrical contractor for power from an electrical panel spare breaker to control panel. This contractor is responsible to install power from panel to control panel.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Johnson Controls, Inc.; Controls Group.
  - 2. Invensys
  - 3. Siemens Building Technology

### **2.02 THERMOSTATS**

- A. Equipment Manufacturer supplied thermostats furnished as portion of equipment for field mounting.
- B. Electric Low Voltage Thermostat: Direct or reverse acting with signal proportional to temperature sensed.

### **2.03 CONTROL CABLE**

- A. Electronic Cable for Control Wiring: As specified in Division 16 Section "Control/Signal Transmission Media."

### **2.04 STEAM CONTROL VALVE**

- A. Valves:
  - 1. Valves will be two way as detailed on the Mechanical Drawings for steam service.
    - a. Valves smaller than 2" will be threaded with bronze or brass bodies.
    - b. Valves 2 1/2" and above will be flanged with cast iron bodies.
    - c. All valves will be rated for 125 psig of pressure and 25 psig of differential pressure.
    - d. Actuators will be of adequate torque to provide smooth linear operation over the valve stroke.

- e. Select actuators to provide close-off against 25 psi of differential pressure.
- f. Provide spring return, failsafe operation on all valves where unconditioned outdoor air may enter the coil.
- g. Valves are installed by the Mechanical Contractor.

## **2.05 CONTROL PANEL**

- A. Control panel to enclose all controllers and relays and consist of electronic or digital components as designed by a Controls Contractor. The control to perform the sequence of operations as described in these specifications.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install equipment level and plumb.
- B. Verify location of thermostats and other exposed control sensors with plans and room details before installation. Locate all sensors coordinated with Owner's maintenance personnel.
- C. Install electronic cables according to Division 16 Section "Control/Signal Transmission Media."

### **3.02 ELECTRICAL WIRING AND CONNECTION INSTALLATION**

- A. Install raceways, boxes, and cabinets according to Division 16 Section "Raceways and Boxes."
- B. Install building wire and cable according to Division 16 Section "Conductors and Cables."
- C. Install signal and communication cable according to Division 16 Section "Control/Signal Transmission Media."
  - 1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
  - 2. Install exposed cable in raceway.
  - 3. Install concealed cable in raceway.
  - 4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
  - 5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
  - 6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.

### **3.03 CONNECTIONS**

- A. Ground equipment.

### **3.04 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to provide wiring diagrams and all sensing and controlling components with final field inspected assembled components, perform start-up service and equipment installation, including electrical connections. Report results in writing.
  - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment, and retest.
- B. Replace damaged or malfunctioning controls and equipment.
  - 1. Start, test, and adjust control systems.
  - 2. Demonstrate compliance with requirements, including calibration and testing, and control sequences.
  - 3. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

### **3.05 ON-SITE ASSISTANCE**

- A. Occupancy Adjustments: Within one year of date of Substantial Completion, provide up to three Project-site visits, when requested by Owner, to adjust and calibrate components and to assist Owner's personnel in making program changes and in adjusting sensors and controls to suit actual conditions.

### **3.06 SEQUENCES OF OPERATION FOR HEATING SYSTEM**

- A. Building steam to water heat exchanger, steam control valve, outside air temperature sensor and primary and standby water circulating pumps.
  - 1. Remote mounted field installed panel to be provided with the following:
    - a. Outside air sensor with solar guard:
      - (1) When outside air is less than 65 degrees F (adj) activate water circulating pumps and release steam modulating control valve to modulate open in accordance to a reset water schedule. When outside air temperature is above 70 degrees F (adj) the pumps are inactive and steam control valve is closed.
      - (2) Reset water schedule to modulate steam control valve for 140 degree F discharge temperature at 10 degrees F to 100 degrees F at 50 degrees F outside air temperature. Temperature sensor in hot water heat exchanger discharge pipe to sense the discharge temperature.
      - (3) Primary water circulating pump to operate and second pump to be indexed to standby operation. Provide wiring to contacts at the pump motor starter to activate or disable pump. Index the standby pump to primary operation in the event that the primary pump fails to start as determined by current sensor. Provide a led lag manual pump switches

- on local control panel to manually designate the primary and standby pump.
- (4) Provide an alarm indication on the outside of the building for an audible and visual alarm should primary pump fail or if discharge hot water temperature is above or below reset schedule. Locate a silencing switch at the panel to disable the alarm.

**END OF SECTION**

**SECTION 23 21 00**  
**HYDRONIC PUMPS**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Review all division sections for coordination items and related work execution that develops standards of construction performance for installation.

**1.02 SUMMARY**

- A. Section Includes:
  - 1. In-line circulators.
  - 2. Vertical in-line pumps.

**1.03 REFERENCES**

- A. National Electrical Manufacturers Association:
  - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. Underwriters Laboratories Inc.:
  - 1. UL 778 - Motor Operated Water Pumps.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Provide pumps to operate at system fluid temperatures indicated on Drawings without vapor binding and cavitations, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

**1.05 SUBMITTALS**

- A. Product Data: Submit certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements. Submit also, manufacturer model number, dimensions, service sizes, and finishes.
- B. Manufacturer's Installation Instructions: Submit application, selection, and hookup configuration with pipe and accessory elevations. Submit hanging and support requirements and recommendations.
- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

**1.06 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: Submit installation instructions, servicing requirements, assembly views, lubrication instructions, and replacement parts list.

- B. Maintain one copy of each document on site.

### **1.07 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Protect systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

### **1.09 EXTRA MATERIALS**

- A. Furnish one set of mechanical seals for each pump.
- B. Furnish 1 set of cartridges for each side-stream filter.

## **PART 2 PRODUCTS**

### **2.01 IN-LINE CIRCULATORS**

- A. Manufacturers:
  - 1. Armstrong Pumps
  - 2. Grundfos Pumps Corp.
  - 3. ITT Bell & Gosset
  - 4. PACO Pumps
  - 5. TACO Pumps
  - 6. Thrush Company
  - 7. approved equal.
- B. Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for in-line mounting, oil lubricated, for 175 psig maximum working pressure.
- C. Casing: Cast iron, with flanged pump connections.
- D. Impeller: Stamped brass or cast bronze, keyed to shaft.
- E. Bearings: Two, oil lubricated bronze sleeves.
- F. Shaft: Alloy or stainless steel with copper or bronze sleeve, integral thrust collar.
- G. Seal: Carbon rotating against stationary ceramic seat, 225 degrees F maximum continuous operating temperature.
- H. Drive: Flexible coupling.
- I. Performance:
  - 1. Refer to schedule on the drawings.



- J. Electrical Characteristics and Components:
  - 1. Electrical Characteristics: In accordance with Division 16000.
  - 2. Motors: 1750 rpm unless indicated otherwise.
  - 3. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

## **2.02 VERTICAL IN-LINE PUMPS**

- A. Manufacturers:
  - 1. Armstrong Pumps
  - 2. ITT Bell & Gosset
  - 3. PACO Pumps
  - 4. TACO Pumps
  - 5. Thrush Company
  - 6. approved equal.
- B. Type: Vertical, single stage, close coupled, radial or horizontally split casing, for in-line mounting, for 175 psig working pressure.
- C. Casing: Cast iron or Cast steel with suction and discharge gage port, casing wear ring, mechanical seals, drain plug, flanged suction and discharge.
- D. Impeller: Bronze, fully enclosed, keyed directly to motor shaft or extension.
- E. Shaft: Carbon steel with stainless steel impeller cap screw or nut and bronze sleeve.
- F. Shaft Sleeve: Aluminum bronze.
- G. Seal: Carbon rotating against stationary ceramic seat, 225 degrees F maximum continuous operating temperature.
- H. Performance:
  - 1. Scheduled on the drawings.
- I. Electrical Characteristics and Components:
  - 1. Electrical Characteristics: In accordance with Division 16000.
  - 2. Motors: 1750 rpm unless indicated otherwise.
  - 3. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Provide pumps to operate at specified system fluid temperatures without vapor binding and cavitations, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
- B. Install long radius reducing elbows or reducers between in-line pump and piping. Support piping adjacent to pump so no weight is carried on pump casings.
- C. Install in-line pumps on concrete pad with supports or suspended with hangers.
- D. Install flexible connectors at or near pumps where piping configuration does not absorb vibration.
- E. Provide line sized shut-off valve, strainer and pump suction fitting on pump suction, and line sized soft seat check valve, balancing valve, and shut-off valve or combination pump discharge valve on pump discharge.
- F. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump so no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and larger.
- G. Provide air cock and drain connection on horizontal pump casings.
- H. Lubricate pumps before start-up.

### **3.02 FIELD QUALITY CONTROL**

- A. Inspect for alignment of base mounted pumps.

**END OF SECTION**

## SECTION 23 21 13

### MECHANICAL HYDRONIC PIPING AND VALVES

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### 1.02 SUMMARY

- A. Section Includes: Pipe, pipe fittings and above ground valves for the following systems:
  1. Heating water piping.
  2. Equipment drains and over flows.
  3. Unions and flanges.

##### 1.03 REFERENCES

- A. American Society of Mechanical Engineers:
  1. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
  2. ASME B16.3 - Malleable Iron Threaded Fittings.
  3. ASME B16.4 - Gray Iron Threaded Fittings.
  4. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
  5. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  6. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings (DWV).
  7. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
  8. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
  9. ASME B31.1 - Power Piping.
  10. ASME B31.9 - Building Services Piping.
  11. ASME B36.10M - Welded and Seamless Wrought Steel Pipe.
  12. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
- B. ASTM International:
  1. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings.
  2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  3. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
  4. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
  5. ASTM B32 - Standard Specification for Solder Metal.
  6. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.

7. ASTM B43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes.
8. ASTM B68 - Standard Specification for Seamless Copper Tube, Bright Annealed.
9. ASTM B75 - Standard Specification for Seamless Copper Tube. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
10. ASTM A216/A216M - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.
11. ASTM B251 - Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.
12. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
13. ASTM B302 - Standard Specification for Thread less Copper Pipe.
14. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV).
15. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

C. American Welding Society:

1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
2. AWS D1.1 - Structural Welding Code - Steel.

D. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP 67 - Butterfly Valves.
2. MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
3. MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
4. MSS SP 78 - Cast Iron Plug Valves, Flanged and Threaded Ends.
5. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
6. MSS SP 85 - Cast Iron Globe & Angle Valves, Flanged and Threaded.
7. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

## 1.04 SUBMITTALS

- A. Product Data: Submit data on pipe materials and fittings. Submit data on valves, each type of valve to be provided by a single manufacturer. Submit manufacturers catalog information.
  1. Submit manufacturers catalog information with valve data for each service.
- B. Welders' Certificate: Include welders' certification of compliance with ASME Section IX or AWS D1.1.
- C. Piping pressure test results.
- D. Manufacturer's installation instructions: submit valve hanging, support methods and joining procedures.

## **1.05 QUALITY ASSURANCE**

- A. Perform Work in accordance with ASME B31.1 or ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.
- B. Perform Work in accordance with State of Pennsylvania standard.
- C. Maintain one copy of each document on site.

## **1.06 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

## **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Accept pipe, fittings and valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Furnish temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.
- D. Provide temporary protective coating on cast iron and steel valves.

## **1.08 ENVIRONMENTAL REQUIREMENTS**

- A. Comply with manufacturers requirements environmental conditions affecting products on site including installation requirements

## **1.09 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

## **1.10 EXTRA MATERIALS**

- A. Furnish two packing kits for each size valve.
- B. Furnish one spare valve handle for each type of valve.

## **PART 2 PRODUCTS**

### **2.01 HOT WATER PIPING, ABOVE GROUND**

- A. Steel Pipe: ASTM A53/A53M, Schedule 40, for all pipe sizes black.
  - 1. Fittings 3 inch pipe size and larger: ASME B16.3, malleable iron or ASTM A234/A234M, forged steel welding type.

2. Fittings: ASTM A395/A395M and ASTM A536 ductile iron or ASTM A234/A234M carbon steel, grooved ends.
  3. Joints: Threaded for pipe 2 inches and smaller; welded for pipe 2-1/2 inches and larger.
  4. Joints: Grooved mechanical couplings meeting ASTM F1476.
    - a. Housing Clamps: ASTM A395/A395M and ASTM A536 ductile iron, enamel coated, compatible with steel piping sizes, rigid type.
    - b. Gasket: Elastomer composition for operating temperature range from -30 degrees F to 230 degrees F.
    - c. Accessories: Stainless steel bolts, nuts, and washers.
- B. Copper Tubing: ASTM B88, Type L, hard drawn.
1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
  2. Fittings: ASME B16.18 cast copper alloy, or ASME B16.22 wrought copper and bronze, grooved ends.
  3. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
  4. Joints: 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.
  5. Joints: Grooved mechanical couplings meeting ASTM F1476.
    - a. Housing Clamps: ASTM A395/A395M and ASTM A536 ductile iron, enamel coated, compatible with copper tubing sizes, to engage and lock designed to permit some angular deflection, contraction, and expansion.
    - b. Gasket: Elastomer composition for operating temperature range from -30 degrees F to 230 degrees F.
    - c. Accessories: Stainless steel bolts, nuts, and washers.

## 2.02 EQUIPMENT DRAINS AND OVERFLOWS

- A. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized or steel.
1. Fittings: ASME B16.3, malleable iron or ASME B16.4, cast iron.
  2. Fittings: ASTM A395/A395M and ASTM A536 ductile iron, or ASTM A234/A234M carbon steel, grooved ends.
  3. Joints: Threaded for pipe 2 inches and smaller.
  4. Joints: Grooved mechanical couplings meeting ASTM F1476.
    - a. Housing Clamps: ASTM A395/A395M and ASTM A536 ductile iron, enamel coated compatible with steel piping sizes, rigid or flexible type.
    - b. Gasket: Elastomer composition for operating temperature range from -30 degrees F to 230 degrees F
    - c. Accessories: Stainless steel bolts, nuts, and washers.
- B. Copper Tubing: ASTM B88, Type L hard drawn.
1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
  2. Joints: Solder, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

## 2.03 VALVES

### A. GATE VALVES

1. Manufacturers:
  - a. Crane Valve, North America
  - b. Hammond Valve
  - c. Milwaukee Valve Company
  - d. NIBCO, Inc.
  - e. Stockham Valves & Fittings
  - f. approved equal.
2. 2 inches and Smaller: MSS SP 80, Class 125, bronze body, bronze trim, threaded or union bonnet, non-rising stem, hand-wheel, solid wedge disc, alloy seat rings, solder or threaded ends.
3. 2-1/2 inches and Larger: MSS SP 70, Class 125, cast iron body, bronze trim, bolted bonnet, rising stem, hand-wheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

### B. GLOBE VALVES

1. Manufacturers:
  - a. Crane Valve, North America
  - b. Hammond Valve
  - c. Milwaukee Valve Company
  - d. NIBCO, Inc.
  - e. Stockham Valves & Fittings
  - f. approved equal.
2. 2 inches and Smaller: MSS SP 80, Class 125, bronze body, bronze trim, threaded or union bonnet, hand wheel, Buna-N or Teflon composition disc, solder or threaded ends.
3. 2-1/2 inches and Larger: MSS SP 85, Class 125, cast iron body, bronze trim, hand wheel, outside screw and yoke, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

### C. BALL VALVES

1. Manufacturers:
  - a. Crane Valve, North America
  - b. Hammond Valve
  - c. Milwaukee Valve Company
  - d. NIBCO, Inc.
  - e. Stockham Valves & Fittings
  - f. approved equal.
2. 2 inches and Smaller: MSS SP 110, 400 psi WOG, one piece bronze body, chrome plated brass ball, full port, teflon seats, blow-out proof stem, solder or threaded ends locking lever handle extended lever handle with balancing stops.
3. 2 inches and Smaller: MSS SP 110, Class 150, bronze, two piece body, type 316 stainless steel ball, full port, teflon seats, blow-out proof stem, solder or threaded ends, locking lever handle with balancing stops.

#### D. PLUG VALVES

1. Manufacturers:
  - a. DeZURIK, Unit of SPX Corp.
  - b. Flow Control Equipment, Inc.
  - c. Homestead Valve
  - d. approved equal.
2. 2 inches and Smaller: MSS SP 78, Class 150, construction, full pipe area, regular opening, pressure, lubricated, teflon packing, threaded ends. Furnish one plug valve wrench for every ten plug-valves with minimum of one wrench.
3. 2-1/2 inches and Larger: MSS SP 78, Class 150 construction, full pipe area, pressure, lubricated, teflon packing, flanged ends. Furnish wrench-operated.

#### E. BUTTERFLY VALVES

1. Manufacturers:
  - a. Crane Valve, North America
  - b. Hammond Valve Model
  - c. Milwaukee Valve Company
  - d. NIBCO, Inc.
  - e. Stockham Valves & Fittings
  - f. approved equal.
2. 2-1/2 inches and Larger: MSS SP 67, Class 150.
  - a. Body: Cast or ductile iron, wafer, lug or grooved ends, stainless steel stem, extended neck.
  - b. Disc: Nickel-plated ductile iron, Elastomer coated ductile iron, Chrome plated ductile iron or stainless steel.
  - c. Seat: Resilient replaceable EPDM.
  - d. Handle and Operator: Infinite position lever handle with memory stop. Furnish gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

#### F. CHECK VALVES

1. Horizontal Swing Check Valves:
  - a. Manufacturers:
    - (1) Crane Valve, North America
    - (2) Hammond Valve
    - (3) Milwaukee Valve Company
    - (4) NIBCO, Inc.
    - (5) Stockham Valves & Fittings
    - (6) approved equal.
  - b. 2 inches and Smaller: MSS SP 80, Class 150, bronze body and cap, bronze seat, Buna-N disc, solder threaded ends.
  - c. 2-1/2 inches and Larger: MSS SP 71, Class 125, cast iron body, bolted cap, bronze or cast iron disc, renewable disc seal and seat, flanged ends.

#### G. SPRING LOADED CHECK VALVES:

1. Manufacturers:
  - a. Crane Valve, North America



- b. Hammond Valve
  - c. Milwaukee Valve Company
  - d. NIBCO, Inc.
  - e. Stockham Valves & Fittings
  - f. approved equal.
2. 2 inches and Smaller: MSS SP 80, Class 250, bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat, solder or threaded ends.
  3. 2-1/2 inches and Larger: MSS SP 71, Class 125, wafer or globe style, cast iron body, bronze seat, center guided bronze disc, stainless steel spring and screws, flanged ends.

## **2.04 UNIONS AND FLANGES**

- A. Unions for Pipe 2 inches and Smaller:
  1. Ferrous Piping: Class 150, malleable iron, threaded.
  2. Copper Piping: Class 150, bronze unions with soldered brazed joints.
  3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
  4. PVC Piping: PVC.
- B. Flanges for Pipe 2-1/2 inches and Larger:
  1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
  2. Copper Piping: Class 150, slip-on bronze flanges.
  3. PVC Piping: PVC flanges.
  4. Gaskets: 1/16 inch thick preformed neoprene gaskets.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Division 1 - Administrative Requirements and Related Sections.
- B. Verify piping system is ready for valve installation.

### **3.02 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

### **3.03 INSTALLATION VALVES**

- A. Install valves with stems upright or horizontal, not inverted.

- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install ¾ inch ball valves with cap for drains at main shut-off, low points of piping, bases of vertical risers, and at equipment.
- D. Install valves with clearance for installation of insulation and allowing access.
- E. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors with other trades according to 15050 Basic Materials and Methods.
- F. Refer to Section 15060 for pipe hangers.
- G. Refer to Section 15080 for insulation requirements for valves.

### **3.04 VALVES APPLICATIONS**

- A. Install shutoff and drain valves at locations indicated on Drawings or as required in accordance with this Section.
- B. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- C. Install ball, butterfly or globe valves for throttling, bypass, or manual flow control services.
- D. Install spring loaded check valves on discharge of water pumps and locations as detailed on the drawings.
- E. Install lug end butterfly valves adjacent to equipment when functioning to isolate equipment.
- F. Install gate valve at locations required by the building code otherwise, install ball or butterfly valves.

### **3.05 INSTALLATION - ABOVE GROUND PIPING**

- A. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- B. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.
- C. Group piping whenever practical at common elevations.
- D. Sleeve pipe passing through partitions, walls and floors. Refer to Section 15050.

- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 15060.
- G. Install non-conducting dielectric connections wherever jointing dissimilar metals.
- H. Slope piping and arrange systems to drain at low points.
- I. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.
- J. Install piping specialties in accordance with Section 15121.
- K. Install pipe identification in accordance with Section 15075.
- L. Where contractor has elected to use PVC pipe for HPLS & R service, provide flanges at pipe ends to accept valves and accessories.
- M. Insulation to be applied per section 15080 regardless of pipe material used.

### **3.06 FIELD QUALITY CONTROL**

- A. Division 1 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Test water piping system minimum, pressure test of 1½ times system operating pressure or 100 psig in accordance with ASME B31.9.
- C. Clean exterior of piping, hanger, insulation and connected equipment.

**END OF SECTION**

## **SECTION 23 22 00**

### **STEAM AND CONDENSATE PIPING AND VALVES**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all division sections for coordination items and related work execution that develops standards of construction performance for installation.

##### **1.02 SUMMARY**

- A. Section Includes:
  - 1. Low pressure steam piping.
  - 2. Low pressure steam condensate piping.
  - 3. Equipment drains and over flows.
  - 4. Unions and flanges.
  - 5. Pipe hangers and supports.
  - 6. Valves.

##### **1.03 REFERENCES**

- A. American Society of Mechanical Engineers:
  - 1. ASME B16.3 - Malleable Iron Threaded Fittings.
  - 2. ASME B16.4 - Gray Iron Threaded Fittings.
  - 3. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
  - 4. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  - 5. ASME B31.1 - Power Piping.
  - 6. ASME B31.9 - Building Services Piping.
  - 7. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
- B. ASTM International:
  - 1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - 2. A216/A216M - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High- Temperature Service.
  - 3. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
  - 4. ASTM B32 - Standard Specification for Solder Metal.
  - 5. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
  - 6. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
- C. American Welding Society:
  - 1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

2. AWS D1.1 - Structural Welding Code - Steel.

D. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
3. MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
4. MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
5. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
6. MSS SP 85 - Cast Iron Globe & Angle Valves, Flanged and Threaded.
7. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
8. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

#### **1.04 SYSTEM DESCRIPTION**

- A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.
- B. Provide flanges, union, and couplings at locations requiring servicing. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- C. Provide pipe hangers and supports in accordance with ASME B31.1, ASME B31.9, ASTM F708, MSS SP 58, MSS SP 69, and MSS SP 89.
- D. Use gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Use globe valves for throttling services.
- F. Use spring loaded check valves on discharge of condensate pumps.
- G. Use horizontal swing check valves for vacuum breakers and discharge of steam traps.
- H. Use 3/4 inch gate or ball valves with cap for blow downs at strainers.
- I. Use 3/4 inch gate or ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.
- J. Flexible Connectors: Use at or near pumps where piping configuration does not absorb vibration.

#### **1.05 SUBMITTALS**

- A. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
  2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
  3. Hangers and Supports: Submit manufacturers catalog information including load capacity.
- B. Design Data: Indicate pipe size. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- C. Test Reports: Indicate results of piping system pressure test.
- D. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures and isolation.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- F. Welders' Certificate: Include welders' certification of compliance with ASME Section IX and AWS D1.1.

#### **1.06 CLOSEOUT SUBMITTALS**

- A. Project Record Documents: Record actual locations of valves, equipment and accessories.
- B. Operation and Maintenance Data: Submit instructions for installation and changing components, spare parts lists, exploded assembly views.

#### **1.07 QUALITY ASSURANCE**

- A. Perform Work in accordance with ASME B31.1 and ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.
- B. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.
- C. Maintain one copy of each document on site.

#### **1.08 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

#### **1.09 DELIVERY, STORAGE, AND HANDLING**

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

### **1.10 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

### **1.11 WARRANTY**

- A. Furnish one year manufacturer warranty for valves excluding packing.

### **1.12 EXTRA MATERIALS**

- A. Furnish two packing kits for each size and valve type.

## **PART 2 PRODUCTS**

### **2.01 LOW PRESSURE STEAM PIPING, ABOVE GROUND (15 PSIG MAXIMUM)**

- A. Steel Pipe: ASTM A53/A53M, Schedule 40.
  - 1. Fittings: ASME B16.3 malleable iron Class 125, or ASTM A234/A234M forged steel Class 125.
  - 2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.

### **2.02 LOW PRESSURE STEAM CONDENSATE PIPING, ABOVE GROUND**

- A. Steel Pipe: ASTM A53/A53M, Schedule 40.
  - 1. Fittings: ASME B16.3 malleable iron Class 125, or ASTM A234/A234M forged steel Class 125.
  - 2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.

### **2.03 EQUIPMENT DRAINS AND OVERFLOWS**

- A. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized.
  - 1. Fittings: ASME B16.3, malleable iron or ASME B16.4, cast iron.
  - 2. Joints: Threaded for pipe 2 inch and smaller; flanged for pipe 2-1/2 inches and larger.
- B. Copper Tubing: ASTM B88, Type L, hard drawn.
  - 1. Fittings: ASME B16.18, cast brass, or ASME B16.22 wrought copper.
  - 2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 - 535 degrees F. Braze, AWS A5.8,BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 F.

## **2.04 UNIONS AND FLANGES**

- A. Unions for Pipe 2 inches and Smaller:
  - 1. Ferrous Piping: Class 150 to 300 to match pipe material connected, malleable iron, threaded.
  - 2. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
- B. Flanges for Pipe 2-1/2 inches and Larger:
  - 1. Ferrous Piping: Class 150 to 300 to match pipe material connected, forged steel, slip-on flanges.
  - 2. Copper Piping: Class 150, slip-on bronze flanges.
  - 3. Gaskets: 1/16 inch thick preformed neoprene gaskets.

## **2.05 GATE VALVES**

- A. Manufacturers:
  - 1. Crane Valve.
  - 2. Hammond Valve.
  - 3. Milwaukee Valve.
  - 4. NIBCO, Inc.
  - 5. Stockham Valves & Fittings.
  - 6. approved equal.
- B. 2 inches and Smaller: MSS SP 80, Class 125, bronze body, bronze trim, threaded or union bonnet, hand-wheel, inside screw, solid or split wedge disc, alloy seat rings, solder or threaded ends.
- C. 2-1/2 inches and Larger: MSS SP 70, Class 125, cast iron body, bronze trim, bolted bonnet, hand-wheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

## **2.06 GLOBE VALVES**

- A. Manufacturers:
  - 1. Crane Valve, North America
  - 2. Hammond Valve.
  - 3. Milwaukee Valve Company.
  - 4. NIBCO, Inc.
  - 5. Stockham Valves & Fittings.
  - 6. approved equal.
- B. 2 inches and Smaller: MSS SP 80, Class 125, bronze body, bronze trim, threaded or union bonnet, hand wheel, Buna-N or teflon composition disc, solder or threaded ends.



- C. 2-1/2 inches and Larger: MSS SP 85, Class 125, cast iron body, bronze trim, hand wheel, outside screw and yoke, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

## **2.07 BALL VALVES**

- A. Manufacturers:
  - 1. Crane Valve, North America
  - 2. Hammond Valve.
  - 3. Milwaukee Valve Company.
  - 4. NIBCO, Inc.
  - 5. Stockham Valves & Fittings.
  - 6. approved equal.
- B. 2 inches and Smaller: MSS SP 110, Class 150, bronze, three piece body, type 316 stainless steel ball, full port, teflon seats, blow-out proof stem, solder or threaded ends, lever handle.

## **2.08 CHECK VALVES**

- A. Horizontal Swing Check Valves:
  - 1. Manufacturers:
    - a. Crane Valve, North America
    - b. Hammond Valve.
    - c. Milwaukee Valve Company.
    - d. NIBCO, Inc.
    - e. Stockham Valves & Fittings.
    - f. approved equal.
  - 2. 2 inches and Smaller: MSS SP 80, Class 150, bronze body and cap, bronze seat, Buna-N or teflon disc, solder or threaded ends.
  - 3. 2-1/2 inches and Larger: MSS SP 71, Class 125, cast iron body, bolted cap, bronze or cast iron disc, renewable disc seal and seat, flanged ends.
- B. Spring Loaded Check Valves:
  - 1. Manufacturers:
    - a. Crane Valve, North America
    - b. Hammond Valve.
    - c. Milwaukee Valve Company.
    - d. NIBCO, Inc.
    - e. Stockham Valves & Fittings.
    - f. approved equal.
  - 2. 2 inches and Smaller: MSS SP 80, Class 250, bronze body, in-line spring lift check, silent closing, Buna-N or teflon disc, integral seat, solder or threaded ends.
  - 3. 2-1/2 inches and Larger: MSS SP 71, Class 250, cast iron body, bronze seat, center guided bronze disc, stainless steel spring and screws, flanged ends.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems.

### **3.02 INSTALLATION - PIPE HANGERS AND SUPPORTS**

- A. Install in accordance with ASME B31.9, ASTM F708 and MSS SP 89.
- B. Support horizontal piping as scheduled in Section 15060.
- C. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
- D. Place hangers within 12 inches of each elbow.
- E. Use hangers with 1- ½ minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
- F. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
- G. Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.
- H. Provide copper plated hangers and supports for copper piping.
- I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

### **3.03 INSTALLATION - ABOVE GROUND PIPING SYSTEMS**

- A. Route piping parallel to building structure and maintain gradient.
- B. Install piping to conserve building space, and not interfere with use of space.
- C. Group piping whenever practical at common elevations.
- D. Sleeve pipe passing through partitions, walls and floors. Refer to Section 15050.

- E. Install fire stopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to section 15050.
- F. Install pipe identification in accordance with Section 15075.
- G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors at non-accessible ceiling locations.
- I. Slope steam supply piping one inch in 40 feet in direction of flow. Use eccentric reducers to maintain bottom of pipe aligned.
- J. Slope steam condensate piping one inch in 40 feet. Use eccentric reducers to maintain bottom of pipe aligned.
- K. Provide drip trap assembly at low points, risers, changes in elevation and before control valves.
- L. Install valves with stems upright or horizontal, not inverted.
- M. Insulate piping and equipment; refer to Section 15080.

#### **3.04 FIELD QUALITY CONTROL**

- A. Test low pressure steam supply piping, low pressure steam condensate piping, medium and high pressure steam supply piping, medium and high pressure steam condensate piping in accordance with ASME B3.19 or ASME B3.11.

**END OF SECTION**

## SECTION 23 22 13

### STEAM PIPING SYSTEMS SPECIALTIES

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### 1.02 SUMMARY

- A. Section Includes:
  - 1. Flexible connectors.
  - 2. Pressure gages.
  - 3. Pressure gage taps.
  - 4. Strainers.
  - 5. Steam traps.
  - 6. Steam air vents.
  - 7. Steam safety valves.

##### 1.03 REFERENCES

- A. American Society of Mechanical Engineers:
  - 1. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.
  - 2. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.
- B. ASTM International:
  - 1. ASTM A105/A105M - Standard Specification for Carbon Steel Forgings for Piping Applications.
  - 2. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
  - 3. ASTM A216/A216M - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.
  - 4. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
- C. Underwriters Laboratories Inc.:
  - 1. UL 393 - Indicating Pressure Gauges for Fire-Protection Service.
  - 2. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service.

##### 1.04 PERFORMANCE REQUIREMENTS

- A. Steam Traps:
  - 1. Select to handle minimum of two times maximum condensate load of apparatus served.
  - 2. Pressure Differentials:

- a. Low Pressure Systems (5 psi and less): 1/4 psi.
- b. Low Pressure Systems (15 psi maximum): 2 psi.
- c. Medium Pressure Steam (25 psi maximum): 5 psi.
- d. Medium Pressure Steam (40 psi maximum): 10 psi.
- e. Medium Pressure Steam (60 psi maximum): 15 psi.
- f. High Pressure Steam (100 psi maximum): 30 psi.
- g. High Pressure Steam (150 psi maximum): 40 psi.

## **1.05 SUBMITTALS**

- A. Product Data: Submit for manufactured products and assemblies used in this Project.
  1. Manufacturer's data [and list] indicating use, operating range, total range, accuracy, and location for manufactured components.
  2. Submit product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes.
  3. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each piping specialty.
  4. Submit electrical characteristics and connection requirements.
- B. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures, application, selection, and hook-up configuration. Include pipe and accessory elevations.
- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

## **1.06 CLOSEOUT SUBMITTALS**

- A. Project Record Documents: Record actual locations of actual locations of components and instrumentation, flow controls, flow meters for complete system.
- B. Operation and Maintenance Data: Submit instructions for calibrating instruments, installation instructions, assembly views, servicing requirements, lubrication instruction, and replacement parts list.

## **1.07 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

## **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Accept piping specialties on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.

- C. Protect systems from entry of foreign materials by temporary covers, caps and closures, completing sections of the work, and isolating parts of completed system until installation.

## **1.09 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install instruments when areas are under construction, except rough in, taps, supports and test plugs.

## **1.10 FIELD MEASUREMENTS**

- A. Verify field measurements before fabrication.

## **1.11 EXTRA MATERIALS**

- A. Furnish two pressure gages with pulsation damper and dial thermometers
- B. Furnish two service kits for each size and type of steam trap.

## **PART 2 PRODUCTS**

### **2.01 FLEXIBLE CONNECTORS**

- A. Manufacturers:
  - 1. Flexonic.
  - 2. Flex-Hose Company.
  - 3. Flexicraft industries, Inc.
  - 4. approved equal.
- B. Corrugated stainless steel or bronze hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure 300 psig.

### **2.02 PRESSURE GAGES**

- A. Manufacturers:
  - 1. Amtek, Inc.
  - 2. H.O. Trerice.
  - 3. Weiss instruments, Inc.
  - 4. approved equal.
- B. Gage: ASME B40.1, UL 393 or UL 404 with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
  - 1. Case: Cast aluminum
  - 2. Bourdon Tube: Brass or Phosphor bronze.
  - 3. Dial Size: 2 inch diameter.
  - 4. Mid-Scale Accuracy: two 1/2 percent.
  - 5. Scale: Psi

## **2.03 PRESSURE GAGE TAPS**

- A. Manufacturers:
  - 1. Amtek, Inc.
  - 2. H.O. Trerice.
  - 3. Weiss instruments, Inc.
  - 4. approved equal.
- B. Needle Valve: Brass or Stainless Steel, 1/4 inch NPT for minimum 300 psi.
- C. Ball Valve: Brass or Stainless Steel, 1/4 inch NPT for 250 psi.
- D. Pulsation Damper: Pressure snubber, brass with 1/4 inch NPT connections.
- E. Siphon: Steel, Schedule 40, Brass or Stainless Steel, 1/4 inch NPT angle or straight pattern.

## **2.04 STRAINERS**

- A. Manufacturers:
  - 1. Armstrong Machine Works.
  - 2. Hoffman Specialty - ITT Fluid H.
  - 3. Metraflex Co.
  - 4. Spirax Sarco.
  - 5. Mueller Steam Specialty.
  - 6. Victaulic.
  - 7. Nibco.
  - 8. approved equal.
- B. Size 2 inch and Smaller:
  - 1. Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
- C. Size 2-1/2 inch to 4 inch:
  - 1. Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.
- D. Size 5 inch and Larger:
  - 1. Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

## **2.05 INVERTED BUCKET TRAPS**

- A. Manufacturers:
  - 1. Armstrong International.
  - 2. ITT - Hoffman Specialty.
  - 3. Nicholson Steam Trap.
  - 4. Spirax Sarco.

5. approved equal.

B. Trap:

1. Construction: ASTM A126, Cast iron or semi-steel body with bolted cover, brass or stainless steel bucket, stainless steel seats and plungers, and stainless steel lever mechanism with knife edge operating surfaces.
2. Rating: 60 psig WSP.
3. Features: Access to internal parts without disturbing piping, top test plug, bottom drain plugs.
4. Accessories: Integral inlet strainer of brass or stainless steel

## 2.06 FLOAT AND THERMOSTATIC TRAPS

A. Manufacturers:

1. Armstrong International.
2. ITT - Hoffman Specialty.
3. Nicholson Steam Trap.
4. Spirax Sarco.
5. approved equal.

B. Trap:

1. Construction: ASTM A126, cast iron or semi-steel body and bolted cover, stainless steel or bronze bellows type air vent, stainless steel or copper float, stainless steel lever and valve assembly
2. Rating: 15 psig WSP.
3. Features: Access to internal parts without disturbing piping, bottom drain plug.
4. Accessories: Gage glass with shut-off cocks.

## 2.07 STEAM AIR VENTS

A. Manufacturers:

1. Armstrong International.
2. ITT - Hoffman Specialty.
3. Nicholson Steam Trap.
4. Spirax Sarco.
5. approved equal.

B. Balanced Pressure Type: Cast brass body and cover; access to internal parts without disturbing piping; stainless steel bellows, stainless steel valve and seat.

C. Balanced Pressure Type: ASTM A126 cast iron body and cover; access to internal parts without disturbing piping; phosphor bronze bellows, stainless steel valve and seat.



## **PART 3 EXECUTION**

### **3.01 INSTALLATION - GAGES**

- A. Install pressure gages with pulsation dampers. Provide needle valve or ball valve to isolate each gage. Install siphon on gages in steam systems. Extend nipples and siphons to allow clearance from insulation.
- B. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- C. Install gages in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- D. Adjust gages to final angle, clean windows and lenses, and calibrate to zero.

### **3.02 INSTALLATION - STEAM SYSTEM SPECIALTIES**

- A. Steam Traps:
  - 1. Provide minimum 3/4 inch size on steam mains and branches.
  - 2. Install with union or flanged connections at both ends.
  - 3. Provide gate valve and strainer at inlet, and gate valve and check valve at discharge.
  - 4. Provide minimum 10 inch long, line size dirt pocket between apparatus and trap.
- B. Install float and thermostatic steam traps on the following pieces of equipment:
  - 1. Heat exchangers.
  - 2. Direct steam injected equipment.
  - 3. Main headers.
  - 4. Branch lines.
- C. Install inverted bucket steam traps on the following pieces of equipment:
  - 1. Main headers.
  - 2. Branch lines.
- D. Rate relief valves, for full operating capacity. Set relief at maximum 20 percent above pressure.
- E. Terminate relief valves to outdoors. Provide drip pan elbow with drain connection to nearest floor drain.

### **3.03 PROTECTION OF INSTALLED CONSTRUCTION**

- A. Division 1: Quality Requirements and Field inspecting, testing, adjusting and balancing.

B. Do not install steam pressure gauges until after systems are pressure tested.

**END OF SECTION**

## **SECTION 23 30 00**

### **HVAC DUCTWORK**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all division sections for coordination items and related work execution that develops standards of construction performance for installation.

##### **1.02 SUMMARY**

- A. Section Includes:
  - 1. Duct Materials.
  - 2. Single wall spiral round ducts.

##### **1.03 REFERENCES**

- A. ASTM International:
  - 1. ASTM A36 - Standard Specification for Carbon Structural Steel.
  - 2. ASTM A90 - Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
  - 3. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - 4. ASTM A568 - Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
  - 5. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 6. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
  - 7. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
  - 8. ASTM A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
  - 9. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. National Fire Protection Association:
  - 1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
  - 2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
  - 3. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

- C. Sheet Metal and Air Conditioning Contractors:
  - 1. SMACNA - HVAC Air Duct Leakage Test Manual.
  - 2. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
- D. Underwriters Laboratories Inc.:
  - 1. UL 181 - Factory-Made Air Ducts and Connectors.

#### **1.04 PERFORMANCE REQUIREMENTS**

- A. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

#### **1.05 QUALITY ASSURANCE**

- A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.
- B. Construct ductwork to NFPA 90A standards.
- C. Maintain one copy of each document on site.

#### **1.06 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

#### **1.07 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

### **PART 2 PRODUCTS**

#### **2.01 DUCT MATERIALS**

- A. Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having G90 zinc coating of in conformance with ASTM A90/A90M.
- B. Steel Ducts: ASTM A1008/A1008M, ASTM A1011/A1011M or ASTM A568/A568M.
- C. Aluminum Ducts: ASTM B209; aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength.
- D. Fasteners: Rivets, bolts, or sheet metal screws.
- E. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

## 2.02 SINGLE WALL SPIRAL ROUND DUCTS

- A. Manufacturers:
1. McGill AirFlow Corporation.
  2. Semco Incorporated.
  3. Lindab, Inc.
  4. approved equal.
- B. Product Description: UL 181, Class 1, round spiral lockseam duct constructed of galvanized steel.
- C. Construct duct with the following minimum gages:
- | 1. Diameter            | Gauge |
|------------------------|-------|
| 3 inches to 14 inches  | 26    |
| 15 inches to 26 inches | 24    |
| 28 inches to 36 inches | 22    |
| 38 inches to 50 inches | 20    |
| 52 inches to 84 inches | 18    |
- D. Construct fittings with the following minimum gages:
- | 1. Diameter            | Gauge |
|------------------------|-------|
| 3 inches to 14 inches  | 24    |
| 15 inches to 26 inches | 22    |
| 28 inches to 36 inches | 20    |
| 38 inches to 50 inches | 20    |
| 52 inches to 60 inches | 18    |
| 62 inches to 84 inches | 16    |

## 2.03 DUCTWORK FABRICATION

- A. Fabricate and support round ducts with longitudinal seams in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible Round Duct Construction Standards. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Construct elbows with minimum radius 1-1/2 times centerline duct width.
- C. Fabricate continuously welded round fittings two gages heavier than duct gages indicated in SMACNA Standard. Minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify sizes of equipment connections before fabricating transitions.

### 3.02 INSTALLATION

- A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Install duct hangers and supports in accordance with Section 15060. Use double nuts and lock washers on threaded rod supports.

### 3.03 SCHEDULES

#### A. DUCTWORK MATERIAL SCHEDULE

AIR SYSTEM	MATERIAL
General Exhaust	Galvanized Steel
Dryer Vent	Galvanized Steel

#### B. DUCTWORK PRESSURE CLASS SCHEDULE

AIR SYSTEM	PRESSURE CLASS
General Exhaust	1 inch wg regardless of velocity.
Dryer Vent	1 inch wg regardless of velocity.

**END OF SECTION**

## **SECTION 23 34 00**

### **FANS**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all division sections for coordination items and related work execution that develops standards of construction performance for installation.

##### **1.02 SUMMARY**

- A. Section Includes:
  - 1. Ceiling fans.

##### **1.03 REFERENCES**

- A. American Bearing Manufacturers Association:
  - 1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
  - 2. ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings.
- B. Air Movement and Control Association International, Inc.:
  - 1. AMCA 99 - Standards Handbook.
  - 2. AMCA 204 - Balance Quality and Vibration Levels for Fans.
  - 3. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
  - 4. AMCA 300 - Reverberant Room Method for Sound Testing of Fans.
  - 5. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- C. National Electrical Manufacturers Association:
  - 1. NEMA MG 1 - Motors and Generators.
  - 2. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- D. Underwriters Laboratories Inc.:
  - 1. UL 705 - Power Ventilators.

##### **1.04 SUBMITTALS**

- A. Shop Drawings: Indicate size and configuration of fan assembly, mountings, weights, ductwork and accessory connections.
  - 1. Provide detail of curb anchoring to structure and fan.
  - 2. Provide isolator detail and performance for each isolator provided.
- B. Product Data: Submit data on each type of fan and include accessories, fan curves with specified operating point plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, electrical characteristics and connection requirements.

- C. Manufacturer's Installation Instructions: Submit fan manufacturer's instructions.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

#### **1.05 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: Submit instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

#### **1.06 QUALITY ASSURANCE**

- A. Performance Ratings: Conform to AMCA 210[and bear AMCA Certified Rating Seal.
- B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.
- C. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
- D. Balance Quality: Conform to AMCA 204.
- E. Maintain one copy of each document on site.

#### **1.07 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Protect motors, shafts, and bearings from weather and construction dust.

#### **1.09 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

#### **1.10 MAINTENANCE SERVICE**

- A. Furnish service and maintenance of fans for one year from Date of Substantial Completion.
- B. Include systematic examination, adjustment, and lubrication of fans, and controls checkout and adjustments. Repair or replace parts in accordance with manufacturer's operating and maintenance data. Use parts produced by manufacturer of original equipment.
- C. Perform work without removing fans from service during building normal occupied hours.



D. Provide emergency call back service for this maintenance period.

## **1.11 EXTRA MATERIALS**

A. Furnish one sets of belts for each fan.

## **PART 2 PRODUCTS**

### **2.01 CEILING FANS**

A. Manufacturers:

1. Acme Engineering and Manufacturing Corp.
2. Greenheck Corp.
3. Loren Cook Company
4. Penn Ventilation Model
5. approved equal.

B. Centrifugal Fan Unit: Direct driven with injection molded resin or galvanized steel housing lined with 1/2 inch acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge opening, integral outlet duct collar.

C. Disconnect Switch: Fan mounted toggle switch for thermal overload protected motor.

D. Grille: Molded white plastic or Aluminum with baked white enamel finish.

E. Wheel: DWDI Centrifugal forward curved type constructed of injection molded or polypropylene resin.

F. Motor: Open drip proof type with permanently lubricated sealed bearings and thermal overload protection.

G. Accessories:

1. Wall cap with damper, round duct inlet.
2. Wall cap with rectangular duct inlet.
3. Eave elbow.
4. Roof cap with sloped roof curb.
5. Brick vent constructed of extruded aluminum with inlet screen.
6. Fan speed controller.

H. Performance:

1. Scheduled on the drawings.

I. Electrical Characteristics and Components:

1. Electrical Characteristics: scheduled on the drawings.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Division 1 - Administrative Requirements: Coordination and project conditions.

### **3.02 INSTALLATION**

- A. Provide backdraft dampers on outlet from ceiling fans and as indicated on the Drawings.
- B. Install safety screen where inlet or outlet is exposed.
- C. Provide sheaves required for final air balance.

### **3.03 DEMONSTRATION**

- A. Demonstrate fan operation and maintenance procedures.

### **3.04 PROTECTION OF FINISHED WORK**

- A. Do not operate fans until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

**END OF SECTION**

## **SECTION 23 57 16**

### **U TUBE HEAT EXCHANGERS**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all division sections for coordination items and related work execution that develops standards of construction performance for installation.

##### **1.02 SUMMARY**

- A. Section includes shell and tube type heat exchangers and accessories and trim.

##### **1.03 REFERENCES**

- A. American Society of Mechanical Engineers:
  - 1. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.

##### **1.04 SUBMITTALS**

- A. Shop Drawings: Indicate dimensions, locations, size of taps, and support frame.
- B. Product Data: Submit performance data.
- C. Test Reports: Indicate shop test reports of tube bundle shop pressure tests.

##### **1.05 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: Submit start-up and shut down instructions, assembly drawings, and spare parts lists.

##### **1.06 QUALITY ASSURANCE**

- A. Maintain one copy of each document on site.

##### **1.07 QUALIFICATIONS**

- A. Manufacturer: Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

##### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Accept heat exchangers on site in factory protective packaging. Inspect for damage.
- B. Protect openings with temporary caps to prevent entry of foreign material.

## **1.09 WARRANTY**

- A. 10 yr tube bundle warranty.

## **PART 2 PRODUCTS**

### **2.01 SHELL AND TUBE TYPE HEAT EXCHANGERS**

- A. Manufacturers:
  - 1. Armstrong
  - 2. Baltimore Aircoil Co
  - 3. ITT Bell & Gossett
  - 4. Patterson-Kelley Co
  - 5. Thrush
  - 6. Division 1: Product Requirements
- B. Tubes: U-tube type with 5/8 inch OD minimum seamless brass tubes suitable for 125 psig Working pressure.
- C. Shell: Steel with threaded or flanged piping connections and necessary taps for thermometer wells and drains, steel saddle and attaching U-bolts, prime painted.
- D. Heads: Cast iron or fabricated steel with tube sheets threaded or flanged for piping connections.
- E. Water Chamber and Tube Bundle: Removable for inspection and cleaning.
- F. Design: Heating fluid in shell and heated fluid in tubes.
- G. Heat Exchanger Performance as scheduled on the drawings

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install with clearance to permit removal of tube bundle with minimum disturbance to installed equipment and piping.
- B. Support heat exchangers on welded steel pipe and angle floor stand with anchors to floor slab.
- C. Make connections to heat exchangers with unions or flanges.
- D. Install heat exchangers to allow draining and install drain connection at low point. Pitch shell to completely drain condensate.
- E. Install piping from relief valve and run relief pipe to sump pit.
- F. Install valves and piping specialties in accordance with detail on drawings.

- G. Install steam traps with outlet minimum 12 inches below heat exchanger
- H. Install heat exchanger to allow gravity return of the condensate back to condensate connection at a minimum of 2% slope.

**END OF SECTION**

## **SECTION 23 82 00**

### **TERMINAL HEATING UNITS**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all division sections for coordination items and related work execution that develops standards of construction performance for installation.

##### **1.02 SUMMARY**

- A. Section Includes:
  - 1. Finned tube radiation.
  - 2. Panel radiator.
  - 3. Unit heaters.

##### **1.03 REFERENCES**

- A. Air-Conditioning and Refrigeration Institute:
  - 1. ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.
- B. Sheet Metal and Air Conditioning Contractors:
  - 1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

##### **1.04 SUBMITTALS**

- A. Shop Drawings: Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations. Indicate schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers.
- B. Product Data: Submit coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions. Submit mechanical and electrical service locations, capacities and accessories or optional items.
- C. Manufacturer's Installation Instructions: Submit assembly, support details, and connection requirements.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

##### **1.05 CLOSEOUT SUBMITTALS**

- A. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access to valves.

- B. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

## **1.06 QUALITY ASSURANCE**

- A. Maintain one copy of each document on site.

## **1.07 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

## **1.08 PRE-INSTALLATION MEETINGS**

- A. Convene minimum one week prior to commencing work of this section.

## **1.09 DELIVERY, STORAGE, AND HANDLING**

- A. Accept units on site in factory packing. Inspect for damage. Store under roof.
- B. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors. Protect coils from entry of dirt and debris with pipe caps or plugs.

## **1.10 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

## **PART 2 PRODUCTS**

### **2.01 FINNED TUBE RADIATION**

- A. Manufacturers:
  - 1. Vulcan Radiator Company
  - 2. Sterling Hydronic Products
  - 3. Slant Fin Corporation.
  - 4. approved equal
- B. Heating Elements: Seamless copper tube permanently bonded to aluminum fins by a mechanical process, suitable for soldered fittings.
- C. Element Hangers: Wall mounted element support bracket shall be die formed 14 gauge galvanealed steel with channel type wiped edges.

- D. Enclosures: 14 gauge steel partial perforated enclosure with 1/8" diameter holes on 3/16" staggered center perforations.
- E. Backplate: 14 gauge steel full height backplate, provided with tamper proof screws and fasteners.
- F. Accessories -14 gauge steel, provided with tamper proof fasteners.
- G. Finish: Factory applied baked enamel of color as selected by the architect.
- H. Access Doors: For otherwise inaccessible valves, furnish factory-made permanently hinged access doors, 6 x 7 inch minimum size, integral with cabinet, tamper-proof and lockable.
- I. Capacity: As scheduled, based on 65 degrees F entering air temperature, 137.5 degrees F average water temperature.

## **2.02 Panel Radiator**

- A. Manufacturers:
  1. Runtal North America, Inc.
  2. Panel Radiator Inc.
  3. Mestek, inc
  4. approved equal
- B. Heating Elements: Provide steel panel radiator elements of lengths and in locations as indicated, and of capacities, style and having accessories as scheduled. The wall hung heating panel radiation shall be of one-piece all-welded steel construction, consisting of flattened water tubes welded to headers at each end. The radiator shall include an integral heavy gauge (0.09" minimum) all-welded perforated top grille. RF models to have steel corrugated fins welded to the rear side of the water tubes to increase the convective output of the unit. There shall be no less than 32 fins per foot. Fins shall start within 1" of the headers, and shall be spot-welded three times per tube.
- C. Finish: Factory applied gloss powder coat finish of color as selected by the architect.
- D. Capacity: As scheduled, based on 65 degrees F entering air temperature, 137.5 degrees F average water temperature.
- E. Pressure Rate: Working pressure - 85 psi maximum, Test pressure - 110 psi Maximum.

## **2.03 UNIT HEATERS**

- A. Manufacturers:
  1. Vulcan Radiator Company
  2. Sterling Hydronic Products
  3. approved equal



- B. Coils: Coil elements and headers shall be of heavy wall drawn seamless copper tubing. Element tubes shall be brazed into extruded header junctions. Pipe connection saddles shall be of cast bronze. Aluminum fins shall have drawn collars to assure permanent bond with expanded element tubes and exact spacing.
- C. Casing: 20 gauge die-formed steel.
- D. Finish: Factory applied baked enamel of color as selected by the architect.
- E. Fan: Fans shall be of aluminum blade, steel hub type designed and balanced.
- F. Air Outlet: Units shall be equipped with vertical louvers for four-way air control.
- G. Motor: Totally enclosed fan cooled, resilient mounted with class“B” windings, totally enclosed, and frame mounted, with thermal overload protection and permanently lubricated sleeve bearings.
- H. Control: Space thermostat and control valve.
- I. Capacity: As scheduled, based on 65 degrees F entering air temperature, 137.5 degrees F average water temperature.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify wall construction is ready for installation.
- B. Verify piping is ready for installation.
- C. Verify concealed blocking and supports are in place and connections are correctly located.

#### **3.02 INSTALLATION**

- A. Install equipment exposed to finished areas after walls and ceilings are finished and painted. Avoid damage.
- B. Finned Tube Radiation: Locate on outside walls and run as indicated on drawing. Field measure to verify any wall to wall dimensions. Center elements under windows where possible. Install wall angles where units butt against walls.
- C. Unit Heaters: Hang from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

### **3.03 CLEANING**

- A. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of enclosures.
- B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

**END OF SECTION**

## **SECTION 22 00 00**

### **BASIC MATERIAL AND METHODS**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all division sections for coordination items and related work execution that develops standards of construction performance for installation.

##### **1.02 SUMMARY**

- A. Section includes:
  1. Shop Drawings
  2. Rough patch Materials
  3. Piping materials and installation instructions common to most piping systems.
  4. Transition fittings.
  5. Dielectric fittings.
  6. Mechanical sleeve seals.
  7. Sleeves.
  8. Escutcheons.
  9. Mechanical demolition.
  10. Equipment installation requirements common to equipment sections.
  11. Painting and finishing.
  12. Concrete bases.
  13. Anchorages.
  14. Access doors.
  15. Installation coordination drawings.

##### **1.03 DEFINITIONS**

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

- F. Rough Patching: Patching material for opening created by removal of piping, conduit, etc. to close off opening with-in 1/16 inch of flush surface. Patching material to be compatible with existing construction.
- G. The following are industry abbreviations for plastic materials:
  - 1. CPVC: Chlorinated polyvinyl chloride plastic.
  - 2. PE: Polyethylene plastic.
  - 3. PVC: Polyvinyl chloride plastic.
- H. The following are industry abbreviations for rubber materials:
  - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
  - 2. NBR: Acrylonitrile-butadiene rubber.

#### **1.04 SUBMITTALS**

- A. Product Data: For the following:
  - 1. Transition fittings.
  - 2. Dielectric fittings.
  - 3. Mechanical sleeve seals.
  - 4. Escutcheons.
  - 5. Fire rated premanufactured sleeves
  - 6. Fire stop penetration materials
- B. Welding certificates.

#### **1.05 QUALITY ASSURANCE**

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- C. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
- D. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- E. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

## **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

## **1.07 COORDINATION**

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- B. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified or approved equal.

### **2.02 PIPE, TUBE, AND FITTINGS**

- A. Refer to individual Division 220000 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

### **2.03 JOINING MATERIALS**

- A. Refer to individual Division 220000 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
  - 2. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
  - 3. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 4. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAgl, silver alloy for refrigerant piping, unless otherwise indicated.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements for Joining Plastic Piping:
  - 1. CPVC Piping: ASTM F 493.
  - 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

#### **2.04 TRANSITION FITTINGS**

- A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
  - 1. Manufacturers:
    - a. Cascade Waterworks Mfg. Co.
    - b. Dresser Industries, Inc.; DMD Div.
    - c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
    - d. JCM Industries.
    - e. Smith-Blair, Inc.
    - f. Viking Johnson.
    - g. approved equal
  - 2. Aboveground Pressure Piping: Pipe fitting.
- B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
  - 1. Manufacturers:
    - a. Eslon Thermoplastics.
    - b. approved equal.
- C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
  - 1. Manufacturers:
    - a. Thompson Plastics, Inc.
    - b. approved equal.

## 2.05 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
  - 1. Manufacturers:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company.
    - c. Eclipse, Inc.
    - d. EpcO Sales, Inc.
    - e. Hart Industries, International, Inc.
    - f. Watts Industries, Inc.; Water Products Div.
    - g. Zurn Industries, Inc.; Wilkins Div.
    - h. approved equal.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
  - 1. Manufacturers:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company.
    - c. EpcO Sales, Inc.
    - d. Watts Industries, Inc.; Water Products Div.
    - e. approved equal.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
  - 1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Central Plastics Company.
    - d. Pipeline Seal and Insulator, Inc.
    - e. approved equal.
  - 2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
  - 1. Manufacturers:
    - a. Calpico, Inc.
    - b. Lochinvar Corp.
    - c. approved equal.

- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F .
1. Manufacturers:
    - a. Perfection Corp.
    - b. Precision Plumbing Products, Inc.
    - c. Sioux Chief Manufacturing Co., Inc.
    - d. Victaulic Co. of America.
    - e. approved equal.

## **2.06 MECHANICAL SLEEVE SEALS**

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.
    - e. approved equal.
  2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  3. Pressure Plates: Stainless steel, Include two for each sealing element.
  4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## **2.07 SLEEVES**

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
- E. Underdeck Clamp: Clamping ring with set screws.
- F. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- G. PVC Pipe: ASTM D 1785, Schedule 40.
- H. Molded PE: Reusable, PE, tapered-cup shaped and smooth-outer surface with nailing flange for attaching to wooden forms.



## **2.08 ESCUTCHEONS**

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
  - 1. Finish: Polished chrome-plated or rough brass.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
  - 1. Finish: Polished chrome-plated or rough brass.
- E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Type: With hinge, set screw or spring clips, and chrome-plated finish.
- G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

## **2.09 ACCESS DOORS**

- A. Provide the following:
  - 1. Manufacturer: Milcor or approved equal.
  - 2. Door for drywall style DS, key locked with door to match fire rating in partition or ceiling where installed.

## **PART 3 EXECUTION**

### **3.01 MECHANICAL DEMOLITION**

- A. Refer to demolition notes on the drawings.
  - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
  - 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.

4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged by new construction work in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.
- D. Cutting and patching of walls, floors, roofs, or other surfaces to be coordinated with other Divisions in this specification.
1. Where demolition or repair of walls or other surfaces are noted on Architectural drawings then coordinate work.
  2. Where piping, conduits or equipment is removed and walls or other surfaces is to be patched and not indicated on Architectural drawings; this contractor to patch surface. The patch material to be coordinated with other division contractor which would be acceptable for finishing materials.
    - a. Submit to Architect proposal rough patching materials.
    - b. Concealed patch above ceilings does not require final patch finishing.
    - c. Exposed patch to receive final patching and paint such that final work will match adjacent surfaces in every respect.

### **3.02 PIPING SYSTEMS - COMMON REQUIREMENTS**

- A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.

- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors. Provide chrome plated finish in finished areas and rough brass at concealed area or mechanical room spaces. Provide according to the following:
  - 1. New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
    - f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
    - g. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
    - h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type with rough-brass finish.
    - i. Permanent sleeves are not required for holes formed by removable PE sleeves where sleeve extends (1) one inch above finished floor.
- M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
  - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

- N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
  - 2. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- P. Verify final equipment locations for roughing-in.
- Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### **3.03 PIPING JOINT CONSTRUCTION**

- A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
  3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
  4. PVC Nonpressure Piping: Join according to ASTM D 2855.
  5. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
- L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
1. Plain-End Pipe and Fittings: Use butt fusion.
  2. Plain-End Pipe and Socket Fittings: Use socket fusion.

### **3.04 PIPING CONNECTIONS**

- A. Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping NPS 2" and smaller, adjacent to each valve and at final connection to each piece of equipment.
  2. Install flanges, in piping NPS 2-1/2" and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### **3.05 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS**

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations
- D. Install equipment to allow right of way for piping installed at required slope.
- E. Coordinate with other Division 15 Sections and group valves, dampers, sensors, etc. requiring access from a single door. Size door large enough to service or remove items.

### **3.06 PAINTING**

- A. Damage and Touchup: Repair Equipment marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### **3.07 CONCRETE BASES**

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
  - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
  - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
  - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
  - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
  - 7. Use 3000-psi 28-day compressive-strength concrete and reinforcement.

**END OF SECTION**

## **SECTION 22 05 00**

### **PLUMBING SPECIALTIES**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all division sections for coordination items and related work execution that develops standards of construction performance for installation.

##### **1.02 SUMMARY**

- A. Section Includes the following plumbing specialties:
  1. Backflow preventers.
  2. Balancing valves.
  3. Strainers.
  4. Outlet boxes.
  5. Key-operation hydrants.
  6. Drain valves.
  7. Miscellaneous piping specialties.

##### **1.03 DEFINITIONS**

- A. The following are industry abbreviations for plastic piping materials:
  1. ABS: Acrylonitrile-butadiene-styrene plastic.
  2. PE: Polyethylene plastic.
  3. PUR: Polyurethane plastic.
  4. PVC: Polyvinyl chloride plastic.

##### **1.04 PERFORMANCE REQUIREMENTS**

- A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
  1. Domestic Water Piping: 125 psig.
  2. Sanitary Waste and Vent Piping: 10-foot head of water.

##### **1.05 SUBMITTALS**

- A. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:
  1. Backflow preventers.
  2. Balancing valves.
  3. Water hammer arresters and air vents.
  4. Drain valves, hose bibbs and hydrants.
  5. Washer-supply outlets.
  6. Cleanouts.
  7. Air-admittance valves, vent caps, vent terminals, and roof flashing assemblies.

- B. Shop Drawings:
- C. Field test reports.

## **1.06 QUALITY ASSURANCE**

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of plumbing specialties and are based on the specific system indicated.
- B. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.
- E. NSF Compliance:
  - 1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components. Include marking "NSF-pw" on plastic potable-water piping and "NSF-dwv" on plastic drain, waste, and vent piping.
  - 2. Comply with NSF 61, "Drinking Water System Components--Health Effects, Sections 1 through 9," for potable domestic water plumbing specialties.
    - 1.

## **1.07 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Operating Key Handles: Equal to 1 of each of amount installed for each key-operated hose bib and hydrant installed.

## **PART 2 PRODUCTS**

### **2.01 PIPING SPECIALTIES**

- A. Flanges, Unions, and Couplings:
  - 1. Pipe Size 2 inches and under: Malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
  - 2. Pipe Size Over 2 inches: Forged steel flanges for ferrous piping; bronze flanges for copper piping; preformed neoprene gaskets.
  - 3. Grooved and Shouldered Pipe End Couplings: Malleable iron housing, C-shape elastomer composition sealing gasket, steel bolts, nuts, and washers.
  - 4. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.



## 2.02 BACKFLOW PREVENTERS

- A. Manufacturers:
  - 1. Ames Co., Inc.
  - 2. B & K Industries, Inc.
  - 3. Cla-Val Co.
  - 4. Conbraco Industries, Inc.
  - 5. FLOMATIC Corp.
  - 6. IMI Cash Valve.
  - 7. Mueller Co.; Hersey Meters Div.
  - 8. Sparco, Inc.
  - 9. Watts Industries, Inc.; Water Products Div.
  - 10. Zurn Industries, Inc.; Wilkins Div.
  - 11. approved equal.
  
- B. General: ASSE standard, backflow preventers.
  - 1. NPS 2 and Smaller: Bronze body with threaded ends.
  - 2. Interior Components: Corrosion-resistant materials.
  - 3. Exterior Finish: Polished chrome plate if used in chrome-plated piping system.
  - 4. Strainer: On inlet, if indicated.
  
- C. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent.
  
- D. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7, garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.
  
- E. Intermediate Atmospheric-Vent Backflow Preventers: ASSE 1012, suitable for continuous pressure application. Include inlet screen and two independent check valves with intermediate atmospheric vent.
  
- F. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013, suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet; test cocks; and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between two positive-seating check valves. 1. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
  
- G. Double-Check Backflow Prevention Assemblies: ASSE 1015, suitable for continuous pressure application. Include shutoff valves on inlet and outlet, and strainer on inlet; test cocks; and two positive-seating check valves.
  - 1. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
  
- H. Antisiphon-Pressure-Type Vacuum Breakers: ASSE 1020, suitable for continuous pressure application. Include shutoff valves, spring-loaded check valve, spring-loaded floating disc, test cocks, and atmospheric vent.
  - 1. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.

- I. Dual-Check-Valve-Type Backflow Preventers: ASSE 1024, suitable for continuous pressure application. Include union inlet and two independent check valves.
- J. Dual-Check-Valve-Type Backflow Preventers: ASSE 1032, suitable for continuous pressure application for carbonated beverage dispensers. Include stainless-steel body; primary and secondary checks; ball check; intermediate atmospheric-vent port for relieving carbon dioxide; and threaded ends, NPS 3/8.
- K. Reduced-Pressure Detector Assembly Backflow Preventers: ASSE 1047, FM approved or UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between two positive-seating check valves; and bypass with displacement-type water meter, valves, and reduced-pressure backflow preventer.
  - 1. Pressure Loss: 12 psig (83 kPa) maximum, through middle 1/3 of flow range.
- L. Double-Check Detector Assembly Backflow Preventers: ASSE 1048, FM approved or UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; two positive-seating check valves; and bypass with displacement-type water meter, valves, and double-check backflow preventer.
  - 1. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
- M. Hose-Connection Backflow Preventers: ASSE 1052, suitable for at least 3-gpm flow and applications with up to 10-foot head of water back pressure. Include two check valves; intermediate atmospheric vent; and non-removable, ASME B1.20.7, gardenhose threads on outlet.
- N. Back-Siphonage Backflow Vacuum Breakers: ASSE 1056, suitable for continuous pressure and backflow applications. Include shutoff valves, check valve, test cocks, and vacuum vent.

### **2.03 BALANCING VALVES**

- A. Calibrated Balancing Valves: Adjustable, with two readout ports and memory setting indicator. Include manufacturer's standard hoses, fittings, valves, differential pressure meter, and carrying case.
  - 1. Manufacturers:
    - a. Amtrol, Inc.
    - b. Armstrong Pumps, Inc.
    - c. Armstrong-Yoshitake, Inc.
    - d. Flow Design, Inc.
    - e. ITT Industries; Bell & Gossett Div.
    - f. Taco, Inc.
    - g. Tour & Andersson, Inc.
    - h. Watts Industries, Inc.; Water Products Div.
    - i. approved equal.

2. NPS 2 and Smaller: Bronze body with brass ball, adjustment knob, calibrated nameplate, and threaded or solder-joint ends.
3. NPS 2 and Smaller: Bronze, Y-pattern body with adjustment knob and threaded ends.

## **2.04 OUTLET BOXES**

- A. Manufacturers:
  1. Acorn Engineering Company.
  2. Guy, Gray Manufacturing Co., Inc.
  3. IPS Corporation.
  4. LSP Products Group.
  5. Oatey.
  6. Plastic Oddities, Inc.
  7. Symmons Industries, Inc.
  8. Zurn Industries, Inc.; Jonespec Div.
  9. approved equal.
- B. General: Recessed-mounting outlet boxes with supply fittings complying with ASME A112.18.1M. Include box with faceplate, services indicated for equipment connections, and wood-blocking reinforcement.
- C. Clothes Washer Outlet Boxes: With hot- and cold-water hose connections, drain, and the following:
  1. Box and Faceplate: Enameled or epoxy-painted steel or Plastic.
  2. Shutoff Fitting: Two hose bibbs or Combination, single lever.
  3. Supply Fittings: Two NPS 1/2 gate, globe, or ball valves and NPS 1/2 copper, water tubing.
  4. Drain: NPS 2 standpipe, P-trap, and direct waste connection to drainage piping.
  5. Inlet Hoses: Two ASTM D 3571, 60-inch- long, rubber household clothes washer inlet hoses with female hose-thread couplings.
  6. Drain Hose: One 48-inch- long, rubber household clothes washer drain hose with hooked end.

## **2.05 KEY-OPERATION HYDRANTS**

- A. Manufacturers:
  1. Josam Co.
  2. Murdock, Inc.
  3. Simmons Manufacturing Co.
  4. Smith, Jay R. Mfg. Co.
  5. Tyler Pipe; Wade Div.
  6. Watts Industries, Inc.; Drainage Products Div.
  7. Woodford Manufacturing Co.
  8. Zurn Industries, Inc.; Jonespec Div.
  9. Zurn Industries, Inc.; Specification Drainage Operation.
  10. approved equal.

- B. General: ASME A112.21.3M, key-operation hydrant with pressure rating of 125 psig.
  - 1. Inlet: NPS 3/4 or NPS 1 threaded or solder joint.
  - 2. Outlet: ASME B1.20.7, garden-hose threads.
  - 3. Operating Keys: One with each key-operation hydrant.
- C. Non-freeze Exposed-Outlet Wall Hydrants: ASSE 1019, self-drainable with integral non-removable hose-connection vacuum breaker or backflow preventer, casing and operating rod to match wall thickness, projecting outlet, and wall clamp.
  - 1. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
  - 2. Nozzle and Wall Plate Finish: Polished nickel bronze.
  - 3. Nozzle and Wall Plate Finish: Polished chrome plate.
- D. Non-freeze Concealed-Outlet Wall Hydrants: ASSE 1019, self-drainable with flush-mounting box with cover, integral non-removable hose-connection vacuum breaker or backflow preventer, casing and operating rod to match wall thickness, concealed outlet, and wall clamp
  - 1. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
  - 2. Box and Cover Finish: Polished nickel bronze.

## 2.06 DRAIN VALVES

- A. Hose-End Drain Valves: MSS SP-110, NPS 3/4 ball valve, rated for 400-psig minimum CWP. Include two-piece, copper-alloy body with standard port, chrome-plated brass ball, replaceable seats and seals, blowout-proof stem, and vinyl-covered steel handle.
  - 1. Inlet: Threaded or solder joint.
  - 2. Outlet: Short-threaded nipple with ASME B1.20.7, garden-hose threads and cap.
- B. Hose-End Drain Valve: MSS SP-80, gate valve, Class 125, ASTM B 62 bronze body, with NPS 3/4 threaded or solder-joint inlet and ASME B1.20.7, garden-hose threads on outlet and cap. Hose bibbs are prohibited for this application.
- C. Stop-and-Waste Drain Valves: MSS SP-110, ball valve, rated for 200-psig minimum CWP or MSS SP-80, Class 125, gate valve; ASTM B 62 bronze body, with NPS 1/8 side drain outlet and cap.

## 2.07 MISCELLANEOUS PIPING SPECIALTIES

- A. Water Hammer Arresters: ASSE 1010 or PDI-WH 201, metal-bellows type with pressurized metal cushioning chamber. Sizes indicated are based on ASSE 1010 or PDI-WH 201, Sizes A through F.
  - 1. Manufacturers:
    - a. Josam Co.
    - b. Smith, Jay R. Mfg. Co.
    - c. Tyler Pipe; Wade Div.
    - d. Zurn Industries, Inc.; Specification Drainage Operation.

- e. approved equal.
- B. Water Hammer Arresters: ASSE 1010 or PDI-WH 201, piston type with pressurized metal-tube cushioning chamber. Sizes indicated are based on ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.
1. Manufacturers:
    - a. Amtrol, Inc.
    - b. Josam Co.
    - c. Precision Plumbing Products, Inc.
    - d. Sioux Chief Manufacturing Co., Inc.
    - e. Watts Industries, Inc.; Drainage Products Div.
    - f. Watts Industries, Inc.; Water Products Div.
    - g. Zurn Industries, Inc.; Wilkins Div.
    - h. approved equal.
- C. Hose Bibbs: Bronze body with replaceable seat disc complying with ASME A112.18.1M for compression-type faucets. Include NPS 1/2 or NPS 3/4 threaded or solder-joint inlet, of design suitable for pressure of at least 125 psig integral or field-installed, non-removable, drainable hose-connection vacuum breaker; and garden-hose threads complying with ASME B1.20.7 on outlet.
1. Finish for Equipment Rooms: Rough bronze, or nickel plated.
  2. Finish for Service Areas: Rough bronze.
  3. Finish for Finished Rooms: Chrome or nickel plated.
  4. Operation for Equipment Rooms: Wheel handle or operating key.
  5. Operation for Service Areas: Wheel handle.
  6. Operation for Finished Rooms: Operating key.
  7. Include operating key with each operating-key hose bibb.
  8. Include integral wall flange with each chrome- or nickel-plated hose bibb.
- D. Air Vents: Float type for automatic air venting.
1. Bolted Construction: Bronze body with replaceable, corrosion-resistant metal float and stainless-steel mechanism and seat; threaded NPS 1/2 minimum inlet; 125-psig minimum pressure rating at 140 deg F and threaded vent outlet.
  2. Welded Construction: Stainless-steel body with corrosion-resistant metal float, stainless-steel mechanism and seat, threaded NPS 3/8 (DN 10) minimum inlet, 150-psig minimum pressure rating, and threaded vent outlet.
- E. Roof Flashing Assemblies: Manufactured assembly made of 0.0625-inch- 6-lb/sq. ft. thick, lead flashing collar and skirt extending at least 6 inches pipe with galvanized steel boot reinforcement, and counter flashing fitting.
1. Manufacturers:
    - a. Acorn Engineering Company; Elmdor/Stoneman Div.
    - b. Substitutions: Division 1 requirements
  2. Open-Top Vent Cap: Without cap.
  3. Low-Silhouette Vent Cap: With vandal-proof vent cap.
  4. Extended Vent Cap: With field-installed, vandal-proof vent cap.

- F. Deep-Seal Traps: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap seal primer valve connection.
  - 1. NPS 2 4-inch- minimum water seal.
  - 2. NPS 2-1/2 and Larger: 5-inch- minimum water seal.
- G. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.
- H. Fixed Air-Gap Fittings: Manufactured cast-iron or bronze drainage fitting with semi open top with threads or device to secure drainage inlet piping in top and bottom spigot or threaded outlet larger than top inlet. Include design complying with ASME A112.1.2 that will provide fixed air gap between installed inlet and outlet piping.
- I. Stack Flashing Fittings: Counter flashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
- J. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and set-screws to secure to vent pipe.
- K. Vent Terminals: Commercially manufactured, shop- or field-fabricated, frost-proof assembly constructed of galvanized steel, copper, or lead-coated copper. Size to provide 1-inch enclosed air space between outside of pipe and inside of flashing collar extension, with counter flashing.
- L. Conductor Nozzles: Bronze body with threaded inlet for connected conductor size, and bronze wall flange with mounting holes.
  - 1. Finish: Nickel bronze.

## **2.08 FLASHING MATERIALS**

- A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
  - 1. General Use: 4-lb/sq. ft., 0.0625-inch thickness.
  - 2. Vent Pipe Flashing: 3-lb/sq. ft. 0.0469-inch thickness.
- B. Copper Sheet: ASTM B 152 of the following minimum weights and thicknesses, unless otherwise indicated:
  - 1. General Applications: 12 oz./sq. ft.
  - 2. Vent Pipe Flashing: 8 oz./sq. ft.
- C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for field painting if indicated.
- D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

- E. Fasteners: Metal compatible with material and substrate being fastened.
- F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- G. Solder: ASTM B 32, lead-free alloy.
- H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
  - 1. Locate backflow preventers in same or adjacent room as connected equipment or system.
  - 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
  - 3. Do not install bypass piping around backflow preventers.
- C. Install back flow preventer on main domestic water supply to individual buildings. Backflow preventer to meet the requirements of the local water department.
- D. Coordinate with local water authority for purchase on water service and installation of water meter. Install meter with valves and accessories as required by the authority.
- E. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
  - 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
  - 2. Locate at each change in direction of piping greater than 45 degrees.
  - 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
  - 4. Locate at base of each vertical soil and waste stack.
- F. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.

- G. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions. Cut and patch roof surfaces and seal water tight. Coordinate with owner roofing bond and furnish all certificates to maintain existing roofing bond.
- H. Supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.
- I. Fasten recessed-type plumbing specialties to reinforcement built into walls.
- J. Install wood-blocking reinforcement for wall-mounting and recessed-type plumbing specialties.
- K. Install individual shutoff valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated. Install shutoff valves in accessible locations.
- L. Install air vents at piping high points. Include ball, gate or globe valve in inlet and drain piping from outlet to floor drain.
- M. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
- N. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.
- O. Label and identify equipment.
- P. Provide cleanouts on all sanitary pipe per the newest version of the plumbing code.

### **3.02 CONNECTIONS**

- A. Drawings indicate general arrangement of piping, fittings, and specialties. Final arrangement of piping systems including all valves and accessories to meet the equipment manufacturer's piping and installation details.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Connect plumbing specialties to piping specified in other Division 15 Sections.

### **3.03 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled grease interceptor units and their installation, including piping and electrical connections. Report results in writing.



### **3.04 PROTECTION**

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

**END OF SECTION**

## SECTION 221113

### FACILITY WATER DISTRIBUTION PIPING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes water-distribution piping and related components outside the building for water service.

##### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

##### 1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
  - 1. Comply with requirements of Capital Region Water (CRW). Including tapping of water mains and backflow prevention.
  - 2. Comply with standards for potable-water-service piping, including materials, installation, testing, and disinfection.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. NSF Compliance:
  - 1. Comply with NSF 14 for plastic potable-water-service piping.
  - 2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

##### 1.4 PROJECT CONDITIONS

- A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
  - 1. Notify Architect no fewer than two days in advance of proposed interruption of service.
  - 2. Do not proceed with interruption of water-distribution service without Architect's written permission.

## **1.5 COORDINATION**

- A. Coordinate connection to water main with utility company.

## **PART 2 - PRODUCTS**

### **2.1 PIPE AND FITTINGS**

- A. PVC, AWWA Pipe: AWWA C900, Class 200, with bell end with gasket, and with spigot end.
  - 1. PVC Fabricated Fittings: AWWA C900, Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
  - 2. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.

### **2.2 JOINING MATERIALS**

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for commonly used joining materials.
- B. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

### **2.3 PIPING SPECIALTIES**

- A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

### **2.4 SADDLE AND CURB VALVES**

- A. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.
  - 1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
  - 2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.
  - 3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.
- B. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

- C. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.
  - 1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

## **PART 3 - EXECUTION**

### **3.1 EARTHWORK**

- A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

### **3.2 PIPING APPLICATIONS**

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
- C. Do not use flanges or unions for underground piping.
- D. Flanges, unions, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
- E. Underground water-service piping NPS 3/4 to NPS 3 shall be soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

### **3.3 VALVE APPLICATIONS**

- A. General Application: Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.
- B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - 1. Underground Valves, NPS 3 and Smaller: AWWA, cast-iron, nonrising-stem, resilient-seated gate valves with valve box.

### **3.4 PIPING SYSTEMS - COMMON REQUIREMENTS**

- A. See Division 22 Section "Basic Material and Methods" for piping-system common requirements.

### **3.5 PIPING INSTALLATION**

- A. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
- B. Make connections NPS 2 and smaller with drilling machine according to the following:
  - 1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
  - 2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
  - 3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
  - 4. Install corporation valves into service-saddle assemblies.
  - 5. Install manifold for multiple taps in water main.
  - 6. Install curb valve in water-service piping with head pointing up and with service box.
  - 7. Repair prior tap location in accordance with CRW requirements.
- C. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.
- D. Bury piping with depth of cover over top at least 36 inches, with top at least 12 inches below level of maximum frost penetration.
- E. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.
  - 1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Plumbing contractor to make connections to building-water-piping systems when those systems are installed.
- F. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

### **3.6 JOINT CONSTRUCTION**

- A. See Division 22 Section "Common Work Results for Plumbing" for basic piping joint construction.

B. Make pipe joints according to the following:

1. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
2. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure. Refer to Division 22 Section "Common Work Results for Plumbing" for joining piping of dissimilar metals.

### **3.7 ANCHORAGE INSTALLATION**

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.
2. Locking mechanical joints.
3. Set-screw mechanical retainer glands.
4. Bolted flanged joints.
5. Heat-fused joints.
6. Pipe clamps and tie rods.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
2. Fire-Service-Main Piping: According to NFPA 24.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

### **3.8 VALVE INSTALLATION**

A. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

### **3.9 CONNECTIONS**

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. See Division 22 Section "Common Work Results for Plumbing" for piping connections to valves and equipment.

- C. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve, and service clamp and corporation valve.

### **3.10 FIELD QUALITY CONTROL**

- A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
  - 1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- C. Prepare reports of testing activities.

### **3.11 IDENTIFICATION**

- A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Section "Earth Moving."
- B. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel. See Division 22 Section "Common Work Results for Plumbing" for identifying devices.

### **3.12 CLEANING**

- A. Clean and disinfect water-distribution piping as follows:
  - 1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
  - 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
  - 3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:

- a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
- b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
- c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
- d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

**END OF SECTION 221113**



## SECTION 22 11 16

### DOMESTIC WATER PIPING

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Review all division sections for coordination items and related work execution that develops standards of construction performance for installation.

##### 1.02 SUMMARY

- A. Section Includes:
  - 1. Domestic water piping, above grade.
  - 2. Unions and flanges.
  - 3. Valves.
  - 4. Pipe hangers and supports.
  - 5. Strainers.

##### 1.03 REFERENCES

- A. American National Standards Institute:
  - 1. ANSI Z21.22 - Relief Valves for Hot Water Supply Systems.
- B. American Society of Mechanical Engineers:
  - 1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
  - 2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  - 3. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
  - 4. ASME B31.9 - Building Services Piping.
  - 5. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.
  - 6. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
- C. American Society of Sanitary Engineering:
  - 1. ASSE 1010 - Performance Requirements for Water Hammer Arresters.
  - 2. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers.
  - 3. ASSE 1019 - Performance Requirements for Vacuum Breaker Wall Hydrants, Freeze Resistant, Automatic Draining Type.
- D. ASTM International:
  - 1. ASTM A536 - Standard Specification for Ductile Iron Castings.
  - 2. ASTM B32 - Standard Specification for Solder Metal.
  - 3. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.
  - 4. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
  - 5. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.

- E. American Welding Society:
  - 1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
- F. American Water Works Association:
  - 1. AWWA C651 - Disinfecting Water Mains.
- G. Manufacturers Standardization Society of the Valve and Fittings Industry:
  - 1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
  - 2. MSS SP 67 - Butterfly Valves.
  - 3. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
  - 4. MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
  - 5. MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
  - 6. MSS SP 78 - Cast Iron Plug Valves, Flanged and Threaded Ends.
  - 7. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
  - 8. MSS SP 85 - Cast Iron Globe & Angle Valves, Flanged and Threaded.
  - 9. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
  - 10. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
- H. National Electrical Manufacturers Association:
  - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

#### **1.04 SUBMITTALS**

- A. Product Data:
  - 1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturer's catalog information.
  - 2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
  - 3. Hangers and Supports: Submit manufacturers catalog information including load capacity.
  - 4. Domestic Water Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.
- B. Manufacturer's Installation Instructions: Submit installation instructions for pumps, valves and accessories.
- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

#### **1.05 CLOSEOUT SUBMITTALS**

- A. Project Record Documents: Record actual locations of valves and equipment.
- B. Operation and Maintenance Data: Submit spare parts list, exploded assembly views and recommended maintenance intervals.

## **1.06 QUALITY ASSURANCE**

- A. Perform Work in accordance with State of Pennsylvania standards.
- B. Maintain one copy of each document on site.

## **1.07 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

## **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Accept valves and equipment on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

## **1.09 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install underground piping when bedding is wet or frozen.

## **1.10 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

## **PART 2 PRODUCTS**

### **2.01 DOMESTIC WATER PIPING, ABOVE GRADE**

- A. Copper Tubing: ASTM B88, Type L, hard drawn.
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: Solder, lead free, ASTM B32.
- B. Copper Tubing: ASTM B88, Type L, hard drawn, rolled grooved ends.
  - 1. Fittings: ASME B16.18 cast copper alloy, or ASME B16.22 wrought copper and bronze, or ASTM B584 bronze sand castings, grooved ends.
  - 2. Joints: Grooved mechanical couplings meeting ASTM F1476.

- a. Housing Clamps: ASTM A395/A395M and ASTM A536 ductile iron, enamel coated, compatible with copper tubing sizes, to engage and lock designed to permit some angular deflection, contraction, and expansion.
- b. Gasket: Elastomer composition for operating temperature range from 30 degrees F to 230 degrees F.
- c. Accessories: Stainless steel bolts, nuts, and washers.

## **2.02 UNIONS AND FLANGES**

- A. Unions for Pipe 2 inches and Smaller:
  1. Copper Piping: Class 150, bronze unions with soldered or threaded joints.
  2. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
- B. Flanges for Pipe 2-1/2 inches and Larger:
  1. Copper Piping: Class 150, slip-on bronze flanges.
  2. Gaskets: 1/16 inch thick preformed neoprene gaskets.

## **2.03 GATE VALVES**

- A. Manufacturers:
  1. Crane Valve, North America
  2. Hammond Valve
  3. Milwaukee Valve Company
  4. NIBCO, Inc.
  5. Stockham Valves & Fittings
  6. approved equal.
- B. 2 inches and Smaller: MSS SP 80, Class 125 bronze body, bronze trim, threaded or union bonnet, non-rising or rising stem, hand-wheel, inside screw, solid or split wedge disc, alloy seat rings, solder or threaded ends.
- C. 2-1/2 inches and Larger: MSS SP 70, Class 125 cast iron body, bronze trim, bolted bonnet, rising or non-rising stem, hand-wheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

## **2.04 GLOBE VALVES**

- A. Manufacturers:
  1. Crane Valve, North America
  2. Hammond Valve
  3. Milwaukee Valve Company
  4. NIBCO, Inc.
  5. Stockham Valves & Fittings
  6. approved equal.

- B. 2 inches and Smaller: MSS SP 80, Class 125 bronze body, bronze trim, threaded or union bonnet, hand wheel, Buna-N composition disc, solder or threaded ends.
- C. 2-1/2 inches and Larger: MSS SP 85, Class 125 cast iron body, bronze trim, hand wheel, outside screw and yoke, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

## **2.05 BALL VALVES**

- A. Manufacturers:
  - 1. Crane Valve, North America
  - 2. Hammond Valve
  - 3. Milwaukee Valve Company
  - 4. NIBCO, Inc.
  - 5. Stockham Valves & Fittings
  - 6. approved equal.
- B. 2 inches and Smaller: MSS SP 110, 400 psi WOG one or two piece bronze body, chrome plated brass ball, full port, teflon seats, blow-out proof stem, solder or threaded ends, lever handle.
- C. 2 inches and Smaller: MSS SP 110, Class 150 bronze, two piece body, chrome plated bronze type 316 stainless steel ball, full port, teflon seats, blow-out proof stem, solder or threaded ends with union, lever handle, wing or tee handle.

## **2.06 PLUG VALVES**

- A. Manufacturers:
  - 1. DeZURIK, Unit of SPX Corp.
  - 2. Flow Control Equipment, Inc.
  - 3. Homestead Valve
  - 4. approved equal.
- B. 2 inches and Smaller: MSS SP 78, Class 150 semi-steel construction, round, square or rectangular port, full pipe area, pressure lubricated, teflon packing, threaded ends. Furnish one plug valve wrench for every ten plug-valves with minimum of one wrench.
- C. 2-1/2 inches and Larger: MSS SP 78, Class 150, semi-steel construction, round, square or rectangular port, full pipe area, pressure lubricated, teflon packing, flanged ends. Furnish wrench-operated or worm gear-operated.

## **2.07 BUTTERFLY VALVES**

- A. Manufacturers:
  - 1. Crane Valve, North America
  - 2. Hammond Valve Model
  - 3. Milwaukee Valve Company

4. NIBCO, Inc.
  5. Stockham Valves & Fittings
  6. approved equal.
- B. 2-1/2 inches and Larger: MSS SP 67, Class 150.
1. Body: Cast or ductile iron, wafer, lug or grooved ends, stainless steel stem, extended neck.
  2. Disc: Nickel-plated ductile iron, Aluminum bronze, Elastomer coated ductile iron, Chrome plated ductile iron or stainless steel.
  3. Seat: Resilient replaceable EPDM or Buna N.
  4. Handle and Operator: Infinite position lever handle with memory stop on 4" pipe and smaller. Hand-wheel and gear drive furnished for valves 6 inches and larger.

## **2.08 CHECK VALVES**

- A. Horizontal Swing Check Valves:
1. Manufacturers:
    - a. Crane Valve, North America
    - b. Hammond Valve
    - c. Milwaukee Valve Company
    - d. NIBCO, Inc.
    - e. Stockham Valves & Fittings
    - f. approved equal.
  2. 2 inches and Smaller: MSS SP 80, Class 150, bronze body and cap, bronze seat, Buna-N disc, solder or threaded ends.
  3. 2-1/2 inches and Larger: MSS SP 71, Class 125, cast iron body, bolted cap, bronze or cast iron disc, renewable disc seal and seat, flanged ends.
- B. Spring Loaded Check Valves:
1. Manufacturers:
    - a. Crane Valve, North America
    - b. Hammond Valve
    - c. Milwaukee Valve Company
    - d. NIBCO, Inc.
    - e. Stockham Valves & Fittings
    - f. approved equal.
  2. 2 inches and Smaller: MSS SP 80, Class 250, bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat, solder or threaded ends.
  3. 2-1/2 inches and Larger: MSS SP 71, Class 125, wafer or globe style, cast iron body, bronze seat, center guided bronze disc, stainless steel spring and screws, flanged ends.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify excavations are to required grade, dry, and not over-excavated.

### **3.02 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.

### **3.03 INSTALLATION - HANGERS AND SUPPORTS**

- A. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9, ASTM F708 and MSS SP 89.
  - 2. Support horizontal piping as schedule.
  - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 4. Place hangers within 12 inches of each horizontal elbow.
  - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
  - 7. Where piping is installed in parallel and at same elevation, contractor may provide multiple pipes on the trapeze hangers.
  - 8. Provide copper plated hangers and supports for copper piping.
  - 9. Prime coat exposed steel hangers and supports. Hangers and supports located in pipe shafts and suspended ceiling spaces are not considered exposed.
  - 10. Provide hangers adjacent to motor driven equipment with vibration isolation.

### **3.04 INSTALLATION - ABOVE GROUND PIPING**

- A. Install non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- C. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.
- D. Group piping whenever practical at common elevations.
- E. Slope piping and arrange systems to drain at low points.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors with Division 8 and as noted on architectural and Mechanical drawings.

- I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- J. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- K. Install domestic water piping in accordance with ASME B31.9.
- L. Sleeve pipes passing through partitions, walls and floors.
- M. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping.
- N. Install unions downstream of valves and at equipment or apparatus connections.
- O. Install valves with stems upright or horizontal, not inverted.
- P. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- Q. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- R. Install globe, ball or butterfly valves for throttling, bypass, or manual flow control services.
- S. Provide lug end butterfly valves adjacent to equipment when functioning to isolate equipment.
- T. Provide spring loaded check valves on discharge of water pumps.
- U. Install potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, fire sprinkler systems, premise isolation and irrigation systems.
- V. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories, sinks, water closets, urinals, washing machine outlets, etc.
- W. Install air chambers on hot and cold water supply piping to each sink, lavatory, etc., not grouped with other fixtures and furnished with a water hammer arrestor. Fabricate air chamber one size larger than supply pipe (3/4 inch minimum,) and minimum 18 inches long. Air chamber is arranged as a trapped pipe section and filled with air. Pipes serving fixtures with air chambers to be arranged with drain valves to recharge air chamber.



### **3.05 FIELD QUALITY CONTROL**

- A. Test domestic water piping system in accordance with applicable code and local authority having jurisdiction.

### **3.06 CLEANING**

- A. Disinfect water distribution system in accordance with Plumbing Code.
- B. Prior to starting work, verify system is complete, flushed and clean.
- C. Verify pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder and tablet or gas form, throughout system to obtain residual from 50 to 80 mg/L.
- E. Bleed water from outlets to obtain distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. When final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual concentration is equal to incoming water or 1.0 mg/L.

**END OF SECTION**

## SECTION 22 13 16

### SANITARY, WASTE AND VENT PIPING

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Review all division sections for coordination items and related work execution that develops standards of construction performance for installation.

##### 1.02 SUMMARY

- A. Section Includes:
  - 1. Sanitary sewer piping buried within 5 feet of building.
  - 2. Sanitary sewer piping above grade.
  - 3. Unions and flanges.

##### 1.03 REFERENCES

- A. American Society of Mechanical Engineers:
  - 1. ASME A112.14.1 - Backwater Valves.
  - 2. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
  - 3. ASME B16.3 - Malleable Iron Threaded Fittings.
  - 4. ASME B16.4 - Gray Iron Threaded Fittings.
  - 5. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings (DWV).
  - 6. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
  - 7. ASME B31.9 - Building Services Piping.
- B. ASTM International:
  - 1. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings.
  - 2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - 3. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
  - 4. ASTM A536 - Standard Specification for Ductile Iron Castings.
  - 5. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe.
  - 6. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
  - 7. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
  - 8. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
  - 9. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
  - 10. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

11. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
12. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
13. ASTM D2665 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
14. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
15. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
16. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

C. Cast Iron Soil Pipe Institute:

1. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
2. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

D. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

E. Plumbing and Drainage Institute:

1. PDI G101 - Standard - Testing and Rating Procedure for Grease Interceptors.

## **1.04 QUALITY ASSURANCE**

- A. Perform work in accordance with State of Pennsylvania standards.
- B. Maintain one copy of each document on site.

## **1.05 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

## **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

## **1.07 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install underground piping when bedding is wet or frozen.

## **1.08 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

## **PART 2 PRODUCTS**

### **2.01 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. Cast Iron Soil Pipe: ASTM A74, extra heavy or service weight, bell and spigot ends.
  - 1. Fittings: Cast iron, ASTM A74.
  - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hub-less.
  - 1. Fittings: Cast iron, CISPI 301.
  - 2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.
- C. Ductile Iron Pipe: ASTM A746, extra heavy or service weight, bell and spigot ends.
  - 1. Fittings: AWWA C110, ductile or gray iron, standard thickness.
  - 2. Joints: AWWA C111, rubber gasket joint devices.
- D. PVC Pipe: ASTM D2729, polyvinyl chloride (PVC) material, bell and spigot solvent sealed ends.
  - 1. Fittings: PVC, ASTM D2729.
  - 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.
- E. PVC Pipe: ASTM D3034, Type PSM, polyvinyl chloride (PVC) material, bell and spigot style rubber ring sealed gasket joint.
  - 1. Fittings: PVC, ASTM D3034.
  - 2. Joints: ASTM F477, elastomeric gaskets.
- F. PVC Pipe: ASTM D1785, Schedule 40, polyvinyl chloride (PVC) material, bell and spigot style solvent sealed joint ends.
  - 1. Fittings: ASTM D2466, Schedule 40.
  - 2. Joints: ASTM D2855, solvent weld with ASTM D2564 Solvent cement.

### **2.02 SANITARY SEWER PIPING, ABOVE GRADE**

- A. Cast Iron Pipe: ASTM A74, service weight.
  - 1. Fittings: Cast iron, ASTM A74.
  - 2. Joints: ASTM C564, rubber gasket joint devices or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hub-less, service weight.

1. Fittings: Cast iron, CISPI 301.
  2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. PVC Pipe: ASTM D2729, polyvinyl chloride (PVC) material.
1. Fittings: ASTM D2729, PVC.
  2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.
- D. PVC Pipe: ASTM D2665, polyvinyl chloride (PVC) material.
1. Fittings: ASTM D2665, PVC.
  2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.
- E. PVC Pipe: ASTM D1785 Schedule 40 or ASTM D2241 SDR-26 for not less than 150 psi pressure rating, polyvinyl chloride (PVC) material.
1. Fittings: ASTM D2466, Schedule 40, PVC
  2. Joints: ASTM D2855, solvent weld with ASTM D2564 Solvent cement.

### **2.03 UNIONS AND FLANGES**

- A. Flanges for Pipe 2-1/2 inches and Larger:
1. PVC Piping: PVC flanges.
  2. Gaskets: 1/16 inch thick preformed neoprene gaskets.
- B. PVC Pipe Materials: For connections to equipment and valves with threaded connections, furnish solvent-weld socket to screwed joint adapters and unions, or ASTM D2464, Schedule 80, threaded, PVC pipe.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify excavations are to required grade, dry, and not over-excavated.

### **3.02 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

### **3.03 INSTALLATION - BURIED PIPING SYSTEMS**

- A. Verify connection size, location, and invert is as indicated on Drawings.
- B. Establish elevations of buried piping with not less than 3 ft of cover.

- C. Remove scale and dirt on inside of piping before assembly.
- D. Route pipe in straight line.

### **3.04 INSTALLATION - ABOVE GROUND PIPING**

- A. Establish invert elevations, slopes for drainage to 1/8 or 1/4 inch per foot minimum. Maintain gradients.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Provide clearances at cleanout for snaking drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- E. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- F. Install piping to maintain headroom. Do not spread piping, conserve space.
- G. Group piping whenever practical at common elevations.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- I. Provide clearance in hangers and from structure and other equipment for installation of insulation.
- J. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors with Division 8 and as noted on Architectural drawings.
- K. Install piping penetrating roofed areas to maintain integrity of roof assembly.
- L. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Division 9, Architectural and Mechanical drawings.
- M. Install bell and spigot pipe with bell end upstream.
- N. Sleeve pipes passing through partitions, walls and floors.
- O. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Division 7 and 15 related sections.
- P. Support cast iron drainage piping at every joint.
- Q. Material for service to comply with IBC Plumbing requirements with materials listed in these specifications for choice by the contractor.

- R. Crawl space sanitary piping to be any of the materials listed for service in these specifications. Provide sleeves where pipe penetrates walls or floors.

**END OF SECTION**

## SECTION 22 14 29

### SUMP AND CONDENSATE PUMPS

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### 1.02 SUMMARY

- A. Condensate Pumps
- B. Sump Pump

##### 1.03 SUBMITTALS

- A. Product Data: Include performance curves, furnished specialties, and accessories for each type and size of pump indicated.
- B. Shop Drawings: Show layout and connections for pumps. Include setting drawings with templates, directions for installing foundation and anchor bolts, and other anchorages.
  - 1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.
- C. Maintenance Data: For each type and size of pump specified to include in maintenance manuals specified in Division 1.

##### 1.04 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, connections, and dimensional requirements of pumps and are based on specific manufacturer types and models indicated. Other manufacturers' pumps with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

##### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.
- B. Protect bearings and couplings against damage.
- C. Comply with pump manufacturer's rigging instructions for handling.



## **PART 2 PRODUCTS**

### **2.01 Condensate Pumps**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Condensate Pumps:
    - a. Alyan Pump Co.
    - b. BJM Corp.
    - c. Burks Pumps
    - d. Chicago Pump Co.
    - e. Crane Pumps & Systems, Inc.; Weinman Div.
    - f. Federal Pump Corp.
    - g. Gorman-Rupp Co.
    - h. Goulds Pumps, Inc.
    - i. Grundfos Pumps Corp.
    - j. Liberty Pumps.
    - k. PACO Pumps, Inc.
    - l. Weil Pump Company
    - m. approved equal.
- B. Description: Vertically mounted, Simplex, direct-connected condensate pump with condensate collection tank and control panel.
1. Casing: Cast iron with metal inlet strainer. Include discharge companion flange suitable for plain-end pipe connection arranged for horizontal discharge.
  2. Impeller: Cast iron, bronze or brass,
  3. Pump and Motor Shaft: Steel, with factory-sealed, grease-lubricated ball bearings.
  4. Seal: Mechanical type.
  5. Motor: Hermetically sealed capacitor-start type; with built-in overload protection; and three-conductor waterproof power cable of length required, with grounding plug and cable-sealing assembly for connection at pump.
  6. Pump Discharge Piping: field fabricated, ASTM A 53, Schedule 40, galvanized-steel pipe or copper tube.
  7. Controls: simplex control panel, NEMA 1 Enclosure with:
    - a. Main circuit breaker
    - b. Motor contactor
    - c. H.D.A. selector switch
    - d. High level alarm
    - e. Audible alarm with silence switch
    - f. Remote mounted visual signal with tamper proof cover
    - g. NEMA float switches
  8. Tank: Cast Iron or Steel tank
- C. Discharge Pipe End Connections NPS 2 and Smaller: Threaded. Pumps available only with flanged-end discharge pipe may be furnished with threaded companion flanges.

- D. Motors: Single speed, with grease-lubricated ball bearings, and non-overloading through full range of pump performance curves.
- E. Finish: Manufacturer's standard paint applied to factory-assembled and -tested units before shipping.
- F. Performance:
  - 1. Scheduled on the drawings.

## 2.02 Sump Pumps

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Submersible Sump Pumps:
    - a. Alyan Pump Co.
    - b. Barnes Pumps, Inc.
    - c. Chicago Pump Co.
    - d. Crane Pumps & Systems, Inc.; Weinman Div.
    - e. Federal Pump Corp.
    - f. Goulds Pumps, Inc.
    - g. Grundfos Pumps Corp.
    - h. Liberty Pumps.
    - i. PACO Pumps, Inc.
    - j. Weil Pump Company
    - k. approved equal.
- B. General Description: Factory-assembled and -tested, single-stage, centrifugal, end-suction sump pump units complying with UL 778. Include motor, operating controls, and construction for permanent installation.
- C. Discharge Pipe End Connections NPS 2 and Smaller: Threaded. Pumps available only with flanged-end discharge pipe may be furnished with threaded companion flanges.
- D. Motors: Single speed, with grease-lubricated ball bearings, and non-overloading through full range of pump performance curves.
- E. Finish: Manufacturer's standard paint applied to factory-assembled and -tested units before shipping.
- F. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembling and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.
- G. Description: Simplex, submersible, direct-connected sump pump.
  - 1. Casing: Cast iron with metal inlet strainer. Include discharge companion flange suitable for plain-end pipe connection arranged for vertical discharge.
  - 2. Impeller: Cast iron, bronze or brass,

3. Pump and Motor Shaft: Steel, with factory-sealed, grease-lubricated ball bearings.
4. Seal: Mechanical type.
5. Motor: Hermetically sealed capacitor-start type; with built-in overload protection; and three-conductor waterproof power cable of length required, with grounding plug and cable-sealing assembly for connection at pump.
6. Pump Discharge Piping: field fabricated, ASTM A 53, Schedule 40, galvanized-steel pipe or copper tube.
7. Controls: simplex control panel, NEMA 1 Enclosure with:
  - a. Main circuit breaker
  - b. Motor contactor
  - c. H.D.A. selector switch
  - d. High level alarm
  - e. Audible alarm with silence switch
  - f. NEMA float switches

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine roughing-in of plumbing piping systems to verify actual locations of piping connections before pump installation.
- B. Examine electrical rough-in for power to unit.

### **3.02 INSTALLATION**

- A. Install pumps according to manufacturer's written instructions.
- B. Install pumps and arrange to provide access for maintenance, including removal of motors, impellers, couplings, and accessories.
- C. Support piping so weight of piping is not supported by pumps.
- D. Submersible Sump Pumps: Set pumps on basin, pit, or sump floor. Make direct connections to drainage piping and discharge as shown on the drawings.

### **3.03 CONNECTIONS**

- A. Drainage piping installation requirements are specified elsewhere in Division 15. Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements:
  1. Install discharge pipe sizes equal to or greater than diameter of pump nozzles and connect to discharge location.
  2. Install swing check valve and gate or ball valve on each sump pump discharge.
  3. Run piping as noted on the drawings.
- B. Install electrical connections for power, controls, and devices.

- C. Electrical power and control components, wiring, and connections are specified in Division 16 Sections.
- D. Ground equipment.
  - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### **3.04 ADJUSTING**

- A. Pump Controls: Set pump controls for automatic start, stop, and alarm operation as required for system application.

### **3.05 DEMONSTRATION**

- A. Demonstrate operation of each pump by adding water to sump basin.

**END OF SECTION**

## SECTION 22 40 00

### PLUMBING FIXTURES

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### 1.02 SUMMARY

- A. This Section includes plumbing fixtures and related components.

##### 1.03 DEFINITIONS

- A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

##### 1.04 SUBMITTALS

- A. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.
- B. Operation and maintenance data.

##### 1.05 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; about plumbing fixtures for people with disabilities.
- C. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- D. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
  - 1. Vitreous-China Fixtures: ASME A112.19.2M.
  - 2. Water-Closet, Flushometer Tank Trim: ASSE 1037.

- E. Comply with the following applicable standards and other requirements specified for lavatory faucets:
  - 1. Faucets: ASME A112.18.1M.
  - 2. NSF Materials: NSF 61.
  - 3. Pipe Threads: ASME B1.20.1.
  - 4. Supply and Drain Fittings: ASME A112.18.1M.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the specified manufacturers or equivalent from.
- B. Substitution Manufacturers.
  - 1. Manufacturers meeting criteria named and model number scheduled on the drawing, will be considered as equal. Submit substitution and note any deviation from the drawing model number indicated.
- C. Provide all supports, accessories, as required for complete system.

### **2.02 LAVATORY, URINALS, SINKS, DRINKING FOUNTAINS, TUBS, SHOWERS AND WATER CLOSETS**

- A. Refer to drawings, the scheduled fixture shall be the basis of minimum quality standards and shall include all components for a complete operation unit.
  - 1. Products:
    - a. Acorn Engineering
    - b. American Standard, Inc.
    - c. Crane Plumbing/Fiat Products
    - d. Delta
    - e. Eljer Plumbingware Division
    - f. Elkay
    - g. Fiat
    - h. Haws
    - i. Just Manufacturing Company
    - j. Kohler Co.
    - k. Lasco
    - l. Mansfield
    - m. Oasis
    - n. Orion
    - o. Sloan
    - p. Sloan
    - q. Symmons
    - r. Toto

- s. Universal-Rundle Corp.
- t. Waterless Urinals Company

B. Substitution Manufacturers.

- 1. Manufacturers meeting criteria of named manufacturer and model number scheduled on the drawing, will be considered as equal. Submit substitution and note any deviation from the drawing model number indicated.

C. Provide all supports, accessories, as required for complete system.

## **PART 3 EXECUTION**

### **3.01 FIXTURE INSTALLATION**

- A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- C. Install wall-hanging fixtures with tubular waste piping attached to supports.
- D. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.
- E. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
  - 1. Exception: Use ball valve if stops are not available for fixture. Locate ball valves on branch piping above ceiling.
- F. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
  - 1. Exception: Omit trap on fixtures with integral traps.
- G. Install toilet seats on water closets.
- H. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts. If faucets are not available with required rates and patterns, include adapters if required.
- I. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.
- J. Install escutcheons at piping wall penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.

- K. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 Section "Joint Sealants" for sealant and installation requirements. Where required by fine rating seal joints with fine rated caulking.
- L. Install fire caulking on concealed piping penetrating fire rated wall to fixture. Install pre-fabricated fire rated sleeves on exposed piping penetrating fire rated wall.

### **3.02 CONNECTIONS**

- A. Connect water supplies from water distribution piping to fixtures.
- B. Connect drain piping from fixtures to drainage piping.
- C. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.
- D. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.
- E. Supply and waste connections to owner or kitchen equipment: make all final connects to equipment with required reducers, or accessories.

### **3.03 PROTECTION**

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

**END OF SECTION**



## SECTION 26 05 00

### BASIC MATERIAL AND METHODS

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Review all division sections for coordination items and related work execution that develops standards of construction performance for installation.

##### 1.02 SUMMARY

- A. Section includes:
  1. Shop Drawings
  2. Rough patch Materials
  3. Piping materials and installation instructions common to most piping systems.
  4. Transition fittings.
  5. Dielectric fittings.
  6. Mechanical sleeve seals.
  7. Sleeves.
  8. Escutcheons.
  9. Mechanical demolition.
  10. Equipment installation requirements common to equipment sections.
  11. Painting and finishing.
  12. Concrete bases.
  13. Anchorages.
  14. Access doors.
  15. Installation coordination drawings.

##### 1.03 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

- F. Rough Patching: Patching material for opening created by removal of piping, conduit, etc. to close off opening with-in 1/16 inch of flush surface. Patching material to be compatible with existing construction.
- G. The following are industry abbreviations for plastic materials:
  - 1. CPVC: Chlorinated polyvinyl chloride plastic.
  - 2. PE: Polyethylene plastic.
  - 3. PVC: Polyvinyl chloride plastic.
- H. The following are industry abbreviations for rubber materials:
  - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
  - 2. NBR: Acrylonitrile-butadiene rubber.

#### **1.04 SUBMITTALS**

- A. Product Data: For the following:
  - 1. Transition fittings.
  - 2. Dielectric fittings.
  - 3. Mechanical sleeve seals.
  - 4. Escutcheons.
  - 5. Fire rated premanufactured sleeves
  - 6. Fire stop penetration materials
- B. Welding certificates.

#### **1.05 QUALITY ASSURANCE**

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- C. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
- D. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- E. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

## **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

## **1.07 COORDINATION**

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- B. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified or approved equal.

### **2.02 PIPE, TUBE, AND FITTINGS**

- A. Refer to individual Division 260000 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

### **2.03 JOINING MATERIALS**

- A. Refer to individual Division 260000 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
  - 2. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
  - 3. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 4. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAgl, silver alloy for refrigerant piping, unless otherwise indicated.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements for Joining Plastic Piping:
  - 1. CPVC Piping: ASTM F 493.
  - 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

#### **2.04 TRANSITION FITTINGS**

- A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
  - 1. Manufacturers:
    - a. Cascade Waterworks Mfg. Co.
    - b. Dresser Industries, Inc.; DMD Div.
    - c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
    - d. JCM Industries.
    - e. Smith-Blair, Inc.
    - f. Viking Johnson.
    - g. approved equal
  - 2. Aboveground Pressure Piping: Pipe fitting.
- B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
  - 1. Manufacturers:
    - a. Eslon Thermoplastics.
    - b. approved equal.
- C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
  - 1. Manufacturers:
    - a. Thompson Plastics, Inc.
    - b. approved equal.

## 2.05 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
  - 1. Manufacturers:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company.
    - c. Eclipse, Inc.
    - d. EpcO Sales, Inc.
    - e. Hart Industries, International, Inc.
    - f. Watts Industries, Inc.; Water Products Div.
    - g. Zurn Industries, Inc.; Wilkins Div.
    - h. approved equal.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
  - 1. Manufacturers:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company.
    - c. EpcO Sales, Inc.
    - d. Watts Industries, Inc.; Water Products Div.
    - e. approved equal.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
  - 1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Central Plastics Company.
    - d. Pipeline Seal and Insulator, Inc.
    - e. approved equal.
  - 2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
  - 1. Manufacturers:
    - a. Calpico, Inc.
    - b. Lochinvar Corp.
    - c. approved equal.

- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F .
  - 1. Manufacturers:
    - a. Perfection Corp.
    - b. Precision Plumbing Products, Inc.
    - c. Sioux Chief Manufacturing Co., Inc.
    - d. Victaulic Co. of America.
    - e. approved equal.

## **2.06 MECHANICAL SLEEVE SEALS**

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
  - 1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.
    - e. approved equal.
  - 2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - 3. Pressure Plates: Stainless steel, Include two for each sealing element.
  - 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## **2.07 SLEEVES**

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
- E. Underdeck Clamp: Clamping ring with set screws.
- F. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- G. PVC Pipe: ASTM D 1785, Schedule 40.
- H. Molded PE: Reusable, PE, tapered-cup shaped and smooth-outer surface with nailing flange for attaching to wooden forms.

## **2.08 ESCUTCHEONS**

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
  - 1. Finish: Polished chrome-plated or rough brass.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
  - 1. Finish: Polished chrome-plated or rough brass.
- E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Type: With hinge, set screw or spring clips, and chrome-plated finish.
- G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

## **2.09 ACCESS DOORS**

- A. Provide the following:
  - 1. Manufacturer: Milcor or approved equal.
  - 2. Door for drywall style DS, key locked with door to match fire rating in partition or ceiling where installed.

## **PART 3 EXECUTION**

### **3.01 MECHANICAL DEMOLITION**

- A. Refer to demolition notes on the drawings.
  - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
  - 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.

4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged by new construction work in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.
- D. Cutting and patching of walls, floors, roofs, or other surfaces to be coordinated with other Divisions in this specification.
1. Where demolition or repair of walls or other surfaces are noted on Architectural drawings then coordinate work.
  2. Where piping, conduits or equipment is removed and walls or other surfaces is to be patched and not indicated on Architectural drawings; this contractor to patch surface. The patch material to be coordinated with other division contractor which would be acceptable for finishing materials.
    - a. Submit to Architect proposal rough patching materials.
    - b. Concealed patch above ceilings does not require final patch finishing.
    - c. Exposed patch to receive final patching and paint such that final work will match adjacent surfaces in every respect.

### **3.02 PIPING SYSTEMS - COMMON REQUIREMENTS**

- A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.



- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors. Provide chrome plated finish in finished areas and rough brass at concealed area or mechanical room spaces. Provide according to the following:
  - 1. New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
    - f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
    - g. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
    - h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type with rough-brass finish.
    - i. Permanent sleeves are not required for holes formed by removable PE sleeves where sleeve extends (1) one inch above finished floor.
- M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
  - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

- N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
  - 2. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- P. Verify final equipment locations for roughing-in.
- Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### **3.03 PIPING JOINT CONSTRUCTION**

- A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
  - H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
  - I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
    1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
    2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
    3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
    4. PVC Nonpressure Piping: Join according to ASTM D 2855.
    5. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
  - J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
  - K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
  - L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
    1. Plain-End Pipe and Fittings: Use butt fusion.
    2. Plain-End Pipe and Socket Fittings: Use socket fusion.

### **3.04 PIPING CONNECTIONS**

- A. Make connections according to the following, unless otherwise indicated:
  1. Install unions, in piping NPS 2" and smaller, adjacent to each valve and at final connection to each piece of equipment.
  2. Install flanges, in piping NPS 2-1/2" and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### **3.05 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS**

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations
- D. Install equipment to allow right of way for piping installed at required slope.
- E. Coordinate with other Division 15 Sections and group valves, dampers, sensors, etc. requiring access from a single door. Size door large enough to service or remove items.

### **3.06 PAINTING**

- A. Damage and Touchup: Repair Equipment marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### **3.07 CONCRETE BASES**

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
  - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
  - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
  - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
  - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
  - 7. Use 3000-psi 28-day compressive-strength concrete and reinforcement.

**END OF SECTION**

## SECTION 26 05 19

### BUILDING WIRE AND CABLE

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### 1.02 SUMMARY

- A. Section includes building wire and cable; type NM-B cable, metal clad cable; and wiring connectors and connections.
- B. Related Sections:
  - 1. Section 16075 - Identification for Electrical Systems: Product requirements for wire identification.

##### 1.03 REFERENCES

- A. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- B. National Fire Protection Association:
  - 1. NFPA 70 - National Electrical Code.
  - 2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

##### 1.04 SYSTEM DESCRIPTION

- A. Product Requirements: Provide products as follows:
  - 1. Solid conductor for feeders and branch circuits 10 AWG and smaller.
  - 2. Stranded conductors for control circuits.
  - 3. Conductor not smaller than 12 AWG for power and lighting circuits.
  - 4. Conductor not smaller than 16 AWG for control circuits.
  - 5. 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet
- B. Wiring Methods: Provide the following wiring methods:
  - 1. Concealed Dry Interior Locations
    - a. Branch circuits in apartment units: Use building wire, Type THHN/THWN insulation, in raceway or type NM-B cable.
    - b. Panel feeders: Use building wire, Type THHN/THWN insulation, in conduit.
    - c. Branch circuits for mechanical and plumbing: Use building wire, Type THHN/THWN insulation, in conduit.

2. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
3. Above Accessible Ceilings: Use only building wire, Type THHN/THWN insulation, in raceway or type NM-B cable.
4. Wet or Damp Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
5. Exterior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
6. Underground Locations: Use only building wire, Type THHN/THWN insulation, in raceway.

## **1.05 SUBMITTALS**

- A. Submit catalog cuts with product data.

## **1.06 CLOSEOUT SUBMITTALS**

- A. Project Record Documents: Record actual locations of components and circuits.

## **1.07 QUALITY ASSURANCE**

- A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested in accordance with NFPA 262.

## **1.08 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

## **1.09 FIELD MEASUREMENTS**

- A. Verify field measurements are as indicated on Drawings.

## **1.10 COORDINATION**

- A. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.
- B. Wire and cable routing indicated is approximate unless dimensioned. Include wire and cable lengths within 20 ft of length shown.

## **PART 2 PRODUCTS**

### **2.01 BUILDING WIRE**

- A. Manufacturers:
  1. Diamond Wire & Cable Co.
  2. Essex Group Inc.

3. General Cable Co.
4. South Wire Co.
5. Approved equal.

B. Product Description: Single conductor insulated wire.

C. Conductor: Copper.

D. Insulation: 600 volt rating; thermoplastic material rated 90 degrees C.

## **2.02 METAL CLAD CABLE**

A. Manufacturers:

1. Diamond Wire & Cable Co.
2. Essex Group Inc.
3. General Cable Co.
4. South Wire Co.
5. Approved equal..

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation Temperature Rating: 90 degrees C.

E. Insulation Material: Thermoplastic.

F. Armor Material: Steel.

G. Armor Design: Corrugated tube.

H. Jacket: PVC where required.

## **2.03 TYPE NM-B CABLE**

A. Conductor: Copper.

B. Insulation Voltage Rating: 600 volts.

C. Insulation Temperature Rating: 90 degrees C.

D. Insulation Material: Thermoplastic.

E. 2 or 3 solid conductor cable with separate bare ground. Conductors shall have a PVC jacket.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify interior of building has been protected from weather.
- B. Verify mechanical work likely to damage wire and cable has been completed.
- C. Verify raceway installation is complete and supported.

### **3.02 PREPARATION**

- A. Completely and thoroughly swab raceway before installing wire.

### **3.03 INSTALLATION**

- A. Route wire and cable to meet Project conditions.
- B. Neatly train and lace wiring inside boxes, equipment, and loadcenters.
- C. Identify and color code wire and cable under provisions of Section 16075. Identify each conductor with its circuit number or other designation indicated.
- D. Special Techniques--Building Wire in Raceway:
  - 1. Pull conductors into raceway at same time.
  - 2. Install building wire 4 AWG and larger with pulling equipment.
- E. Special Techniques - Cable:
  - 1. Protect exposed cable from damage.
  - 2. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.
  - 3. Use suitable cable fittings and connectors.
- F. Special Techniques - Wiring Connections:
  - 1. Clean conductor surfaces before installing lugs and connectors.
  - 2. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
  - 3. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
  - 4. Install split bolt connectors for copper conductor splices and taps, 6 AWG and larger.
  - 5. Install solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
  - 6. Install insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
- G. Install solid conductor for feeders and branch circuits 10 AWG and smaller.



- H. Install stranded conductors for branch circuits 10 AWG and smaller. However, when stranded conductors are used in lieu of solid, then install crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under screws.

### **3.04 WIRE COLOR**

- A. General:
  - 1. For wire sizes 10 AWG and smaller, install wire colors in accordance with the following:
    - a. Black and red for single phase circuits at 120/240 volts.
  - 2. For wire sizes 8 AWG and larger, identify wire with colored tape at terminals, splices and boxes. Colors are as follows:
    - a. Black and red for single phase circuits at 120/240 volts.
- B. Neutral Conductors: White. When two or more neutrals are located in one conduit, individually identify each with proper circuit number.
- C. Branch Circuit Conductors: Install three or four wire home runs with each phase uniquely color coded.
- D. Feeder Circuit Conductors: Uniquely color code each phase.
- E. Ground Conductors:
  - 1. For 6 AWG and smaller: Green.
  - 2. For 4 AWG and larger: Identify with green tape at both ends and visible points including junction boxes.

### **3.05 FIELD QUALITY CONTROL**

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.3.1.

**END OF SECTION**

## SECTION 26 05 26

### GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### 1.02 SUMMARY

- A. Section Includes:
  - 1. Rod electrodes.
  - 2. Wire.
  - 3. Mechanical connectors.
  - 4. Exothermic connections.

##### 1.03 REFERENCES

- A. Institute of Electrical and Electronics Engineers:
  - 1. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
  - 2. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.
- B. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- C. National Fire Protection Association:
  - 1. NFPA 70 - National Electrical Code.

##### 1.04 SYSTEM DESCRIPTION

- A. Grounding systems use the following elements as grounding electrodes:
  - 1. Metal underground water pipe.
  - 2. Rod electrode.

##### 1.05 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 5 ohms maximum.

##### 1.06 SUBMITTALS

- A. Product Data: Submit data on grounding electrodes and connections.
- B. Test Reports: Indicate overall resistance to ground and resistance of each electrode.
- C. Manufacturer's Installation Instructions: Submit for active electrodes.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

### **1.07 CLOSEOUT SUBMITTALS**

A. Project Record Documents: Record actual locations of components and grounding electrodes.

### **1.08 QUALITY ASSURANCE**

A. Provide grounding materials conforming to requirements of NEC, IEEE 142, and UL labeled.

B. Perform Work in accordance with local authority having jurisdiction and National Electrical Code.

### **1.09 QUALIFICATIONS**

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing work of this section approved by the manufacturer.

### **1.10 DELIVERY, STORAGE, AND HANDLING**

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

C. Do not deliver items to project before time of installation. Limit shipment of bulk and multiple-use materials to quantities needed for immediate installation.

## **PART 2 PRODUCTS**

### **2.01 ROD ELECTRODES**

A. Manufacturers:

1. Apache Grounding/Erico Inc.
2. Copperweld, Inc.
3. Erico, Inc..
4. O-Z Gedney Co.
5. Thomas & Betts, Electrical] Model

B. Product Description:

1. Material: Copper-clad steel.
2. Diameter: 3/4 inch.
3. Length: 10 feet.

- C. Connector: Connector for exothermic welded connection.

## **2.02 WIRE**

- A. Material: Stranded copper.
- B. Minimum: 4AWG.
- C. Grounding Electrode Conductor: Copper conductor bare.
- D. Bonding Conductor: Copper conductor bare.

## **2.03 MECHANICAL CONNECTORS**

- A. Manufacturers:
  1. Apache Grounding/Erico Inc.
  2. Copperweld, Inc.
  3. Erico, Inc.
  4. ILSCO Corporation.
  5. O-Z Gedney Co.
  6. Thomas & Betts, Electrical.
- B. Description: Bronze connectors, suitable for grounding and bonding applications, in configurations required for particular installation.

## **2.04 EXOTHERMIC CONNECTIONS**

- A. Manufacturers:
  1. Apache Grounding/Erico Inc.
  2. Cadweld, Erico, Inc.
  3. Copperweld, Inc.
  4. ILSCO Corporation.
  5. O-Z Gedney Co.
  6. Thomas & Betts, Electrical.
- B. Product Description: Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify final backfill and compaction has been completed before driving rod electrodes.

### **3.02 PREPARATION**

- A. Remove paint, rust, mill oils, surface contaminants at connection points.

### **3.03 INSTALLATION**

- A. Install in accordance with IEEE and NEC.
- B. Install rod electrodes at locations at service entrance equipment.. Install additional rod electrodes to achieve specified resistance to ground.
- C. Install grounding and bonding conductors concealed from view.
- D. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- E. Install continuous grounding using underground cold water system and ground rod electrodes.
- F. Permanently ground entire light and power system in accordance with NEC, including service equipment, meter centers, load centers, light fixtures, switch and starter enclosures, motor frames, grounding type receptacles, light poles, and other exposed non-current carrying metal parts of electrical equipment.
- G. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes or metal enclosures of service equipment. Ground conduits by means of grounding bushings on terminations at panelboards with installed number 12 conductor to grounding bus.
- H. Grounding electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC.
- I. Permanently attach equipment and grounding conductors prior to energizing equipment.

### **3.04 FIELD QUALITY CONTROL**

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Grounding and Bonding: Perform inspections and tests listed in NETA ATS, Section 7.13.
- C. Perform ground resistance testing in accordance with IEEE 142.
- D. Perform continuity testing in accordance with IEEE 142.
- E. When improper grounding is found on receptacles, check receptacles in entire project and correct. Perform retest.

**END OF SECTION**

## SECTION 26 05 29

### HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### 1.02 SUMMARY

- A. Section Includes:
  - 1. Conduit supports.
  - 2. Formed steel channel.
  - 3. Spring steel clips.
  - 4. Sleeves.
  - 5. Mechanical sleeve seals.
  - 6. Firestopping relating to electrical work.
  - 7. Firestopping accessories.
  - 8. Equipment bases and supports.

##### 1.03 REFERENCES

- A. ASTM International:
  - 1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
  - 3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
  - 4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.
- B. FM Global:
  - 1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.
- C. National Fire Protection Association:
  - 1. NFPA 70 - National Electrical Code.
- D. Underwriters Laboratories Inc.:
  - 1. UL 263 - Fire Tests of Building Construction and Materials.
  - 2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
  - 3. UL 1479 - Fire Tests of Through-Penetration Firestops.
  - 4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
  - 5. UL - Fire Resistance Directory.
- E. Intertek Testing Services (Warnock Hersey Listed):

1. WH - Certification Listings.

#### **1.04 DEFINITIONS**

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

#### **1.05 SYSTEM DESCRIPTION**

- A. Firestopping Materials: ASTM E119, ASTM E814, UL 263, UL 1479 to achieve fire ratings as noted on Architectural Drawings for adjacent construction, but not less than 1 hour fire rating.
- B. Surface Burning: with maximum flame spread / smoke developed rating of 25/450.
- C. Firestop interruptions to fire rated assemblies, materials, and components.

#### **1.06 PERFORMANCE REQUIREMENTS**

- A. Firestopping: Conform to applicable code for fire resistance ratings and surface burning characteristics.
- B. Firestopping: Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

#### **1.07 SUBMITTALS**

- A. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.
- B. Product Data:
  1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
  2. Firestopping: Submit data on product characteristics, performance and limitation criteria.
- C. Manufacturer's Installation Instructions:
  1. Hangers and Supports: Submit special procedures and assembly of components.
  2. Firestopping: Submit preparation and installation instructions.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- E. Engineering Judgements: For conditions not covered by UL or WH listed designs, submit judgements by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.

#### **1.08 QUALITY ASSURANCE**

- A. Through Penetration Firestopping of Fire Rated Assemblies: [UL 1479 or] ASTM E814 with 0.10 inch water gage minimum positive pressure differential to achieve fire

F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.

1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.
2. Floor Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
  - a. Floor Penetrations With-in Wall Cavities: T-Rating is not required.

B. Through Penetration Firestopping of Non-Fire Rated Floor Assemblies: Materials to resist free passage of flame and products of combustion.

1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.

C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.

D. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10 inch water gage minimum positive pressure differential to achieve fire resistant rating as indicated on Drawings for floor assembly.

E. Surface Burning Characteristics: 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

F. Perform Work in accordance with local authority having jurisdiction.

## **1.09 QUALIFICATIONS**

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing work of this section approved by manufacturer.

## **1.10 DELIVERY, STORAGE, AND HANDLING**

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

## **1.11 ENVIRONMENTAL REQUIREMENTS**

A. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F.



- B. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.
- C. Provide ventilation in areas to receive solvent cured materials.

## **PART 2 PRODUCTS**

### **2.01 CONDUIT SUPPORTS**

- A. Manufacturers:
  - 1. Allied Tube & Conduit Corp.
  - 2. Electroline Manufacturing Company.
  - 3. O-Z Gedney Co.
  - 4. Substitutions: Section 01600 - Product Requirements.
- B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.
- C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
- D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.
- E. Conduit clamps - general purpose: One hole malleable iron for surface mounted conduits.
- F. Cable Ties: High strength nylon temperature rated to 185 degrees F. Self locking.

### **2.02 FORMED STEEL CHANNEL**

- A. Manufacturers:
  - 1. Allied Tube & Conduit Corp.
  - 2. B-Line Systems.
  - 3. Midland Ross Corporation, Electrical Products Division.
  - 4. Unistrut Corp.
  - 5. Substitutions: Section 01600 - Product Requirements.
- B. Product Description: Galvanized (12 gage) thick steel. With holes 1-1/2 inches on center.

### **2.03 SLEEVES**

- A. Furnish materials in accordance with local authority having jurisdiction and industry standards.
- B. Sleeves for Through Non-fire Rated Floors: 18 gage thick galvanized steel.

- C. Sleeves for Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- D. Sleeves for Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.
- E. Fire-stopping Insulation: Glass fiber type, non-combustible.

## **2.04 MECHANICAL SLEEVE SEALS**

- A. Manufacturers:
  1. Thunderline Link-Seal, Inc.
  2. NMP Corporation.
  3. Substitutions: Section 01600 - Product Requirements.
- B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

## **2.05 FIRESTOPPING**

- A. Manufacturers:
  1. Dow Corning Corp.
  2. Fire Trak Corp.
  3. Hilti Corp.
  4. International Protective Coating Corp.
  5. 3M fire Protection Products.
  6. Specified Technology, Inc.
  7. Substitutions: Section 01600 - Product Requirements.
- B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
  1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
  2. Foam Firestopping Compounds: Single component foam compound.
  3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
  4. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.
  5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
  6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
  7. Firestop Pillows: Formed mineral fiber pillows.
- C. Color: As selected from manufacturer's full range of colors.

## **2.06 FIRESTOPPING ACCESSORIES**

- A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.
- B. Dam Material: Permanent:
  - 1. Mineral fiberboard.
  - 2. Mineral fiber matting.
  - 3. Sheet metal.
  - 4. Plywood or particle board.
  - 5. Alumina silicate fire board.
- C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
- D. General:
  - 1. Furnish UL listed products.
  - 2. Select products with rating not less than rating of wall or floor being penetrated.
- E. Non-Rated Surfaces:
  - 1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.
  - 2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify openings are ready to receive sleeves.
- B. Verify openings are ready to receive firestopping.

### **3.02 PREPARATION**

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.
- C. Install damming materials to arrest liquid material leakage.
- D. Do not drill or cut structural members.

### **3.03 INSTALLATION - HANGERS AND SUPPORTS**

- A. Anchors and Fasteners:

1. Concrete Structural Elements: Provide precast inserts, expansion anchors and preset inserts required for existing and new construction.
2. Steel Structural Elements: Provide beam clamps.
3. Concrete Surfaces: Provide self-drilling anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts and hollow wall fasteners.
5. Solid Masonry Walls: Provide expansion anchors and preset inserts.
6. Sheet Metal: Provide sheet metal screws.
7. Wood Elements: Provide wood screws.

B. Inserts:

1. Install inserts for placement in concrete forms.
2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

C. Install conduit and raceway support and spacing in accordance with NEC.

D. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

E. Install multiple conduit runs on common hangers.

F. Supports:

1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
2. Install surface mounted cabinets and panelboards/loadcenters with minimum of four anchors.
3. In wet and damp locations install steel channel supports to stand cabinets and panelboards/loadcenters 1 inch off wall.
4. Support vertical conduit at every floor.

### **3.04 INSTALLATION - FIRESTOPPING**

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.
- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating, to uniform density and texture.
- D. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.

- E. Remove dam material after firestopping material has cured.
- F. Fire Rated Surface:
  - 1. Seal opening at floor, wall, partition, ceiling, and roof as follows:
    - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
    - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
    - c. Pack void with backing material.
    - d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
  - 2. Where cable tray, bus, cable bus, conduit, wireway, trough, penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.
- G. Non-Rated Surfaces:
  - 1. Seal opening through non-fire rated wall, partition, floor, ceiling, and roof opening as follows:
    - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
    - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
    - c. Install type of firestopping material recommended by manufacturer.
  - 2. Install escutcheons or ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
  - 3. Exterior wall openings below grade: Assemble rubber links of mechanical seal to size of conduit and tighten in place, in accordance with manufacturer's instructions.
  - 4. Interior partitions: Seal pipe penetrations at computer rooms, telecommunication rooms, data rooms. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

### **3.05 INSTALLATION - EQUIPMENT BASES AND SUPPORTS**

- A. Provide housekeeping pads of concrete for meter center equipment, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment.
- B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of formed steel channel. Brace and fasten with flanges bolted to structure.

### **3.06 INSTALLATION - SLEEVES**

- A. Exterior watertight entries: Seal with adjustable interlocking rubber links.
- B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.

- C. Set sleeves in position in forms. Provide reinforcing around sleeves.
- D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- E. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.
- F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with stuffing] insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- G. Install chrome plated steel escutcheons at finished surfaces.

### **3.07 FIELD QUALITY CONTROL**

- A. Inspect installed firestopping for compliance with specifications and submitted schedule.

### **3.08 CLEANING**

- A. Clean adjacent surfaces of firestopping materials.

### **3.09 PROTECTION OF FINISHED WORK**

- A. Protect adjacent surfaces from damage by material installation.

**END OF SECTION**

## **SECTION 26 05 33**

### **RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### **1.02 SUMMARY**

- A. Section includes conduit and tubing, surface raceways, outlet boxes, pull and junction boxes.
- B. Related Sections:
  - 1. Section 16060 - Grounding and Bonding for Electrical Systems.
  - 2. Section 16070 - Hangers and Supports for Electrical Systems.
  - 3. Section 16075 - Identification for Electrical Systems.
  - 4. Section 16140 - Wiring Devices.
  - 5. Section 16150 - Wiring Connections.

##### **1.03 REFERENCES**

- A. American National Standards Institute:
  - 1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
  - 2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
  - 3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).
- B. National Electrical Manufacturers Association:
  - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
  - 2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
  - 3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
  - 4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
  - 5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
  - 6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
  - 7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

##### **1.04 SYSTEM DESCRIPTION**

- A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory

requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.

- B. Underground More than 5 feet outside Foundation Wall: Provide, thickwall nonmetallic conduit. Provide cast metal boxes.
- C. Underground Within 5 feet from Foundation Wall: Provide, plastic coated conduit. Provide cast metal or nonmetallic boxes.
- D. In or Under Slab on Grade: Provide rigid steel conduit. Provide cast or nonmetallic metal boxes.
- E. Outdoor Locations, Above Grade: Provide, intermediate metal conduit. Provide cast metal or nonmetallic outlet, pull, and junction boxes.
- F. In Slab Above Grade: Provide, intermediate metal conduit. Provide sheet metal boxes.
- G. Wet and Damp Locations: Provide, intermediate metal conduit. Provide cast metal or nonmetallic outlet, junction, and pull boxes. Provide flush mounting outlet box in finished areas.
- H. Concealed Dry Locations: Provide, electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.
- I. Exposed Dry Locations: Provide, intermediate metal conduit. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

## **1.05 DESIGN REQUIREMENTS**

- A. Minimum Raceway Size: 1/2 inch unless otherwise specified.

## **1.06 SUBMITTALS**

- A. Product Data: Submit for the following:
  - 1. Flexible metal conduit.
  - 2. Liquidtight flexible metal conduit.
  - 3. Nonmetallic conduit.
  - 4. Flexible nonmetallic conduit.
  - 5. Raceway fittings.
  - 6. Conduit bodies.
  - 7. Surface raceway.
  - 8. Pull and junction boxes.
- B. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements.



Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

### **1.07 CLOSEOUT SUBMITTALS**

- A. Project Record Documents:
  - 1. Record actual routing of conduits larger than 2 inch.
  - 2. Record actual locations and mounting heights of outlet, pull, and junction boxes.

### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- B. Protect PVC conduit from sunlight.

### **1.09 COORDINATION**

- A. Coordinate installation of outlet boxes for equipment connected under Section 16150.
- B. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

## **PART 2 PRODUCTS**

### **2.01 METAL CONDUIT**

- A. Manufacturers:
  - 1. Carlon Electrical Products.
  - 2. Hubbell Wiring Devices.
  - 3. Thomas & Betts Corp.
  - 4. Walker Systems Inc.
  - 5. The Wiremold Co.
  - 6. Approved equal.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Rigid Aluminum Conduit: ANSI C80.5.
- D. Intermediate Metal Conduit (IMC): Rigid steel.
- E. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

### **2.02 PVC COATED METAL CONDUIT**

- A. Product Description: NEMA RN 1; rigid steel conduit with external PVC coating, 40 mil thick.

- B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

### **2.03 FLEXIBLE METAL CONDUIT**

- A. Product Description: Interlocked steel construction.
- B. Fittings: NEMA FB 1.

### **2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT**

- A. Product Description: Interlocked steel with PVC jacket.
- B. Fittings: NEMA FB 1.

### **2.05 ELECTRICAL METALLIC TUBING (EMT)**

- A. Product Description: ANSI C80.3; galvanized tubing.
- B. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron, compression type.

### **2.06 NONMETALLIC CONDUIT**

- A. Product Description: NEMA TC 2; Schedule 40 PVC.
- B. Fittings and Conduit Bodies: NEMA TC 3.

### **2.07 SURFACE METAL RACEWAY**

- A. Manufacturers:
  - 1. Wiremold V700 Series or approved equal.
- B. Product Description: Steel channel with fitted cover, suitable for use as surface raceway.
- C. Finish: White
- D. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories, finish to match raceway.

### **2.08 OUTLET BOXES**

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
  - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.
  - 2. Concrete Ceiling Boxes: Concrete type.
- B. Nonmetallic Outlet Boxes: NEMA OS 2.

- C. Cast Boxes: NEMA FB 1, Type FD, cast ferrous alloy. Furnish gasketed cover by box manufacturer.
- D. Wall Plates for Finished Areas: As specified in Section 16140.
- E. Wall Plates for Unfinished Areas: Furnish gasketed cover.

## **2.09 PULL AND JUNCTION BOXES**

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Hinged Enclosures: As specified in Section 16131.
- C. Surface Mounted Cast Metal Box: NEMA 250, Type 4X; flat-flanged, surface mounted junction box:
  - 1. Material: Cast aluminum.
  - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- D. In-Ground reinforced fiberglass handhole: , outside flanged, recessed cover box for flush mounting:
  - 1. Material: Cast aluminum.
  - 2. Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.
  - 3. Cover Legend: "ELECTRIC".

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

### **3.02 INSTALLATION**

- A. Ground and bond raceway and boxes in accordance with Section 16060.
- B. Fasten raceway and box supports to structure and finishes in accordance with Section 16070.
- C. Identify raceway and boxes in accordance with Section 16075.
- D. Arrange raceway and boxes to maintain headroom and present neat appearance.

### **3.03 INSTALLATION - RACEWAY**

- A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.
- B. Arrange raceway supports to prevent misalignment during wiring installation.

- C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 16070 ; provide space on each for 25 percent additional raceways.
- E. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports
- F. Do not attach raceway to ceiling support wires or other piping systems.
- G. Construct wireway supports from steel channel specified in Section 16070.
- H. Route exposed raceway parallel and perpendicular to walls.
- I. Route raceway installed above accessible ceilings parallel and perpendicular to walls.
- J. Route conduit in and under slab from point-to-point.
- K. Maintain clearance between raceway and piping for maintenance purposes.
- L. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.
- M. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- N. Bring conduit to shoulder of fittings; fasten securely.
- O. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.
- P. Install conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- Q. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install factory elbows for bends in metal conduit larger than 2 inch size.
- R. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
- S. Install fittings to accommodate expansion and deflection where raceway crosses seismic, control and expansion joints.
- T. Install suitable pull string or cord in each empty raceway except sleeves and nipples.
- U. Install suitable caps to protect installed conduit against entrance of dirt and moisture.

- V. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.

### **3.04 INSTALLATION - BOXES**

- A. Install wall mounted boxes at elevations to accommodate mounting heights as indicated on Drawings or specified in section for outlet device.
- B. Where outlet boxes are installed in fire rated walls and or partitions installation shall comply with requirements to maintain the UL rating of wall.
- C. Protect wiring to outlet boxes with UL listed steel plates where installed within 1-1/4" of the edge of stud.
- D. Adjust box location up to 15 feet prior to rough-in to accommodate intended purpose.
- E. Orient boxes to accommodate wiring devices oriented as specified in Section 16140.
- F. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- G. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- H. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- I. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches separation. Install with minimum 24 inches separation in fire rated walls and acoustic walls.
- J. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- K. Install stamped steel bridges to fasten flush mounting outlet box between studs.
- L. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- M. Install adjustable steel channel fasteners for hung ceiling outlet box.
- N. Do not fasten boxes to ceiling support wires or other piping systems.
- O. Support boxes independently of conduit.
- P. Install gang box where more than one device is mounted together. Do not use sectional box.

Q. Install gang box with plaster ring for single device outlets.

### **3.05 INTERFACE WITH OTHER PRODUCTS**

- A. Install conduit and outlet boxes to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with applicable codes.
- B. Locate outlet boxes to allow luminaires positioned as indicated on Drawings and or required for installation.
- C. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

### **3.06 ADJUSTING**

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closures in unused openings in boxes.

### **3.07 CLEANING**

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

### **3.08 CLOSEOUT SUBMITTALS**

- A. Project Record Documents:
  - 1. Record actual routing of conduits larger than 2 inch.
  - 2. Record actual locations and mounting heights of outlet, pull, and junction boxes.

### **3.09 DELIVERY, STORAGE, AND HANDLING**

- A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- B. Protect PVC conduit from sunlight.

### **3.10 COORDINATION**

- A. Coordinate installation of outlet boxes for equipment connected under Section 16150.
- B. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

**END OF SECTION**

## SECTION 26 05 53

### ELECTRICAL IDENTIFICATION

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### 1.02 SUMMARY

- A. Section Includes:
  - 1. Nameplates.
  - 2. Labels.
  - 3. Wire markers.

##### 1.03 REFERENCES

- A. ANSI A13.1
- B. ANSI C2
- C. NFPA 70
- D. 29 CFR 1910.145

##### 1.04 SUBMITTALS

- A. Product Data:
  - 1. Submit manufacturer's catalog literature for each product required.
  - 2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.

##### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept identification products on site in original containers. Inspect for damage.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

##### 1.06 ENVIRONMENTAL REQUIREMENTS

- A. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Provide electrical identification products of one of the following:
  - 1. Alarm Supply Co, Inc.
  - 2. Brady, W.H. Co.
  - 3. Calpico, Inc.
  - 4. Cole-Flex Corp.
  - 5. Direct Safety Co.
  - 6. George-Ingraham Corp.
  - 7. Griffolyn Company
  - 8. Ideal Industries, Inc.
  - 9. LEM Products, Inc.
  - 10. Markal Company
  - 11. National Band and Tag Co.
  - 12. Panduit Corp.
  - 13. Radar Engineers Division, EPIC Corp.
  - 14. Seton Name Plate Co.
  - 15. Tesa Corp.
- B. Furnish materials in accordance with State of Pennsylvania standards.

### **2.02 NAMEPLATES**

- A. Product Description: Laminated three-layer plastic with engraved white letters on black contrasting background color.
- B. Letter Size:
  - 1. 1/8 inch high letters for identifying individual equipment and loads.
  - 2. 1/4 inch high letters for identifying grouped equipment and loads.

### **2.03 LABELS**

- A. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background.

### **2.04 WIRE MARKERS**

- A. Description: Cloth tape type wire markers.
- B. Legend:
  - 1. Power and Lighting Circuits: Branch circuit or feeder number as indicated on Drawings.
  - 2. Control Circuits: Control wire number as indicated on shop drawings.



## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Degrease and clean surfaces to receive adhesive for identification materials.

### **3.02 INSTALLATION**

- A. Install identifying devices after completion of painting.
- B. Nameplate Installation:
  - 1. Install nameplate parallel to equipment lines.
  - 2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.
  - 3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
  - 4. Secure nameplate to equipment front using rivets or adhesive.
  - 5. Install nameplates for the following:
    - a. Meter Centers
    - b. Load centers.
    - c. Disconnect switches.
    - d. Motor starters.
    - e. Contactors.
    - f. Electrical cabinets and enclosures.
- C. Label Installation:
  - 1. Install label parallel to equipment lines.
  - 2. Install label for identification of individual control device stations, and receptacles
  - 3. Install labels for permanent adhesion and seal with clear lacquer.
- D. Wire Marker Installation:
  - 1. Install wire marker for each conductor at load center gutters, pull boxes , outlet and junction boxes and each load connection.
  - 2. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.

**END OF SECTION**

## **SECTION 26 06 00**

### **ELECTRICAL UTILITY SERVICES**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### **1.02 SUMMARY**

- A. Section includes arrangement with Utility Company for permanent electric service; payment of Utility Company charges for service; service provisions; and utility metering equipment.

##### **1.03 SYSTEM DESCRIPTION**

- A. Utility Company: PPL
- B. System Characteristics 120/240volts, single phase, three-wire, 60 Hertz.
- C. Service Entrance: Underground.
- D. Underground Service Provisions: Underground service entrance to building service entrance equipment.
  - 1. Utility Raceway Connection: At main service breaker
  - 2. Utility Service-Entrance Conductor Connection: At main service breaker

##### **1.04 SUBMITTALS**

- A. Submit to Utility Company for approval of meter center and service entrance pull section and main breaker.

##### **1.05 QUALITY ASSURANCE**

- A. Perform Work in accordance with Utility Company written requirements.
- B. Maintain one copy of each document on site.

##### **1.06 FIELD MEASUREMENTS**

- A. Verify field measurements are as indicated on Drawings and Utility Company drawings.

## **1.07 COORDINATION**

- A. Contact utility company regarding charges related to service installation. Include utility charges in this contract.
- B. Utility charges for service installation will be paid by Contractor are to be part of contractors bid price.

## **PART 2 PRODUCTS**

### **2.01 UTILITY METERS**

- A. Furnished by Utility Company.

### **2.02 UTILITY METER BASE**

- A. Provided by the electrical contractor in accordance with utility company requirements.

### **2.03 MAIN SERVICE BREAKER, PULL SECTION AND METER CENTER**

- A. Provided by the electrical contractor in accordance with PPL requirements and indicated on the drawings:
  - 1. Service cable Pull Section
  - 2. Main service breaker AIC rating of 42,000 amps.( size as indicated on the drawings)
  - 3. Meter Center with individual service breakers AIC rating of 22,000 amps
  - 4. All equipment in Nema 3 R enclosures.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify service equipment is ready to be connected and energized.

### **3.02 INSTALLATION**

- A. Install service entrance conduits to building service entrance equipment. Utility Company will connect service lateral conductors to service entrance main breaker.

**END OF SECTION**

## **SECTION 26 07 00**

### **ELECTRICAL DEMOLITION**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### **1.02 SUMMARY**

- A. Section Includes:
  - 1. Removal of existing electrical equipment, wiring, and conduit in areas to be remodeled; removal of designated construction; dismantling, cutting and alterations for completion of the Work.
  - 2. Disposal of materials.
  - 3. Storage of removed materials.
  - 4. Identification of utilities.
  - 5. Salvaged items.
  - 6. Relocate existing equipment to accommodate construction.

##### **1.03 SCHEDULING**

- A. Schedule work to coincide with new construction and work to be performed in existing construction areas.
- B. Cease operations immediately when structure appears to be in danger and notify Professional. Do not resume operations until directed.

##### **1.04 COORDINATION**

- A. Conduct demolition to minimize interference with adjacent occupied building areas.
- B. Coordinate demolition work with all trades
- C. Coordinate and sequence demolition so as not to cause shutdown of operation of surrounding areas.
- D. Shut-down Periods:
  - 1. Arrange timing of shut-down periods of in service panels with Owner. Do not shut down any utility without prior written approval.
  - 2. Keep shut-down period to minimum or use intermittent period as directed by Owner.
  - 3. Maintain life-safety systems in full operation in occupied facilities.
- E. Identify salvage items in cooperation with Owner.

## **PART 2 PRODUCTS-Not Used**

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify wiring and equipment indicated to be demolished serve only abandoned facilities.
- B. Verify termination points for demolished services.

### **3.02 PREPARATION**

- A. Erect, and maintain temporary safeguards, including warning signs and lights, barricades, and similar measures, for protection of the public, Owner, Contractor's employees, and existing improvements to remain.
- B. Temporary egress signage and emergency lighting

### **3.03 DEMOLITION**

- A. Remove all exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- B. Remove all conduit, wire, boxes, and fastening devices to avoid any interference with new installation.
- C. Disconnect all electrical systems in walls, floors, and ceilings scheduled for removal.
- D. Reconnect equipment being disturbed by renovation work and required for continue service to or nearest available panel.
- E. Disconnect or shut off service to areas where electrical work is to be removed. Remove electrical fixtures, equipment, and related switches, outlets, conduit and wiring which are not part of final project.
- F. Install temporary wiring and connections to maintain existing systems in service during construction.
- G. Perform work on energized equipment or circuits with experienced and trained personnel.
- H. Remove, relocate, and extend existing installations to accommodate new construction.
- I. Repair adjacent construction and finishes damaged during demolition and extension work.
- J. Remove exposed abandoned grounding and bonding components, fasteners and supports, and electrical identification components, including abandoned components

above accessible ceiling finish. Cut embedded support elements flush with walls and floors.

- K. Clean and repair existing equipment to remain or to be reinstalled.
- L. Protect and retain power to existing active equipment remaining.
- M. Cap abandoned empty conduit at both ends.
- N. Remove all existing electrical equipment including, but not limited to the following:
  1. All panelboards, load centers, screw in type fuse boxes, disconnect switches, starters, and all other electrical equipment which is not identified on the drawings as existing to remain.
  2. All wiring devices, including switches, receptacles, smoke detectors, door bell and chimes, etc.
  3. All power wiring, conduit, surface raceway, etc.
  4. All telephone, data and cable TV wiring and devices.
  5. All lighting fixtures interior and exterior.
  6. All overhead service conductors, utility poles, transformers, service masts, conduit, etc. related to the removal of the existing electrical service for this phase of construction.
  7. All cable and phone service cabinets and service entrance cables to buildings being renovated under this phase of construction.

### **3.04 CLEANING**

- A. Remove demolished materials as work progresses. Legally dispose.
- B. Keep workplace neat.

### **3.05 PROTECTION OF FINISHED WORK**

- A. Do not permit traffic over unprotected floor surface

**END OF SECTION**

## **SECTION 26 24 00**

### **LOADCENTERS**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### **1.02 SUMMARY**

- A. Section includes loadcenters.
- B. Related Sections:
  - 1. Section 16060 - Grounding and Bonding for Electrical Systems.
  - 2. Section 16075 - Identification for Electrical Systems.

##### **1.03 REFERENCES**

- A. Institute of Electrical and Electronics Engineers:
  - 1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
- B. National Electrical Manufacturers Association:
  - 1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
  - 2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
  - 3. NEMA PB 1 - Panelboards.
  - 4. NEMA PB 1.1 - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.
- C. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- D. National Fire Protection Association:
  - 1. NFPA 70 - National Electrical Code.
- E. Underwriters Laboratories Inc.:
  - 1. UL 67 - Safety for Panelboards.

##### **1.04 SUBMITTALS**

- A. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and arrangement and sizes.

- B. Product Data: Submit catalog data showing specified features of standard products.

## **1.05 CLOSEOUT SUBMITTALS**

- A. Project Record Documents: Record actual locations of loadcenters and record actual circuiting arrangements.
- B. Operation and Maintenance Data: Submit spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

## **1.06 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

## **PART 2 PRODUCTS**

### **2.01 BRANCH CIRCUIT LOADCENTERS**

- A. Manufacturers:
  - 1. GE Electrical.
  - 2. Siemens.
  - 3. Square D.
  - 4. Cutler Hammer.
  - 5. Substitutions: Division 1 - Product Requirements.
- B. Product Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit loadcenters.
- C. Loadcenter Bus: Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each loadcenter.
- D. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical for 240 volt loadcenter. Refer to drawings for each AIC rating of loadcenters.
- E. Molded Case Circuit Breakers: NEMA AB 1, plug-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.
- F. Provide arc fault breakers for all breakers feeding bedroom circuits.
- G. Enclosure: NEMA PB 1, Type 1 for interior locations and type 3R for exterior locations.
- H. Cabinet Box: 4-3/4" inches deep, 15 inches wide.



- I. Cabinet Front: Flush or Surface (as indicated on drawing schedules) cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike. Finish in manufacturer's standard gray enamel.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install loadcenters in accordance with NEMA PB 1.1.
- B. Install loadcenters plumb.
- C. Install recessed loadcenters flush with wall finishes.
- D. Height: 4 feet to centerline of main breaker.
- E. Install filler plates for unused spaces in loadcenters.
- F. Provide typed circuit directory for each branch circuit loadcenter . Revise directory to reflect circuiting changes to balance phase loads.
- G. Install engraved plastic nameplates in accordance with Section 16075.
- H. Install spare conduits out of each recessed loadcenter to accessible location above ceiling. Minimum spare conduits: 2 empty 1 inch. Identify each as SPARE.
- I. Ground and bond loadcenter enclosure according to Section 16060. Connect equipment ground bars of panels in accordance with NFPA 70.

### **3.02 FIELD QUALITY CONTROL**

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform circuit breaker inspections and tests listed in NETA ATS, Section 7.6.
- C. Perform switch inspections and tests listed in NETA ATS, Section 7.5.

### **3.03 ADJUSTING**

- A. Measure steady state load currents at each loadcenter; rearrange circuits in loadcenter to balance phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

**END OF SECTION**

## **SECTION 26 27 26**

### **WIRING DEVICES**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### **1.02 SUMMARY**

- A. Section includes wall switches; receptacles; cable and phone devices, device plates and decorative box covers.
- B. Related Sections:
  - 1. Section 16128 - Raceway and Boxes for Electrical Systems: Outlet boxes for wiring devices.

##### **1.03 REFERENCES**

- A. National Electrical Manufacturers Association:
  - 1. NEMA WD 1 - General Requirements for Wiring Devices.
  - 2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

##### **1.04 SUBMITTALS**

- A. Product Data: Submit manufacturer's catalog information showing dimensions, colors, and configurations.
- B. Samples: Submit two samples of each wiring device and wall plate illustrating materials, construction, color, and finish.

##### **1.05 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

##### **1.06 EXTRA MATERIALS**

- A. Furnish two of each style, size, and finish wall plate.

#### **PART 2 PRODUCTS**

##### **2.01 WALL SWITCHES**

- A. Manufacturers:
  - 1. Arrow Hart Wiring Devices.

2. Eagle Electric.
3. Leviton.
4. Hubbell.
5. Pass & Seymour.
6. Approved equal.

B. Product Description: NEMA WD 1, Heavy-Duty AC only general-use snap switch.

C. Body and Handle: White plastic with toggle handle.

D. Ratings:

1. Voltage: 120-277 volts, AC.
2. Current: 20 amperes.

## **2.02 RECEPTACLES**

A. Manufacturers:

1. Arrow Hart Wiring Devices.
2. Eagle Electric.
3. Leviton.
4. Hubbell.
5. Pass & Seymour.
6. Approved equal.

B. Product Description: NEMA WD 1, Heavy-duty general use receptacle.

C. Device Body: White plastic.

D. Configuration: NEMA WD 6, type as indicated on Drawings.

E. Convenience Receptacle: Type 5-20.

F. GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements. GFCI receptacles shall be manufactured by Cooper Wiring Devices meeting the project requirements.

## **2.03 WALL PLATES**

A. Decorative Cover Plate: Smooth nylon.

B. Weatherproof Cover Plate: Gasketed cast metal plate with hinged and gasketed device cover. Provide recessed cover on front porch locations manufactured by Intermatic Inc, Model number WP100RC or approved equal.

## **2.04 CABLE TV DEVICES**

A. Provide demarcation cabinet manufactured by Keptel Model CG-1000 or approved equal.

- B. Provide 4- way splitter manufactured by Regal Model DS4DGV10 or approved equal.
- C. Provide coax RG 59 cable from each jack to termination cabinet.
- D. Provide F-Connectors at each TV jack location.
- E. Provide cable testing and labeling.
- F. Provide cable from cabinet to utility demarcation utility point at utility shed.
- G. Coordinate with Cable TV Company.

## **2.05 PHONE DEVICES**

- A. Provide wiring terminal enclosure manufactured by TII Network Technologies Model 169T or approved equal.
- B. Provide punch down termination blocks manufactured by TII Network Technologies Model 68T-2 or approved equal.
- C. Provide 4 pair CAT 5E cable from each jack to termination block.
- D. Provide RJ45 jack at each phone outlet.
- E. Provide cable testing and labeling.
- F. Provide cable from cabinet to utility demarcation utility point at utility shed.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify outlet boxes are installed at proper height.
- B. Verify wall openings are neatly cut and completely covered by wall plates.
- C. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

### **3.02 PREPARATION**

- A. Clean debris from outlet boxes.

### **3.03 INSTALLATION**

- A. Install devices plumb and level.
- B. Install switches with OFF position down.
- C. Install receptacles with grounding pole on bottom.

- D. Connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor.
- E. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
- F. Connect wiring devices by wrapping solid conductor around screw terminal. Install stranded conductor for branch circuits 10 AWG and smaller. When stranded conductors are used in lieu of solid, use crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under device screws.
- G. Use jumbo size plates for outlets installed in masonry walls.
- H. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

### **3.04 INTERFACE WITH OTHER PRODUCTS**

- A. Coordinate locations of outlet boxes provided under Section 16128 to obtain mounting heights as specified and as indicated on drawings.
- B. Install wall switch 48 inches above finished floor.
- C. Install convenience receptacle 18 inches above finished floor.
- D. Install convenience receptacle 6 inches above back splash of counter.

### **3.05 FIELD QUALITY CONTROL**

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

### **3.06 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.

### **3.07 CLEANING**

- A. Clean exposed surfaces to remove splatters and restore finish.

**END OF SECTION**

## SECTION 26 27 27

### WIRING CONNECTIONS

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### 1.02 SUMMARY

- A. Section includes electrical connections to equipment.
- B. Related Sections:
  - 1. Section 16123 - Building Wire and Cable.
  - 2. Section 16128 - Raceway and Boxes for Electrical Systems.

##### 1.03 REFERENCES

- A. National Electrical Manufacturers Association:
  - 1. NEMA WD 1 - General Requirements for Wiring Devices.
  - 2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

##### 1.04 SUBMITTALS

- A. Product Data: Submit wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- B. Manufacturer's installation instructions.

##### 1.05 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations, sizes, and configurations of equipment connections.

##### 1.06 COORDINATION

- A. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
- B. Determine connection locations and requirements.
- C. Sequence rough-in of electrical connections to coordinate with installation of equipment.
- D. Sequence electrical connections to coordinate with start-up of equipment.

- E. Coordinate electrical connections for mechanical and plumbing equipment.

## **PART 2 PRODUCTS**

### **2.01 CORD AND PLUGS**

- A. Manufacturers:
  - 1. Hubbell.
  - 2. Leviton
  - 3. Approved equal.
- B. Attachment Plug Construction: Conform to NEMA WD 1.
- C. Configuration: NEMA WD 6; match receptacle configuration at outlet furnished for equipment.
- D. Cord Construction: Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
- E. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify equipment is ready for electrical connection, for wiring, and to be energized.

### **3.02 INSTALLATION**

- A. Make electrical connections to all mechanical, plumbing and Owner provided equipment.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Install receptacle outlet to accommodate connection with attachment plug.
- E. Install cord and cap for field-supplied attachment plug.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

**END OF SECTION**



## **SECTION 26 28 13**

### **FUSES**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### **1.02 SUMMARY**

- A. Section includes fuses.

##### **1.03 REFERENCES**

- A. National Electrical Manufacturers Association:
  - 1. NEMA FU 1 - Low Voltage Cartridge Fuses.

##### **1.04 DESIGN REQUIREMENTS**

- A. Select fuses to provide appropriate levels of short circuit and overcurrent protection for the following components: wire, cable, bus structures, and other equipment. Design system to maintain component damage within acceptable levels during faults.
- B. Select fuses to coordinate with time current characteristics of other overcurrent protective elements, including other fuses, circuit breakers, and protective relays. Design system to maintain operation of device closest to fault operates.

##### **1.05 FUSE PERFORMANCE REQUIREMENTS**

- A. Motor Load Feeder Switches: Class RK1 (time delay).
- B. Other Feeder Switches Larger than 600 amperes: Class L time delay.
- C. Motor Branch Circuits: Class RK1 (time delay).

##### **1.06 SUBMITTALS**

- A. Product Data: Submit data sheets showing electrical characteristics, including time-current curves.

##### **1.07 CLOSEOUT SUBMITTALS**

- A. Project Record Documents: Record actual sizes, ratings, and locations of fuses.

## **1.08 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

## **1.09 MAINTENANCE MATERIALS**

- A. Furnish two fuse pullers.

## **1.10 EXTRA MATERIALS**

- A. Furnish three spare fuses of each Class, size, and rating installed.

## **PART 2 PRODUCTS**

### **2.01 FUSES**

- A. Manufacturers:
  1. Cooper Bussman, Inc..
  2. Eagle Electric Mfg. Co.,Inc.; Cooper Industries.
  3. Ferraz Shawmut, Inc.
  4. Tracor, Inc.; Littlefuse, Inc.
  5. Approved equal.
- B. Substitutions: Division 1 - Product Requirements Dimensions and Performance: NEMA FU 1, Class as specified or as indicated on Drawings.
- C. Voltage: Rating suitable for circuit phase-to-phase voltage.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install fuse with label oriented so manufacturer, type, and size are easily read.

**END OF SECTION**

**SECTION 26 28 16**  
**ENCLOSED SWITCHES**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

**1.02 SUMMARY**

- A. Section includes fusible and non-fusible switches, manual starters, combination starters and lighting contactors.
- B. Related Sections:
  - 1. Section 16491 - Fuses.

**1.03 REFERENCES**

- A. National Electrical Manufacturers Association:
  - 1. NEMA FU 1 - Low Voltage Cartridge Fuses.
  - 2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- B. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

**1.04 SUBMITTALS**

- A. Product Data: Submit switch ratings and enclosure dimensions.

**1.05 CLOSEOUT SUBMITTALS**

- A. Project Record Documents: Record actual locations of enclosed switches and ratings of installed fuses.

**1.06 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

**PART 2 PRODUCTS**

**2.01 FUSIBLE SWITCH ASSEMBLIES**

- A. Manufacturers:

1. GE Electrical.
  2. Square D.
  3. Westinghouse Electric Corp.
  4. Approved equal.
- B. Product Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position.
- C. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses.
- D. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel or stainless steel.
1. Interior Dry Locations: Type 1.
  2. Exterior Locations: Type 3R.
- E. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.
- F. Furnish switches with entirely copper current carrying parts.

## **2.02 NON-FUSIBLE SWITCH ASSEMBLIES**

- A. Manufacturers:
1. GE Electrical.
  2. Square D.
  3. Westinghouse Electric Corp.
  4. Approved equal.
- B. Product Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position] enclosed load interrupter knife switch. Handle lockable in OFF position.
- C. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from [steel finished with manufacturer's standard gray enamel or stainless steel.
1. Interior Dry Locations: Type 1.
  2. Exterior Locations: Type 3R.
- D. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.
- E. Furnish switches with entirely copper current carrying parts.

## **2.03 SWITCH RATINGS**

- A. Switch Rating: Horsepower rated for AC or DC as indicated on Drawings.

- B. Short Circuit Current Rating: UL listed for 10,000 rms symmetrical amperes when used with or protected by Class H or K fuses (30-600 ampere) 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses (30-600 ampere switches employing appropriate fuse rejection schemes). 200,000 rms symmetrical amperes when used with or protected by Class L fuses (800-1200 ampere).

#### **2.04 FRACTIONAL-HORSEPOWER MANUAL CONTROLLER**

- A. Manufacturers:
  - 1. Square D.
  - 2. Siemens.
  - 3. Approved equal.
- B. Product Description: NEMA ICS 2, AC general-purpose, Class A, manually operated, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light, toggle operator.
- C. Enclosure: NEMA ICS 6, Type 1 to meet conditions of installation.

#### **2.05 FULL-VOLTAGE NON-REVERSING CONTROLLERS**

- A. Manufacturers:
  - 1. Square D.
  - 2. Siemens.
  - 3. Approved equal.
- B. Product Description: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower.
- C. Control Voltage: 120 volts, 60 Hertz.
- D. Overload Relay: NEMA ICS 2; bimetal.
- E. Product Features:
  - 1. Auxiliary Contacts: NEMA ICS 2, 2 each normally open and 2 each normally closed contacts in addition to seal-in contact.
  - 2. Cover Mounted Pilot Devices: NEMA ICS 5, heavy duty type.
  - 3. Pilot Device Contacts: NEMA ICS 5, Form Z, rated A150.
  - 4. Pushbuttons: Recessed type.
  - 5. Indicating Lights: LED type.
  - 6. Selector Switches: Rotary type.
  - 7. Relays: NEMA ICS 2.
  - 8. Control Power Transformers: 120 volt secondary, 100 VA minimum, in each motor starter. Furnish fused primary and secondary, and bond unfused leg of secondary to enclosure.

- F. Combination Controllers: Combine motor controllers with disconnect in common enclosure, using thermal magnetic circuit breaker conforming to NEMA AB 1, with integral thermal and instantaneous magnetic trip in each pole.
- G. Enclosure: NEMA ICS 6, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
  - 1. Interior Dry Locations: Type 1.
  - 2. Exterior Locations: Type 3R.

## **2.06 LIGHTING CONTACTORS**

- A. Manufacturers:
  - 1. Square D or approved equal.
- B. Product Description: NEMA ICS 2, magnetic lighting contactor.
- C. Configuration: Electrically held 2 wire controls.
- D. Coil operating voltage: 120 volts, 60 Hertz.
- E. Poles: To match circuit configuration and control function.
- F. Contact Rating: Match branch circuit overcurrent protection, considering derating for continuous loads.
- G. Enclosure: NEMA ICS 6, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
  - 1. Exterior Locations: Type 3R.

## **PART 3 EXECUTION**

### **3.01 EXISTING WORK**

- A. Disconnect and remove abandoned enclosed switches.
- B. Maintain access to existing enclosed switches and other installations remaining active and requiring access. Modify installation or provide access panel.
- C. Clean and repair existing enclosed switches to remain or to be reinstalled.

### **3.02 INSTALLATION**

- A. Install enclosed switches plumb. Provide supports in accordance with Section 16070.
- B. Height: 5 feet to operating handle.
- C. Install fuses for fusible disconnect switches. Refer to Section 16491 for product requirements.
- D. Install engraved plastic nameplates in accordance with Section 16075.

- E. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

### **3.03 FIELD QUALITY CONTROL**

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.5.

**END OF SECTION**

## **SECTION 26 50 00**

### **LIGHTING**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### **1.02 SUMMARY**

- A. Section includes interior luminaires, lamps, ballasts, and accessories.

##### **1.03 SUBMITTALS**

- A. Product Data: Submit dimensions, ratings, and performance data.

##### **1.04 DEFINITIONS**

- A. CRI: Color-rendering index.
- B. CU: Coefficient of utilization.
- C. LED: Light Emitting Diode
- D. LER: Luminaire efficacy rating.
- E. Luminaire: Complete lighting fixture, including ballast housing if provided.
- F. RCR: Room cavity ratio.

#### **PART 2 PRODUCTS**

##### **2.01 LUMINAIRES**

- A. Product Description: Complete luminaire assemblies, with features, options, and accessories as indicated on Fixture Schedule located on the drawings.
- B. Substitutions: Permitted as long as both performance and esthetics criteria are met. Engineer may receive additional calculation from the contractor to ensure performance requirements are met. Engineer may also require a sample before a final decision can be made.



## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install suspended luminaires using pendants supported from swivel hangers.
- B. Locate recessed ceiling luminaires as indicated on Drawings.
- C. Install surface mounted ceiling luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- D. Fixtures and/or fixture outlet boxes shall be provided with hangers to adequately support the complete weight of the fixture. Design of hangers and method of fastening other than herein specified shall be submitted to the Architect for approval. Fixtures mounted on outlet boxes shall be rigidly secured to a fixture stud in the outlet box. Hickies or extension pieces shall be installed where required to facilitate proper installation. Fixtures that weigh more than 50 pounds shall be supported independently of the outlet box.
- E. Install clips to secure recessed grid-supported lighting fixtures in place.
- F. Install wall mounted lighting fixtures at height as indicated on Drawings.
- G. Install accessories furnished with each lighting fixtures.
- H. Bond products and metal accessories to branch circuit equipment grounding conductor.
- I. Install specified lamps in each light fixture.

### **3.02 ADJUSTING**

- A. Aim and adjust luminaires.
- B. Relamp luminaires, lighting units, and exit lights with failed lamps at Substantial Completion.

**END OF SECTION**

## **SECTION 27 13 00**

### **CABLE TV AND PHONE SERVICE**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### **1.02 SUMMARY**

- A. Section includes arrangement with Utility Company for permanent phone and cable TV service; payment of Utility Company charges for service; service provisions; and conduit.

##### **1.03 SYSTEM DESCRIPTION**

- A. Utility Company:
  - 1. Comcast-Cable TV
  - 2. Verizon-Phone service
- B. Service Entrance: Underground.
- C. Underground Service Provisions: Underground service entrance to building service entrance equipment.
  - 1. Utility Raceway Connection: At utility equipment entrance box to be located at utility storage shed.

##### **1.04 QUALITY ASSURANCE**

- A. Perform Work in accordance with Utility Company written requirements.
- B. Maintain one copy of each document on site.

##### **1.05 FIELD MEASUREMENTS**

- A. Verify field measurements are as indicated on Drawings and Utility Company drawings.

##### **1.06 COORDINATION**

- A. Contact utility company regarding charges related to service installation. Include utility charges in this contract.
- B. Utility charges for service installation will be paid by Contractor are to be part of contractors bid price.

## **PART 2 PRODUCTS**

### **2.01 UTILITY COMPANY SERVICE EQUIPMENT**

- A. Furnished by Utility Company.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify service equipment is ready to be connected and energized.

### **3.02 INSTALLATION**

- A. Install service entrance conduits to building service entrance equipment. Utility Company will connect service lateral conductors to utility company demarcation equipment..

**END OF SECTION**

## **SECTION 28 20 00**

### **VIDEO SURVEILLANCE SYSTEM**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### **1.02 SUMMARY**

- A. The intent of this document is to specify the minimum criteria for the design, supply, installation, and commissioning of this Digital Recording and Transmission System. Contact Ryan Anderson at ComTec Systems Inc. at (856)-691-5111 for system equipment and installation.
- B. Vendor must provide a self contained enterprise level multi-site CCTV solution. The Digital Recording and Transmission System shall provide a powerful, intelligent enterprise-class digital storage management tool that combines Video, and Data capabilities in a single RU. Transmission of secure video and data from each site to the central command facility must be achieved thru the implementation of a private secure wireless network. RU's will be managed by a centralized command center utilizing VMS. Operators at the central command center will be able to view and manipulate all system cameras. The system shall be designed to record, search, and transmit Video, and Data transactions, providing operators with both live and post-event assessment options. The Digital Recording and Transmission System shall allow the operator to regulate the data rate, defining the size, frequency, and threshold. This shall allow smaller blocks of data to pass unhindered by larger blocks of data, and ensure that images and system messages are delivered as quickly as possible within the capabilities of the network's available bandwidth.

##### **1.03 REFERENCES**

- A. Consultative Committee for International Radio (CCIR)
- B. Electronic Industry Alliance (EIA)
- C. Federal Communications Commission (FCC)
- D. Institute of Electronic and Electrical Engineers (IEEE)
- E. International Electrotechnical Commission (IEC)
- F. International Organization for Standardization (ISO)
- G. National Television System Committee (NTSC)
- H. Phase Alternation by Line (PAL)

I. Underwriters Laboratories Inc. (UL)

**1.04 DEFINITIONS**

- A. No Substitutes: The exact make identified in this specification shall be provided without exception.
- B. Or Equal: Any item may be substituted for the specified item provided that in every technical sense, the substituted item provides the same or better capability and functionality.
- C. Or Approved Equal: A substitute for the specified item may be offered for approval by the Owner. The proposed substitution must, in every technical sense, provide the same or better capability and functionality as the specified item.

**1.05 SUBMITTALS**

- A. General: Submittals shall be made in accordance with the Conditions of the Contract and Submittal Procedures Section.
- B. Shop Drawings and Schematics: Shall depict the camera final proposed “as built” configuration. The following must be provided:
  - 1. Connection diagrams for interfacing equipment.
  - 2. List of connected equipment.
  - 3. Locations for all major equipment components to be installed under this specification.
- C. Product Data: The following shall be provided:
  - 1. Technical data sheets.
  - 2. A complete set of instruction manuals.
- D. Quality Assurance Submittals: The following shall be submitted:
  - 1. Checkout Report: The Contractor shall provide the Owner with a checkout report for each camera. The report shall include:
    - a. A complete list of every device.
    - b. The date it was tested, and by whom.
    - c. If retested, the date it was retested, and by whom.
    - d. The final test report shall indicate that every device was tested successfully.
  - 2. Manufacturer’s Instructions: The Contractor shall deliver 2 sets of System Operation and Maintenance Manuals to the Owner.
  - 3. Notice of Completion: When the final acceptance has been satisfactorily completed, the Owner shall issue a notice of completion to the Contractor.

**1.06 QUALITY ASSURANCE**

- A. Manufacturer’s Qualifications: The manufacturer shall be the world’s largest and most experienced manufacturer of electronic security systems, with over seventy (70)

years of experience in the security industry. The manufacturer shall provide 24/7 technical assistance and support via a toll-free telephone number at no extra charge.

### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. General: Delivery, storage, and handling of the equipment shall be in accordance with the manufacturer's recommendations.
- B. Ordering: The manufacturer's ordering instructions and lead-time requirements must be followed in order to avoid installation delays.
- C. Delivery: The equipment shall be delivered in the manufacturer's original, unopened, undamaged container with identification labels intact.
- D. Storage and Protection: The equipment shall be stored and protected from exposure to harmful weather conditions and at the environmental conditions recommended by the manufacturer.

### **1.08 WARRANTY**

- A. General: The warranty period shall be a minimum of twenty-four (24) months from the manufacture date code under normal use and service.

### **1.09 MAINTENANCE**

- A. Preventative Maintenance Agreement during Warranty: As a separate price item, the Contractor shall provide preventative maintenance during the warranty period. Maintenance shall include, but not be limited to:
  - 1. Labor and materials, at no additional cost, to repair the equipment.
  - 2. Labor and materials, at no additional cost, to provide test and adjustments to equipment.
  - 3. Regular inspections.
- B. Preventative Maintenance Agreement: As a separate price item, the Contractor shall provide a complete Maintenance Agreement for a period of 12 months after the conclusion of the warranty period. The Maintenance Agreement shall include, but not be limited to:
  - 1. Labor and materials, at no additional cost, to repair the equipment.
  - 2. Labor and materials, at no additional cost, to provide test and adjustments to the equipment.
  - 3. Regular inspections.

### **1.10 TRAINING**

- A. Operator training shall be conducted for a minimum of 2 sessions, with a session length of 8 hours at the customer's site.
- B. Training shall include, but not be limited all equipment for the surveillance system operation and diagnostics.

## **PART 2 PRODUCTS**

### **2.01 AIRAYA WIRELESS NETWORK**

- A. AIRAYA's Wireless GRID Multipoint bridges are to use for the wireless path. They must be secure, fast and supporting multipoint networks of up to 124 subscribers per Base Station radio. Wireless GRID Subscriber Units are orderable as Outdoor Integrated or Connectorized, Solar, Mobile or Indoor Subscriber units. All radios are capable of operating within the frequency ranges of 4.90-6.10 or 2.2-2.5 GHz.
- B. All Wireless Radio and antennas shall be installed per NEC standards following the owners design plan.
- C. All systems must be grounded and install per manufactures Specifications.
- D. Outdoor subscriber unit - The OSU outdoor subscriber unit (client) is designed for worldwide use where wireless multipoint communication is needed. Utilizing 802.11a hardware technology and proprietary multipoint bridging software, the A1108-4958-OSU provides up to 35 Mbps of effective throughput for multipoint communication utilizing the 5.25-5.35, 5.47-5.72, or 5.725-5.85 GHz frequency bands.
  - 1. Features include:
    - a. Will communicate with up to 2 other Wireless GRID bridges.
    - b. Distance tested: Up to 2.5 miles in multipoint mode.
    - c. Simple to use web configuration and management utility
    - d. Antenna Alignment: Real-time RSSi (Signal to Noise) Signal Monitor for Antenna Alignment and Link Quality
    - e. Real-time statistics: Monitor Bridge Status, Data Rate, Packet Error Rate (PER), RSSi (stats and graphing), and more
    - f. Security: Proprietary Wireless GRID Protocol, Wireless GRID & ACL MAC address link authentication. AES data encryption
    - g. Channel Size: 40 or 20 MHz wide
    - h. Non-overlapping Channels: 5.25-5.35 GHz (FCC, IC, Mexico, Poland) 4 x 20 MHz, 2 x 40 MHz
    - i. Non-overlapping Channels: 5.47-5.72 GHz (ETSI, FCC, ITU) with TPC and DFS. 11 x 20 MHz
    - j. Non-overlapping Channels: 5.725-5.850 GHz (UNII & ISM Bands-ETSI, FCC, MII, RA ) 5 x 20 MHz, 2 x 40 MHz
    - k. Modes: 108, 96, 72, 54, 48, 36, 24, 18, 12, 9, 6 Mbps or Auto
    - l. Radio Transmit Output Power: 0 and 21 dBm. Supports Transmit Power Control and Dynamic Frequency Selection where required
    - m. Receive Sensitivity: between -71 to -85 dBm depending on mode of operation
    - n. Modulation: 64QAM, 16QAM, QPSK, and BPSK modulation
    - o. VPN Support: for Ethernet tagged frames (802.1q, 802.1p, and VPN)

- p. Integrated 48v Remote Power: PoE subsystem provides remote power to outdoor unit (Input: 100-240 AC, 50-60Hz)
  - q. LED diagnostics: For indoor-to-outdoor unit connectivity and power monitoring
- E. 2 Radio Base station/repeater
  - 1. The AI108-4958-ON2 outdoor base station/repeater unit is designed for worldwide use where wireless repeating or multipoint communication is needed. Utilizing 802.11a hardware technology and proprietary multipoint bridging software, the AI108-4958-ON2 provides up to 42 Mbps of TCP/IP throughput, and supports both repeater mode and base station mode. Utilizing the 4.94-4.99, 5.25-5.35, 5.47-5.72, or 5.725-5.85 GHz frequency bands, each base station/repeater shall include an indoor signal/power injector, 150 feet of indoor-to-outdoor cable, an outdoor radio with 2 N-type female bulkhead connectors and a 90 or 120 degree Sector antenna
- F. 90 Degree Sector Antenna 4.90-5.875 GHz
  - 1. Specifications: Electrical Frequency range 4.90 - 5.875 GHz Gain, typ. 16 dBi VSWR, max. 1.7 : 1 3dB Beam-Width - Azimuth, typ. 90° 3dB BeamWidth - Elevation, typ. 5° Polarization Linear Vertical Cross-polarization Level, max. -20 dB Front to back ratio -25 dB Power Handling 50 Watts Input Impedance 50 Ohms Mechanical and Environmental Dimensions (LxWxD) 500x80x80 mm Radome Plastic, UV protected Connector N-Type, F Lightning Protection DC Grounded Temperature -40°C to +70°C Standard Compliance ETSI EN 302 085 v1.1.2 (2001-02), CS 1
- G. Radio Specifications
  - 1. RF Modulation: OFDM - 64QAM, 16QAM, QPSK, BPSK
  - 2. OSI and Protocol: Layer-2. (not MESH, Wi-Fi, or WiMax)
  - 3. It shall support multiple frequency channels of 40, 20, 10 and 5MHz wide
  - 4. Capable of operating in the frequency spectrum 4.90GHz - 6.00GHz without the need to change radio hardware
  - 5. Security: Support over the air data encryption WEP/AES and authentication to ensure the prevention of hacking, data theft and unauthorized intrusion.
  - 6. Over the air Data Rate: Not less than 3Mbps over the 5MHz channel, 7Mbps over the 10MHz channel, 15Mbps over the 20MHz channel and 30Mbps over the 40MHz channel
  - 7. Sub 1 Millisecond of Latency
  - 8. Built-in Ethernet and RF network Sniffer
  - 9. Built-in Web server. Telnet. Available at all times through secure interface
  - 10. Device Interface: Ethernet: RJ45 auto sensing 10/100 base TX; Antenna: Standard N-type Female or Integrated
  - 11. Final Assembly and testing performed in the USA
  - 12. Able to define the HTTP port which is used to access the bridges
  - 13. Worldwide Frequency Bands Supported (Local regulations apply)



- a. 4.940-4.990 GHz Public Safety Band (FCC Part 70, licensed Intl.)  
Non-overlapping Channels: 8 x 5 MHz, 4 x 10 MHz, 2 x 20 MHz, 1 x 40 MHz
  - b. 5.25-5.35 GHz license-exempt (FCC, Industry Canada, Mexico) Non-overlapping Channels: 19 x 5 MHz, 9 x 10 MHz, 4 x 20 MHz, 2 x 40 MHz
  - c. 5.47-5.72 GHz license-exempt (ETSI, FCC, ITU) with TPC and DFS  
Non-overlapping Channels: 44 x 5 MHz, 22 x 10 MHz, 11 x 20 MHz, 5 x 40 MHz
  - d. 5.725-5.850 GHz licence exempt UNII & ISM Bands (ETSI, FCC, MII) Non-overlapping Channels: ISM, UNII: 25 x 5 MHz, 12 x 10 MHz, 5 x 20 MHz, 2 x 40 MHz
14. Radio Type-Orthogonal Frequency Division Multiplexing (OFDM)
  15. Standards Compliance-802.3, 802.11i, 802.11a hardware with proprietary bridging extensions
  16. Total System EIRP and radio output power -Radio output power: Max: 21dBm (Set to local regulatory requirements to comply with transmit, conducted and EIRP power limits)
  17. Data Rate-108 to 1 Mbps
  18. Receiver Sensitivity (dBm)- -73 to -91
  19. Modulation-64QAM, 16QAM, QPSK, BPSK
  20. WirelessGRID Operating Modes- Point to Multipoint, Point to Point, Repeater
  21. Antenna Type (5 GHz)

## **2.02 HONEYWELL HIGH-SPEED PTZ DOME**

- A. ACUIX Model Number and Descriptions Table PTZ Dome, Rugged, 26X WDR&TDN, 530TVL, Clr Dome/Wht Trim ACUIX Corner Mount Adapter
- B. The High-Speed PTZ Dome shall include, as a minimum, the following features/functions/specifications:
  1. The High-Speed PTZ Dome must be protected by the most extensive support services in the industry, including Customer Service, Pre-Sales Applications Assistance, After-Sales Technical Assistance, access to Technical Online Support, and Online Training using web conferencing.
  2. The High-Speed PTZ Dome and its components shall be thoroughly tested before shipping from the manufacturer's facility.
  3. The High-Speed PTZ Dome shall be comprised of a high-speed pan/tilt assembly using precision stepper motors with a high-strength belt drive, resulting in quiet and accurate operation.
  4. The High-Speed PTZ Dome shall utilize four (4) Binary Coded Decimal (BCD) rotary switches on the receiver board for setting the domes unique address. Dual In-line Package (DIP) switches are not acceptable.
  5. The High-Speed PTZ Dome must be available with a 530 TVL NTSC (520 TVL PAL) super high-resolution color/monochrome (true day/night) and wide dynamic range (WDR) advanced digital signal processing (DSP)

camera and an 26X optical (3.5 mm to 91 mm) with 12X digital (312X total) zoom factors. The cameras shall have a signal-to-noise ratio of greater than fifty dB (>50dB). The digital zoom can be software adjustable from 1X to the maximum of 12X via a simple on-screen menu. The High-Speed PTZ Dome shall provide for continuous auto focus. When the scene requires extra-fine control, the dome must allow the operator to override the auto focus settings. Auto iris with manual override must also be standard.

6. The High-Speed PTZ Dome shall provide internal synchronization of the video signal, or line-lock with an adjustable vertical sync-phase by means of an on-screen menu.
7. The High-Speed PTZ Dome shall incorporate a sealed, precision gold slip ring to provide three hundred sixty degrees (360°) of continuous rotation. The dome must automatically adjust pan and tilt speed in proportion to the zoom position for greater control. The same amount of picture shall appear to move across the monitor regardless of the zoom factor. Manual pan speeds must range from 0.1° to 480° per second, and manual tilt speeds must range from 0.1° to 240° per second. The operator shall have the ability to program the maximum manual speeds to be no more than 120°, 240°, or 480° per second for pan, and 60°, 120°, or 240° per second for tilt. The speed to preset shall be no less than 480° per second, with a maximum preset recall time of less than ½-second.
8. Upon power-up, the High-Speed PTZ Dome shall display an initialization screen showing the dome type, the control data settings for the unit, and the camera type in the unit. Unless programmed to do so, the dome unit shall not begin initializing until the unit has received its first control command. This feature keeps the entire dome system from initializing simultaneously after a power failure. The initialization screen disappears after a few seconds.
9. The High-Speed PTZ Dome shall automatically create a camera ID from the dome drive address and insert the ID in to the video for viewing on a monitor. The High-Speed PTZ Dome shall allow the user to enter an alphanumeric camera ID and insert the ID in to the video for viewing on a monitor. In addition, a digital zoom label shall be available on the same line as the camera ID to display the current digital zoom magnification. The operator must have the ability to turn both IDs on or off. The operator must also have the option of displaying crosshairs on the video for precise positioning.
10. The High-Speed PTZ Dome shall have the option to reverse the pan and/or the tilt direction via an on-screen menu setting. When enabled, a left pan command shall cause the unit to pan right, a right pan command shall cause the unit to pan left, an up tilt command shall cause the unit to tilt down, and a down tilt command shall cause the unit to tilt up. The operator shall also have the ability to enable the dome for a -5° tilt limit, allowing the unit to view slightly above the horizon without permitting the operator to view the inside of the housing.

11. The High-Speed PTZ Dome shall be able to display the pan azimuth and the tilt elevation/declination, in degrees, on the video. The operator must have the ability to turn the coordinates on or off.
12. The High-Speed PTZ Dome must provide the option of restoring all displays, alarms, camera settings, and diagnostic settings to factory default via an onscreen command. In addition, the unit shall offer a simple “power” reset via the on-screen menus.
13. The High-Speed PTZ Dome shall feature on-screen menus for programming dome parameters. A minimum of the following screens must be available:
  - a. Language
    - (1) English
    - (2) Spanish
    - (3) Polish
    - (4) German
    - (5) Italian
    - (6) French
  - b. Display Options
    - (1) Camera Message
    - (2) Sectors
    - (3) Preset Name
    - (4) Digital Zoom Msg.
    - (5) Start-Up Screen Msg.
    - (6) Change Camera Name/Location
    - (7) Change Sector Name/Location
    - (8) Crosshairs
    - (9) Time and Date
  - c. Control Options
    - (1) Pass
    - (2) Auto Pivot
    - (3) Program Alarms
    - (4) Set Pan and Tilt Options
    - (5) Set Default Function
    - (6) Auto Focus
    - (7) Preset tour Auto Focus
  - d. Diagnostic Options
    - (1) Coordinates
    - (2) Error Table
    - (3) Clear Memory
    - (4) Clear Error Table
    - (5) Display Error Table Codes
    - (6) Restore Default Settings
    - (7) Scan & Camera Reset
  - e. Camera Options
    - (1) Zoom and Focus
    - (2) Exposure Control
    - (3) NightShot Control

- (4) White Balance
  - (5) Still Preset
  - (6) Vertical Phase Edge
  - (7) Vertical Phase
  - (8) Electronic Image Stabilization
  - (9) Motion Detection
- f. Function Programming
- (1) Mimic Tour
  - (2) Program a Preset tour (mode specific)
  - (3) Program Privacy zone (mode specific)
  - (4) Program Sectors (mode specific)
14. The High-Speed PTZ Dome shall feature on-screen menus for programming dome parameters. The High-Speed PTZ Dome shall support a minimum of one hundred forty (140) in Diamond Protocol and one hundred thirty-three (133) in VCL protocol/Maxpro mode programmable preset positions, with each position including pan, tilt, zoom, focus, and iris. The preset accuracy shall be less than one-tenth of a degree ( $<1/10^\circ$ ). A twenty-four (24) character label associated with each preset position must be programmable, with the ability to place the preset title at any location on the video. A list of each dome's programmed presets, displaying the preset numbers and titles, must be available for viewing on the monitor.
15. The High-Speed PTZ Dome shall include a "Still Shot™" feature to "freeze" the video between presets. When an operator calls a preset position, the video and preset title must remain until the dome arrives at the next preset and its video and title is displayed. An asterisk (\*) must appear on the same line as the camera ID to indicate when the video is frozen. The operator must have the ability to turn this feature on or off.
16. The High-Speed PTZ Dome shall include sixteen (16) mimic or learned tours. The operator shall perform a series of pan, tilt, zoom, and focus movements that the dome must "learn", when the pattern is recalled, the dome automatically repeats the movements. The duration of each pattern can be up to two (2) minutes.
17. The High-Speed PTZ Dome must support up to sixteen (16) programmable preset tours, each with sixty-four (64) preprogrammed positions. Each position can include a preset position, the speed, in degrees, in which the dome will go to the preset position, and the dwell time, or how much time the dome waits before going to the next preset position. The tour can be programmed to run only once, or to run continuously until halted by the operator. All programming of preset tours shall be done utilizing simple on-screen menus. A list of each dome's programmed preset tours, displaying the tour numbers and titles, must be available for viewing on the monitor.
18. In order to quickly identify specific areas or scenes an operator is viewing, the High-Speed PTZ Dome shall contain a minimum of sixteen (16) sector IDs, with a 24-character on-screen label associated with each sector. The sector label must be displayed whenever the dome is within the programmed

sector. If the dome is viewing overlapping sectors, the on-screen label shall sequence between the two titles at one and one-half (1½) second intervals.

19. The High-Speed PTZ Dome shall include thirty-two (32) programmable Dynamic Privacy Zones. To prevent unauthorized users from programming or deleting privacy zones, the privacy zones shall be password protected with user-defined passwords of up to fourteen (14) alphanumeric characters.
20. The High-Speed PTZ Dome shall incorporate flash memory to protect the programming for the privacy zones if power is lost. The flash memory shall retain the programming for a minimum of twenty (20) years. If the privacy zones have been programmed and the unit loses power, the video will remain blank until the PTZ dome finds its index position to prevent any area behind programmed privacy zones from being visible when power is restored.
21. The High-Speed PTZ Dome shall include auto-pivot tracking circuitry to allow the dome to automatically turn 180-degrees when reaching its lower limit. This allows the operator to automatically track an individual moving directly below the camera. The operator must have the ability to enable or disable this feature using an on-screen menu.
22. The High-Speed PTZ Dome must support auto-homing to activate a preset tour, mimic tour, or a preset position after a specified period of inactivity, programmable from one (1) to ninety-nine (99) minutes.
23. The High-Speed PTZ Dome shall include a patented “Flashback” feature, allowing the operator to recall the last position observed, whether in manual, preset tour or mimic tour with a single keystroke.
24. The High-Speed PTZ Dome shall incorporate a “freeze” function, allowing the operator to “freeze” and “unfreeze” the video signal with a single keyboard command.
25. The High-Speed PTZ Dome shall include four (4) on-board alarm inputs for normally open or normally closed dry contacts. The dome shall have the ability to go to a preset position, start a preset tour, or start a mimic tour when an alarm occurs. The dome must insert “AL” and the alarm number to the video signal on the same line as the camera ID display for viewing on the monitor until the alarm returns to its normal state. When more than one alarm occurs, the dome must perform the action for the first alarm and “queue” the other alarms in numerical order. As the alarms are acknowledged, the “queued” alarms are serviced.
26. The High-Speed PTZ Dome shall contain a built-in intelligent receiver for RS485 operation. RS485 operation must allow for up to thirty-two (32) domes to be daisy-chained at a maximum of 4000 feet (1200 meters) using the appropriate cable. VCL protocol for up-the-coax (UTC) operation using coaxial cable shall be standard, with a recommended maximum distance of 1000 feet (300 meters). The receiver/driver must provide all voltages for camera controls, pan and tilt functions, and motorized lens functions.
27. The High-Speed PTZ Dome shall accept at a minimum the following control codes:
  - a. Honeywell IntelliBus™
  - b. Honeywell Diamond

- c. Honeywell MAXPRO-mode
  - d. Honeywell VCL
  - e. Honeywell VCL up the coax
  - f. Pelco P
  - g. Pelco D
28. The High-Speed PTZ Dome shall offer the option of active transmission of the video signal over unshielded category five (CAT 5) type cable to a compatible Unshielded Twisted Pair (UTP) receiver. The active transmitter shall provide electronically adjustable compensation for long cable runs. The manufacturer of the dome shall offer compatible UTP video receivers.
  29. The High-Speed PTZ Dome shall be available in indoor configurations designed for installation in dropped, hard-ceiling, and pendant configurations. The bottom domes must be designed to blend in with building aesthetics and shall be constructed of vacuum-formed, optically-graded acrylic available in vaporized gold, smoke and clear finishes. Trim rings must be available in black, white or gold finishes.
  30. The High-Speed PTZ Dome shall be available in a pendant housing specifically designed for installation in an outdoor environment, with an integral resistive type thermostat-controlled 24VAC heater and blower to maintain a sufficient operating temperature. The pendant housing shall be IP66, NEMA 4X and UL50 rated. Built-in power isolation and lightning surge protection must also be standard. The bottom domes shall be designed to blend in with building aesthetics and shall be constructed of vacuum-formed, optically-graded acrylic available in smoke and clear finishes. Available mounting options shall include pendant, wall, roof, and parapet, as well as pole and corner adapters.
  31. The High-Speed PTZ Dome shall be available in a vandal-resistant ruggedized housing specifically designed for installation in indoor or outdoor environments where a tamper-resistant, vandal-resistant or extremely rugged camera is required. This vandal-resistant ruggedized camera shall come standard with an integral resistive type thermostat-controlled 24VAC heater and blower to maintain a sufficient operating temperature. The housing shall be IP66, NEMA 4X and UL50 rated. Built-in power isolation and lightning surge protection must also be standard. The bottom domes shall be designed to blend in with building aesthetics and shall be constructed of vacuumformed, optically-graded acrylic available in smoke and clear finishes. The camera shall have an integral bracket that permits both wall and ceiling mounting with no other brackets needed. This integral bracket shall work with pole and corner adapters offered in the ACUIX line.
  32. The High-Speed PTZ Dome shall be the ACUIX Series or equivalent.
  33. The High-Speed PTZ Dome must have the following mechanical specifications:
    - a. Vandal-resistant Rugged
    - b. Top Dimensions Incl. vertical bracket and dome  
HxW 319.5 mm x 267.2 mm Incl. horizontal bracket and dome  
HxW x Dia 280.5 mm x 333 mm x 267.2 mm

- c. Unit Weight..... 14.75 lbs (6.6 kg)
- d. Lower Dome Diameter ..... 191 mm
- 34. The High-Speed PTZ Dome must have the following electrical specifications:
  - a. Outdoor Pendant and Vandal-resistant Rugged
  - b. Input Voltage 24VAC, 50/60 Hz
  - c. Power Consumption 46 watts maximum with heater/blower
- 35. The High-Speed PTZ Dome shall be designed to meet the following environmental conditions:
  - a. Outdoor Pendant and Vandal-resistant Rugged
  - b. Operating Temperature-40° to 122° F (-40° to 50° C);Absolute maximum rating of 140° F (60° C)
  - c. Emissions FCC: Part 15, Class B CE: EN50081-1
  - d. Immunity CE: EN50082-1
  - e. Safety UL : 60065, CE: EN60065

## 2.03 FIXED DOME CAMERAS

- A. Model Number/Description Table
  - 1. 1/3” Sony Super HAD CCD, True Day/Night (TDN), Vandal Fixed Mini-Dome Camera 540 TVL, 3.3 - 12 mm VFAI, Indoor / Outdoor, NTSC
- B. The High Resolution True Day/Night (TDN) Vandal Mini Fixed Indoor/Outdoor Camera shall include, as a minimum, the following features/functions/specifications:
  - 1. The High Resolution True Day/Night (TDN) Vandal Mini Fixed Indoor/Outdoor Camera must be protected by the most extensive support services in the industry, including Customer Service, Pre-Sales Applications Assistance, After-Sales Technical Assistance, access to Technical Online Support, and Online Training using web conferencing.
  - 2. The High Resolution True Day/Night (TDN) Vandal Mini Fixed Indoor/Outdoor Camera and its components shall be thoroughly tested before shipping from the manufacturer’s facility.
  - 3. The High Resolution True Day/Night (TDN) Vandal Mini Fixed Indoor/Outdoor Camera shall incorporate a 1/3-inch digital signal processing (DSP), and a minimum of 540 TV lines of resolution utilizing an effective pixel count of no less than 768 (H) x 494 (V) NTSC, 752 (H) x 582 (V) PAL.
  - 4. The High Resolution True Day/Night (TDN) Vandal Mini Fixed Indoor/Outdoor Camera shall provide excellent color performance in extremely low light, down to 0.3 lux / f1.5, 0.003 lux(SENS-UP X128).
  - 5. The High Resolution True Day/Night (TDN) Vandal Mini Fixed Indoor/Outdoor Camera shall provide a removable IR cut. When surrounding area becomes dark, the IR Cut Filter motor shall automatically switch from color to black and white increasing sensitivity. When the light increases, the IR Cut Filter motor shall automatically switch back to color mode.
  - 6. The High Resolution True Day/Night (TDN) Vandal Mini Fixed Indoor/Outdoor Camera shall have an internal amplifier that applies gain to the signal from the DPS video imaging system. The amplifier must operate when there is insufficient light in the scene to produce an acceptable video

output level, and must only apply as much gain as is necessary. The camera shall incorporate one level of automatic gain compensation (AGC), allowing the user to achieve the optimal balance of noise and low light performance in demanding environments.

7. The High Resolution True Day/Night (TDN) Vandal Mini Fixed Indoor/Outdoor Camera shall support the use of Auto Iris/Direct Drive lens connected to the camera via 4-pin molex socket located from the inside of the camera housing. The camera must provide DC power drive signal to the lens. The camera must provide power to the lens. Iris level controls can be controlled from one button toggle On-Screen Display (OSD) control.
8. The High Resolution True Day/Night (TDN) Vandal Mini Fixed Indoor/Outdoor Camera shall include a switching 12VDC/24VAC power supply. The camera must have the ability to synchronize the video output to the AC power input so that all cameras on the system may be synchronized to the same point on the AC supply. In order to sync cameras on different phases, a phase adjustment control shall be provided through On Screen Control Menu (OSD). The phase shall be adjustable from 0 to 360 degrees. The camera must also include internal synchronization capabilities.
9. The power consumption of the High Resolution True Day/Night (TDN) Vandal Mini Fixed Indoor/Outdoor Camera shall be no more than 3.5 watts.
10. The High Resolution True Day/Night (TDN) Vandal Mini Fixed Indoor/Outdoor Camera shall have a signal to noise ratio of 50 dB with the AGC off.
11. The High Resolution True Day/Night (TDN) Vandal Mini Fixed Indoor/Outdoor Camera shall incorporate auto-tracking white balance to constantly monitor the light and adjust its color. The automatic white balance ranges shall be selectable using On Screen-Control Menu (OSD). The ATW setting shall be the default setting and have a color temperature range of 2800 to 9500 K.
12. To allow the image to be viewed properly on a standard monitor, the High Resolution True Day/Night (TDN) Vandal Mini Fixed Indoor/Outdoor Camera's default gamma value must be 0.45.
13. The High Resolution True Day/Night (TDN) Vandal Mini Fixed Indoor/Outdoor Camera shall be the Honeywell Video Systems HD4D, HD4DX or equivalent.
14. The High Resolution True Day/Night (TDN) Vandal Mini Fixed Indoor/Outdoor Camera must have the following mechanical specifications:
  - a. Unit Dimensions (HxD) 3.6" x 5.5" (91.5mm x 140mm)
  - b. Unit Weight 2.5lb (1.1 kg)
  - c. Video Output Composite Video (75ohms)
  - d. Auto Iris Output 4-pin molex to main camera PCB
  - e. Color Light Gray Powder Coating
15. The High Resolution True Day/Night (TDN) Vandal Mini Fixed Indoor/Outdoor Camera must have the following electrical specifications:
  - a. Voltage 12VDC/24VAC
  - b. Power Consumption <3.5 watts



16. The High Resolution True Day/Night (TDN) Vandal Mini Fixed Indoor/Outdoor Camera shall be designed to meet the following environmental conditions:
  - a. Operating Temperature -13° to 131° F (-25° to 55° C)
  - b. Storage Temperature -49° to 167° F (-45° to 75° C)
  - c. Emissions FCC: Part 15, Class ACE: EN55022
  - d. Immunity EN61000-4-3 & EN6100-4-6
  - e. Safety EU: 73/23/EEC LVD, UL2044

## **2.04 FIXED BOX CAMERAS**

- A. Description 1/3” High Resolution Wide Dynamic DSP Color Camera, 12VDC/24VAC, NTSC
- B. The High Resolution Wide Dynamic DSP Color Camera shall include, as a minimum, the following features/functions/specifications:
  1. The High Resolution Wide Dynamic DSP Color Camera must be protected by the most extensive support services in the industry, including Customer Service, Pre-Sales Applications Assistance, After-Sales Technical Assistance, access to Technical Online Support, and Online Training using web conferencing.
  2. The High Resolution Wide Dynamic DSP Color Camera and its components shall be thoroughly tested before shipping from the manufacturer’s facility.
  3. The High Resolution Wide Dynamic DSP Color Camera shall incorporate a 1/3-inch Digital Pixel System (DPS) Video Imaging System, digital signal processing (DSP), and a minimum of 480 TV lines of resolution utilizing an effective pixel count of no less than 720 (H) x 540 (V) NTSC, 720 (H) x 540 (V) PAL.
  4. The High Resolution Wide Dynamic DSP Color Camera shall provide excellent color performance in extremely low light, down to 0.4 lux @ f1.2 (50IRE).
  5. The High Resolution Wide Dynamic DSP Color Camera shall have an internal amplifier that applies gain to the signal from the DPS video imaging system. The amplifier must operate when there is insufficient light in the scene to produce an acceptable video output level, and must only apply as much gain as is necessary. The camera shall incorporate variable of automatic gain compensation (AGC), high and low, allowing the user to achieve the optimal balance of noise and low light performance in demanding environments.
  6. The High Resolution Wide Dynamic DSP Color Camera shall support the use of Auto Iris/Manual Iris lenses connected to the camera via an industry standard 4-pin socket located on the rear panel of the camera. The camera must provide power and the video drive signal to the lens. The camera must also include an Automatic Iris Setting (AIS) through the Onscreen Display Menu to adjust the gain (level) of direct drive lenses
  7. The High Resolution Wide Dynamic DSP Color Camera shall include a switching 12VDC/24VAC power supply. The camera must have the ability

to synchronize the video output to the AC power input so that all cameras on the system may be synchronized to the same point on the AC supply. In order to sync cameras on different phases, a phase adjustment control shall be provided through the Onscreen Display Menu. The phase shall be adjustable from 0 to 500 degrees. The camera must also include internal synchronization capabilities.

8. The power consumption of the High Resolution Wide Dynamic DSP Color Camera shall be no more than 2.5 watts, and a LED must be present on the rear of the camera to indicate when the camera is powered.
9. The High Resolution Wide Dynamic DSP Color Camera shall have a signal to noise ratio of 52 dB with the AGC off.
10. The High Resolution Wide Dynamic DSP Color Camera shall have seven preset and one user defined wide dynamic settings as shown in the table below. The Indoor setting is the default setting. The User Defined setting shall allow the user to adjust the limits of the dynamic range response of the camera.
11. The High Resolution Wide Dynamic DSP Color Camera shall incorporate auto-tracking white balance to constantly monitor the light and adjust its color. The automatic white balance ranges shall be selectable using the Onscreen Display Menu. The ATW setting shall be the default setting and have a color temperature range of 2800 to 7500 K. The ATW-Wide setting shall have a color temperature range of 2800 to 11000 K. In addition to the automatic tracking settings, there is a Manual white balance setting to allow the setting of the operating color temperature in the range of 2000 to 11000 K. There is also a Hold setting to maintain the white balance at a current color temperature.
12. The High Resolution Wide Dynamic DSP Color Camera shall have the ability to provide a Camera ID in one of six positions on the monitor screen, with an optional background color of green or blue.
13. The High Resolution Wide Dynamic DSP Color Camera shall include a backfocus adjustment function to allow easy installation and adjustments.
14. The High Resolution Wide Dynamic DSP Color Camera shall include a detachable screw terminal block that is used to provide power connections and RS485 connections to the camera.
15. The High Resolution Wide Dynamic DSP Color Camera shall support the Diamond Protocol and have its Onscreen Display Menu controllable from a remote keyboard, such as the Honeywell HJZTP.
16. The High Resolution Wide Dynamic DSP Color Camera shall be the Honeywell Video Systems HCU484(X) or equivalent.
17. The High Resolution Wide Dynamic DSP Color Camera must have the following mechanical specifications:
  - a. Unit Dimensions (HxWxD) 2.44" x 2.65" x 3.93" (61.90 mm x 67.22 mm x 99.3)
  - b. Unit Weight 17oz. (500 g)
  - c. Video Output Composite Video
  - d. Auto Iris Output 4-pin standard socket

- e. Lens Mount C/CS
  - f. Mounting Hole ¼ -20 UNC top and bottom
  - g. Color Cool Gray
18. The High Resolution Wide Dynamic DSP Color Camera must have the following electrical specifications:
- a. Voltage 12VDC/24VAC
  - b. Power Consumption 2.5 Watts
  - c. Power Indicator Green LED
19. The High Resolution Wide Dynamic DSP Color Camera shall be designed to meet the following environmental conditions:
- a. Operating Temperature 14° to 113° F (-10° to 45° C)
  - b. Storage Temperature 14° to 140° F (-20° to 60° C)
  - c. Emissions FCC: Part 15, Class A CE: EN55022
  - d. Immunity IEC 801 Parts 2, 3, and 4
  - e. Safety CE: EN60065

## **2.05 ENVIRONMENTAL CAMERA HOUSING**

- A. Environmental Camera Housing, 11.4” Internal Length, with HHMW13 Wall Bracket, Sunshield, Heater/Blower
- B. The 12-inch Environmental Camera Housing shall include, as a minimum, the following features/functions/specifications:
- 1. The 12-inch Environmental Camera Housing must be protected by the most extensive support services in the industry, including Customer Service, Pre-Sales Applications Assistance, After-Sales Technical Assistance, access to Technical Online Support, and Online Training using web conferencing.
  - 2. The 12-inch Environmental Camera Housing and its components shall be thoroughly tested before shipping from the manufacturer’s facility.
  - 3. The 12-inch Environmental Camera Housing shall incorporate a side-hinged lid to provide easy access to the camera and lens for trouble-free installation and servicing.
  - 4. The 12-inch Environmental Camera Housing shall be a minimum of 11.4” (290mm) in internal length and be constructed from light gray epoxy powder coated die-cast, extruded, and sheet aluminum to provide an excellent barrier against outdoor environments.
  - 5. The 12-inch Environmental Camera Housing’s maximum camera/lens length shall be no less than 11.4” (290mm) without the optional heater/blower, and 9.0” (230mm) with the optional heater/blower. The maximum width must be no less than 3.1” (78mm).
  - 6. The 12-inch Environmental Camera Housing shall be totally protected from dust and strong jets of water, and must have an International Standards IP Protection Classification of sixty-six (IP66).
  - 7. The 12-inch Environmental Camera Housing shall utilize three (3) weatherproof cable entry glands (PG9, PG16, and PG21), on the rear of the housing to allow for easy installation of power and video cables.

8. The 12-inch Environmental Camera Housing manufacturer shall offer the housing with optional factory installed sunshield, heater, and blower and prepackaged with a wall mount.
9. The 12-inch Environmental Camera Housing's factory installed heater/blower assembly shall require 24VAC. The heater shall produce 20 watts of heat, and must be thermostatically controlled, turning ON at 41°F (5°C) and OFF at 59°F (15°C). The blower shall turn ON at 95° (35°C) and OFF at 68° (20°C).
10. The 12-inch Environmental Camera Housing shall have a removable camera sled that can be secured along any position in the housing. The sled must be constructed of non-metallic material to help eliminate ground loop and voltage differential issues.
11. The 12-inch Environmental Camera Housing's front viewing window shall be no less than 2.4" (61mm) high and 2.90" (73mm) wide, and must be constructed of clear .125" (3mm) thick tempered glass.
12. The 12-inch Environmental Camera Housing shall be the HONEYWELL VIDEO HHC12 Series or equivalent.
13. The 12-inch Environmental Camera Housing must have the following mechanical specifications:
  - a. Camera Mounting Removable Non-Metallic Camera Sled
  - b. Maximum Camera Size (WxHxL)
    - (1) Without Heater/Blower 3.1" x 3.2" x 11.4"(78mm x 82mm x 290mm)
    - (2) With Heater/Blower 3.1" x 3.2" x 9"(78mm x 82mm x 230mm)
  - c. Viewing Area (WxH) 2.9" x 2.4" (73mm x 61mm)
  - d. Viewing Window Clear .125" (3mm) Tempered Glass
  - e. Cable Entry 3 Glands (PG9, PG16 and PG21)
  - f. Unit Dimensions (WxHxL) 5.8" x 4.8" x 15.6"(148mm x 118mm x 397mm)
  - g. Unit Weight 4.2 lbs. (1.9 kg.)
14. The 12-inch Environmental Camera Housing must have the following electrical specifications:
  - a. Input Voltage 24VAC
  - b. Power:
    - (1) Housing Camera power
    - (2) Heater 20 watts Blower 3.4 watts
15. The 12-inch Environmental Camera Housing shall be designed to meet the following environmental conditions:
  - a. Operating Temperature:
  - b. Housing 4° to 140°F (-20° to 60°C)

## 2.06 CCTV POWER SUPPLY

### A. Power Supply:

1. Four Output UL-Listed CCTV Power Supply
2. Eight Output UL-Listed CCTV Power Supply

3. Sixteen Output UL-Listed CCTV Power Supply

B. The UL-Listed CCTV Power Supply shall include, as a minimum, the following features/functions/specifications:

1. The UL-Listed CCTV Power Supply must be protected by the most extensive support services in the industry, including Customer Service, Pre-Sales Applications Assistance, After-Sales Technical Assistance, access to Technical Online Support, and Online Training using web conferencing.
2. The UL-Listed CCTV Power Supply and its components shall be thoroughly tested before shipping from the manufacturer's facility.
3. The UL-Listed CCTV Power Supply shall provide four (4), eight (8), or sixteen (16) individually fused outputs at 24 VAC, and deliver a maximum of either four (4) or eight (8) Amps of power (depending on model) to 24 VAC CCTV cameras and accessories.
4. The UL-Listed CCTV Power Supply shall offer superior voltage regulation (+/- 3%) to protect cameras from damage due to power surges and overvoltage conditions.
5. The UL-Listed CCTV Power Supply shall be designed for ease of installation, and must be housed in a large vented, hinged enclosure with multiple strategically placed knockouts. The status of the incoming AC, as well as each output, shall be displayed with individual LED indicator lights.
6. The UL-Listed CCTV Power Supply shall include spare fuses located inside the cabinet, eliminating the need to locate replacements for service requirements.
7. The UL-Listed CCTV Power Supply shall contain large terminal screws allowing for easy connections using standard sized screwdrivers.
8. To provide additional convenience during installation or servicing of cameras, the UL-Listed CCTV Power Supply shall incorporate a master on/off switch to control power to the 24 VAC output circuits.
9. Connection of incoming AC power to the UL-Listed CCTV Power Supply shall be made through a convenient fuse block. The incoming fuse block must contain a separate pull out fuse allowing isolation of incoming AC from the rest of the unit.
10. The UL-Listed CCTV Power Supply shall be the HONEYWELL Video HPTV Series or equivalent.
11. The UL-Listed CCTV Power Supply must have the following mechanical specifications:
  - a. Construction 18 gauge (1.2mm) steel vented housing
  - b. Hinge Piano-hinged lid
  - c. Finish black, textured
  - d. Knockouts Seven (7), top, bottom, and sides
  - e. Mounting Keyhole mounting
  - f. Dimensions 9.25" x 8.25" x 3.50"(233mm x 210mm x 90mm)
  - g. Status Indicator LED's:
    - (1) Input Power On (green) indicates input voltage.
    - (2) Output Power On (Red) indicates blown output fuse.

12. The UL-Listed CCTV Power Supply must have the following electrical specifications:
  - a. Input Power 120 VAC, (+6%, -10%) 60Hz
  - b. Output Power 24 VAC (+/-3%) with load
  - c. 25.6 VAC (+/-3%) no load
  - d. Output Current 4 Amps maximum
  - e. Grounding Main enclosure, lid, and PCB
  - f. Incoming Safety Block Fuse 3.15A, 250V, ceramic
  - g. Secondary Input Fuse 4A, 250V, 5mm x 20mm
  - h. Load Output Fuses (8) 1A, 250V, 5mm x 20mm
  - i. Spare Fuse Clip Mounted on PCB
13. The UL-Listed CCTV Power Supply shall be designed to meet the following environmental conditions:
  - a. Operating Environment Indoor
  - b. Operating Temperature-4° to 95°F (-20° to 35°C)
  - c. Regulatory UL: 60950
  - d. CSA: C22.2 No. 60950-00

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Submission of a proposal confirms that the contract documents and site conditions are accepted without qualifications unless exceptions are specifically noted.
- B. The site shall be visited on a regular basis to appraise ongoing progress of other trades and contractors, make allowances for all ongoing work, and coordinate the requirements of this contract in a timely manner.
- C. The equipment must be inspected before installation, and shall be free of any cosmetic defects or damage.

### **3.02 PREPARATION**

- A. Prior to installation, system equipment shall be configured and tested in accordance with the manufacturer's instructions.

### **3.03 INSTALLATION**

- A. The equipment must be installed, programmed, and tested in accordance with the manufacturer's instructions.
  1. In order to ensure a complete, functional system, for bidding purposes, where information is not available from the Owner upon request, the worst-case condition shall be assumed.
- B. Interfaces shall be coordinated with the Owner's representative, where appropriate.

- C. All necessary backboxes or housings, connectors, supports, conduit, cable, and wire must be furnished and installed to provide a complete and reliable system installation. Exact location of all boxes, conduit, and wiring runs shall be presented to the Owner for approval in advance of any installation.
- D. All conduit, cable, and wire shall be installed parallel and square with building lines, including raised floor areas. Conduit fill shall not exceed forty percent (40%). All wires shall be gathered and tied up to create an orderly installation.

### **3.04 TESTING AND CERTIFICATION**

- A. The Contractor shall demonstrate the functionality of the equipment upon completion of installation, documenting the result of all tests and providing these results to the Owner. The system shall be tested in accordance with the following:
  - 1. The Contractor shall conduct a complete inspection and test of all installed equipment. This includes testing and verifying operation with connected equipment.
  - 2. The Contractor shall provide staff to test all devices and all operational features of the system for witness by the Owner's representative and the Authority Having jurisdiction. All testing must be witnessed by the Owner's representative, prior to acceptance.
- B. The testing and certification shall take place as follows:
  - 1. The equipment shall be tested in conjunction with the manufacturer's representative.
  - 2. All deficiencies noted in the above test shall be corrected.
  - 3. Test results shall be submitted to the consultant or Owner's representative.
  - 4. The test and correction of any deficiencies shall be witnessed by the owner's representative, and note.
  - 5. The Owner's representative shall accept the system.
  - 6. The system test shall be witnessed by the Authority Having Jurisdiction. Any deficiencies noted during the testing must be corrected.
- C. A letter of certification shall be provided to indicate that the tests have been performed, and all devices are operational.

**END OF SECTION**

## **SECTION 28 23 13**

### **VMS MANAGEMENT SYSTEM**

#### **PART 1 GENERAL**

##### **1.01 RELATED DOCUMENTS**

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

##### **1.02 SUMMARY**

- A. The intent of this document is to specify the minimum criteria for the design, supply, installation, and commissioning of the MAXPRO™ VMS Video Management System.
- B. The world-class MAXPRO VMS shall offer the latest in digital video technology, providing unparalleled stability, reliability, security, ease of use and a unique flexible Graphical User Interface (GUI).

##### **1.03 REFERENCES**

- A. Canadian ICES-003
- B. Consultative Committee for International Radio (CCIR)
- C. Conformity for Europe (CE)
- D. Electronic Industry Association (EIA)
- E. Federal Communications Commission (FCC)
- F. Joint Photographic Experts Group (JPEG)
- G. National Television Systems Committee (NTSC)
- H. Phase Alternating by Line (PAL)
- I. Underwriters Laboratories Inc. (UL)

##### **1.04 DEFINITIONS**

- A. No substitutes: The exact make and model number identified in this specification shall be provided without exception.
- B. Or equal: Any item may be substituted for the specified item provided that in every technical sense, the substituted item provides the same or better capability and functionality.

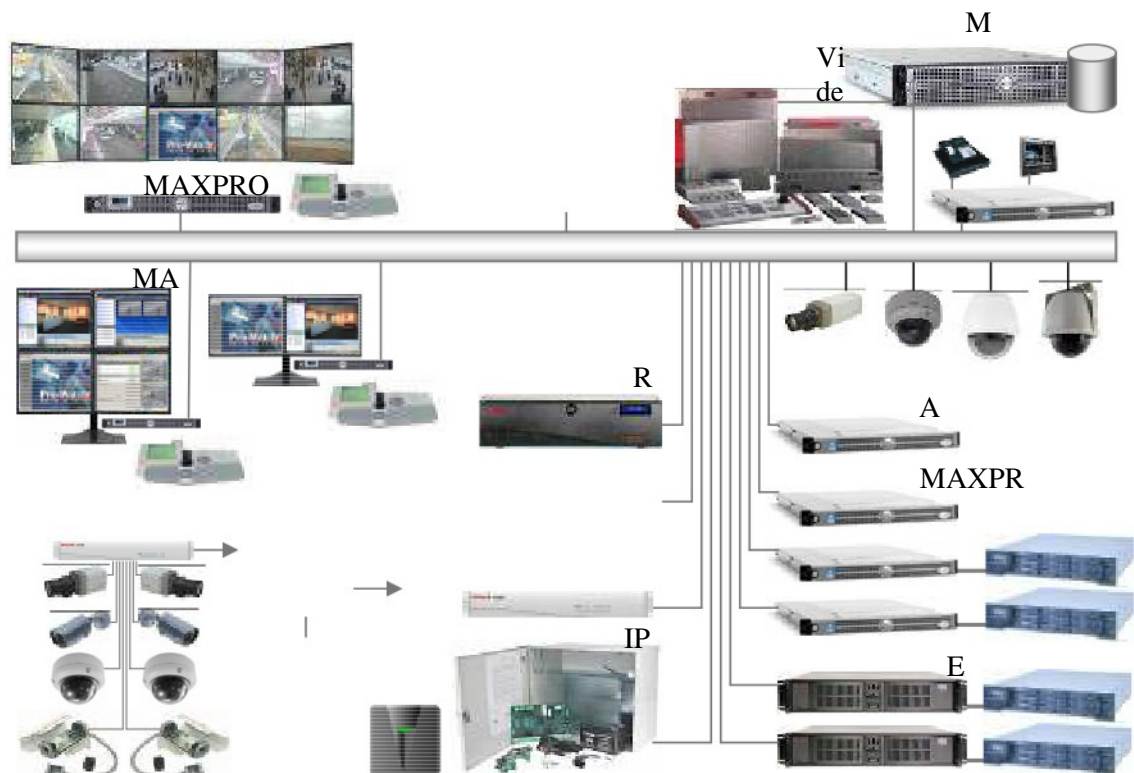


- C. Or approved equal: A substitute for the specified item may be offered for approval by the Owner. The proposed substitution must in every technical sense provide the same or better capability and functionality as the specified item.

**1.05 SYSTEM DESCRIPTION**

A. The MAXPRO VMS is a fully digital IP-based video surveillance system that brings together in one system a network video recorder (NVR) with unlimited storage capacity and integrations onto various DVRs/NVRs, and analog video switchers. It provides tight integration onto the Pro-Watch® access control system. It also provides integration with Honeywell’s video analytics and IDM (Integrated Data Manager) applications. As a software-based enterprise-level video, and data management system, MAXPRO VMS provides a single GUI that monitors, records, and offers analysis functionality to deliver the timely, accurate information required for effectively responding to any challenge. MAXPRO VMS is a fully scalable enterprise-class media management system. This advanced network-based system architecture enables simultaneous live monitoring from multiple stations and is easily configurable for storage both on and off site. The software can be configured to store and to view images captured by one camera or thousands of cameras and monitor connections across an unlimited number of servers. MAXPRO VMS is designed to effectively integrate with existing access control and video equipment including analog matrices, keyboards and cameras to leverage and protect investments in legacy infrastructure and equipment.

B. The following diagram explains the relationship of various system and integration components:



## **1.06 SUBMITTALS**

- A. General: Submittals shall be made in accordance with the conditions of the Contract and Submittal Procedures Section.
- B. Shop Drawings and Schematics: Shall depict MAXPRO VMS in final proposed “as built” configuration. The following must be provided:
  - 1. Connection diagrams for interfacing equipment
  - 2. List of connected equipment
  - 3. Locations for all major equipment components to be installed under this specification
- C. Product Data: The following shall be provided:
  - 1. Technical datasheets
  - 2. A complete set of instruction manuals
- D. Quality Assurance Submittals: The following shall be submitted:
  - 1. Checkout Report: The Contractor shall provide the Owner with a checkout report for each MAXPRO VMS. The report shall include:
    - a. A complete list of every device
    - b. The date it was tested, and by whom
    - c. If retested, the date it was retested, and by whom
- E. The final test report shall indicate that every device was tested successfully
- F. Manufacturer’s Instructions: The contractor shall deliver 2 sets of System Operation and Maintenance Manuals to the Owner.
- G. Notice of Completion: When the final acceptance has been satisfactorily completed, the Owner shall issue a notice of completion to the Contractor.

## **1.07 QUALITY ASSURANCE**

- A. Manufacturer’s Qualifications: MAXPRO VMS manufacturer shall be the world’s largest and most experienced manufacturer of electronic security systems, with more than seventy years of experience in the security industry. The final MAXPRO VMS must be assembled in the U.S., and the manufacturer shall provide 24/7 technical assistance and support via a toll-free telephone number at no extra charge.

## **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. General: Delivery, storage, and handling of MAXPRO VMS shall be in accordance with the manufacturer’s recommendations.
- B. Ordering: The manufacturer’s ordering instructions and lead-time requirements must be followed in order to avoid installation delays.
- C. Delivery: MAXPRO VMS shall be delivered in the manufacturer’s original, unopened, and undamaged container with identification labels intact.

- D. Storage and Protection: MAXPRO VMS shall be stored and protected from exposure to harmful weather conditions and at the environmental conditions recommended by the manufacturer.

## **1.09 WARRANTY**

- A. General: The warranty period shall be a minimum of twelve (12) months from the delivery date of the system under normal use and service.

## **1.10 MAINTENANCE**

- A. Preventive Maintenance Agreement during Warranty: As a separate price item, the Contractor shall provide preventive maintenance during the warranty period. Maintenance shall include, but not be limited to:
  1. Labor and materials, at no additional cost, to repair MAXPRO VMS.
  2. Labor and materials, at no extra cost, to provide test and adjustments to MAXPRO VMS.
  3. Regular inspections.

## **1.11 TRAINING**

- A. System Administrator and Security/Surveillance Operator training shall be conducted for a minimum of 2 sessions, with a session length of 8 hours at the end user's site.
- B. Training shall include, but not be limited to, MAXPRO VMS administration, provisioning, configuration, operation, and diagnostics.

## **PART 2 PRODUCTS**

### **2.01 SYSTEM (APPLICATION) PERFORMANCE**

- A. MAXPRO VMS shall include, as a minimum, the following features/functions/specifications:
  1. MAXPRO VMS must be protected by the most extensive support services in the industry, including customer service, pre-sales applications assistance, after-sales technical assistance, access to technical online support, and online training using Web conferencing. The manufacturer shall provide 24/7 technical assistance and support via a toll-free telephone number at no extra charge.
  2. MAXPRO VMS and its components shall be thoroughly tested before shipping from the integrator's facility.
  3. MAXPRO VMS shall be an enterprise level video, audio and data management system for recording and monitoring.
  4. MAXPRO VMS shall utilize off-the-shelf computer workstations, servers, networking and storage equipment.
  5. MAXPRO VMS shall be capable of pentaplex user operations simultaneously. This includes live viewing, recording, playback, archiving of video data to an external storage device, and handling the exchange of data between the MAXPRO VMS server and a remote workstation.
  - 6.

7. The MAXPRO VMS shall consist of the major components listed below:
  - a. MAXPRO VMS Server, Controller - This shall contain a database of all network-connected cameras and their configurations.
  - b. Workstations (MAXPRO VIEW) - This shall render video and act as a main human/machine interface.
  - c. Honeywell or OEM or Third Party DVRs or NVRs - These will receive, store, and serve back recorded or live digital video to MAXPRO VMS.
  - d. Matrix Switcher - These are analog matrix switchers.
8. There shall be more than one IP Engine/DVR connected to MAXPRO VMS. One IP Engine shall have more than one camera server depending on the number of cameras in the system.
9. There shall be more than one switcher connected to MAXPRO VMS.
10. System Interfaces - MAXPRO VMS shall have the capability to integrate with Honeywell digital video systems and analog video switchers.
  - a. Recorders
    - (1) The system shall include a seamlessly integrated digital video recording system. The system shall support, but not be limited to, the following Honeywell recorders (DVRs/NVRs):
      - a) IP Engine
      - b) Rapid Eye™ Multi-Media Series digital recorders
      - c) Fusion Series digital recorders
      - d) Enterprise Series digital/network recorders
    - (2) Analog video switchers
11. MAXPRO VMS shall include video integration. The matrix switcher capability support of the system shall include camera call up, monitor switching, video command support and PTZ support. The video subsystem shall be the controller device for video cameras, monitors, and VCRs, and shall associate camera inputs with monitor outputs. The system shall allow users to program video monitors and video cameras to execute commands upon recognition of an alarm or any other condition within the system. The user shall be able to add, edit, delete, and partition video subsystems. The system shall support, but not be limited to, the following video switchers:
  - a. VideoBloX Series
  - b. Honeywell/Ultrak MAXPRO VMSPRO Series
12. The number of recorders and switchers shall be scalable within a network to handle any size installation.
13. The MAXPRO VMS application shall have following major capabilities:
  - a. Live viewing of up to 64 cameras on a single workstation with up to four (4) monitors set up at CIF resolution. For D1 resolution, the number of live streams needs to be benchmarked based on client hardware configuration deployed
    - (1) Integration with existing legacy video matrix switchers and matrix keyboards provides a hybrid system solution with 100% digital expansion capabilities
    - (2) Integration with access control system (Pro-Watch)
    - (3) Integration with Honeywell's video analytics and IDM (in the future)

- (4) Failover and redundant capabilities for the IP Engine
  - (5) Powerful investigation and video archive search tools
  - (6) Post recording motion detection and “advanced search”
  - (7) Motion detection-based recording and advanced search
  - (8) Multi-level user access rights
  - (9) Continuous, scheduled, manual, event-based and alarm-based recording
  - (10) Supports both multicast and unicast network topologies and communication protocols
  - (11) Powerful macro capability allows for custom scripts and provides both customization and third party integration
  - (12) Video analytics-enabled platform
  - (13) Supports both centralized and distributed architectures
  - (14) Simultaneous use of multiple video compression including MPEG-4 and M-JPEG
14. This document details the specifications only for the Honeywell IP Engine. For other recording systems (i.e., Rapid Eye, Fusion, Enterprise, etc.).
15. The Honeywell IP Engine NVR system shall include:
- a. Redundant database servers
  - b. Camera servers
  - c. Network connected cameras or network connected camera encoders
16. Database Server - The database server contains a database of all network-connected cameras and their configurations. The database server shall manage the IP Engine database, containing details including:
- a. System configuration
  - b. Camera configuration and settings
  - c. Recording configuration and settings
  - d. Details of recordings
  - e. Schedules
  - f. Configuration of video analytics
  - g. The database server shall be able to be used in a redundant configuration, using two separate database servers (being executed on separate computers). The backup database server shall be continuously synchronized with the master database server to ensure that it is always up to date and ready for a failover when required. There shall only be one database server or redundant database server pair in the system.
17. Camera Servers - The camera servers must be capable of supporting a large amount of disk space for online video storage and access to high capacity archiving mechanisms for the removal of stored video to off-line media. The camera server shall:
- a. Manage live video from camera encoders
  - b. Transmit live video to MAXPRO VMS workstations
  - c. Receive camera control commands from MAXPRO VMS workstations and then send the commands to cameras
  - d. Store live video to hard disk
  - e. Transmit previously stored video to MAXPRO VMS workstations
  - f. Archive previously stored video to off-line storage media

- g. Retrieve archived video from off-line storage media
- 18. The camera servers shall rely on the database server for all camera database information. The IP Engine shall support multiple camera servers, with no limit to the number of camera servers.
- 19. Cameras and Camera Encoders - Each IP Engine database server shall be expandable to support a maximum of 500 cameras. The MAXPRO VMS server shall have the ability to concurrently connect to multiple IP Engine database servers. As a minimum, the IP Engine must support the following network cameras and camera encoders:
  - a. Honeywell's KD6i Digital Dome PTZ Camera
  - b. Honeywell's Network Video Adapter HNVE-1
  - c. Honeywell's ACUIX Range of IP Domes
  - d. Honeywell's HCD554IP Camera
  - e. Honeywell's HCS554IP Camera
  - f. Honeywell's HD4DIP Dome camera
  - g. Honeywell HCX13M Megapixel IP Camera
  - h. Honeywell HCX3D Megapixel IP Camera
  - i. Honeywell HCX5D Megapixel IP Camera
  - j. Rapid Eye Multi-Media LT
  - k. Rapid Eye Multi-Media
  - l. AXIS Communications 205
  - m. AXIS Communications 206
  - n. AXIS Communications 206M
  - o. AXIS Communications 210
  - p. AXIS Communications 211
  - q. AXIS Communications 211A
  - r. AXIS Communications 213
  - s. AXIS Communications 2100
  - t. AXIS Communications 2110
  - u. AXIS Communications 2120
  - v. AXIS Communications 2130
  - w. AXIS Communications 231D
  - x. AXIS Communications 232D
  - y. AXIS Communications 2400
  - z. AXIS Communications 2400+
  - aa. AXIS Communications 2400+ Blade
  - bb. AXIS Communications 2401
  - cc. AXIS Communications 2401+
  - dd. AXIS Communications 2400+ Blade
  - ee. AXIS Communications 240Q
  - ff. AXIS Communications 2411
  - gg. AXIS Communications 241S
  - hh. AXIS Communications 241SA
  - ii. AXIS Communications 241S Blade
  - jj. AXIS Communications 241Q
  - kk. AXIS Communications 241QA

- ll. AXIS Communications 241Q Blade
- mm. AXIS Communications 2420
- 20. The MAXPRO VMS shell shall have the option of two modes of user logins:
  - a. Windows authentication - Uses Windows logged-in user name
  - b. User DB authentication - Uses preconfigured user name and password
- 21. Workstation (MAXPRO VMS shell) shall provide the following options to the operator:
  - a. Configuration
  - b. Viewer
  - c. Search
  - d. Reports
- 22. Configuration - The operator (with Admin privileges) shall have the option to configure MAXPRO VMS. The following configuration shall be possible:
  - a. RECORDERS CONFIGURATION - This shall provide an option to add/edit/delete recorders such as IP Engine, Rapid Eye, Fusion, Enterprise, etc.
  - b. CAMERA CONFIGURATION - This shall provide an option to add/edit/delete cameras and associate to particular recorder or switcher and map to particular site, partition or event group. Cameras need to be added manually for IP Engine, whereas for other recorders cameras are automatically discovered.
  - c. MONITOR CONFIGURATION - This shall provide an option to add/edit/delete monitors and map to particular site, partition, event group or keyboard. It shall provide an option to add a digital monitor and associate with particular recorder and workstation. It shall provide an option to add an analog monitor and associate with particular switcher.
  - d. SWITCHER CONFIGURATION - This shall provide an option to add/edit/delete switchers such as MAXPRO VMS, VideoBloX, Pelco, Vicon, etc.
  - e. KEYBOARD CONFIGURATION - This shall provide an option to add/edit/delete keyboard controllers.
  - f. USER MANAGEMENT (USERS and ROLES) - This shall provide an option to add/edit/delete roles and associate to predefined privileges and then add/edit/delete users and associate users with roles.
  - g. SITE CONFIGURATION - This shall provide an option to add/edit/delete a site which is a group of cameras.
  - h. WORKSTATION CONFIGURATION - This shall provide an option to add/edit/delete a workstation.
  - i. EVENT GROUP CONFIGURATION - This shall provide an option to add/edit/delete event groups.
  - j. PARTITION CONFIGURATION - This shall provide an option to add/edit/delete partitions.
  - k. SEQUENCE CONFIGURATION - This shall provide an option to add/edit/delete scan sequence.
  - l. INTERCEPT KEY CONFIGURATION - This shall provide an option to add/edit/delete intercept keys.

- m. SYSTEM MACRO CONFIGURATION - This shall provide an option to add/edit/delete macros.
  - n. PORT CONFIGURATION - This shall provide an option to add/edit/delete devices to the ports available on the controller. These devices shall be keyboard controllers, switchers, etc.
23. The following configuration shall be possible with cameras mapped to IP Engine:
- a. Camera Details - The user shall be able to configure the following parameters for each IP Engine camera:
    - (1) Name
    - (2) Location
    - (3) Description
    - (4) Camera Number
    - (5) Camera Encoder Type
    - (6) Resolution. The following resolutions shall be supported (depending on the functionality of the camera and camera encoder):
      - a) 160x120
      - b) QCIF (PAL 192x144, NTSC 176x112)
      - c) 240x180
      - d) 320x240
      - e) CIF (PAL 384x288, NTSC 352x240)
      - f) 480x360
      - g) 640x480
      - h) 2CIF (PAL 768x288, NTSC 704x240)
      - i) 4CIF (PAL 768x576, NTSC 704x480)
      - j) Half-D1 (PAL 720x288, NTSC 720x240)
      - k) D1 (PAL 720x576, NTSC 720x480)
    - (7) Video Frame Rate. The supported frame rates (in frames per second) shall be as follows:
      - a) For Motion JPEG encoding: 30, 25, 20, 15, 10, 5, 3, 2 and 1. Slower frame rates of 1 frame every 2, 3, 5, or 10 seconds shall also be available.
      - b) For MPEG encoding: 30, 25, 15, 12.5, 7.5, 6.25, 3.75 and 1.
      - c) Choice of five levels of video compression, equally distributed from minimum to maximum compression.
      - d) Encoder IP address.
      - e) Encoder camera number (when connected to a multiple port camera encoder).
      - f) Choice of frame rate or bandwidth limited streaming.
      - g) Unicast or multicast transmission of video.
      - h) PAL or NTSC camera format.
    - (8) Camera Control - The user shall be able to configure any appropriate camera to be PTZ controllable. The following camera types must be supported as a minimum:



- a) Video Controls Limited (VCL) Orbiter cameras
  - b) Honeywell's RapidDome cameras
  - c) Cameras supporting the Pelco P protocol
  - d) American Dynamics Speed Dome
  - e) Hernis Scan System's Cameras
  - f) Axis Encoder supported PTZ cameras and devices
- (9) The following PTZ characteristics shall be tunable on a camera-by-camera basis from the camera definition pages:
- a) Pan speed
  - b) Tilt speed
  - c) Zoom speed
  - d) Focus speed
  - e) Iris speed
  - f) Increment step size
- (10) For the VCL Orbiter and Honeywell's RapidDome camera ranges, the following additional functionality shall be provided:
- (11) Configuration of Privacy Zones. The IP Engine shall allow the user to select the regions for privacy zones and automatically download the configuration to the camera.
- (12) Configuration of Camera Tours. The IP Engine shall allow the user to fully configure all required camera tours, automatically downloading the configuration to the camera. The user shall be able to select the required camera tour in a similar way as presets are selected. A camera tour may be configured to be a "home" camera tour, similar to a home preset.
- (13) For the Pelco "P" and Hernis cameras, ability to control the washer and wiper shall be provided from within the IP Engine.
- (14) Recording - The following methods of recording live video shall be supported:
- a) User activated
  - b) Event activated
  - c) Scheduled
  - d) Continuous background recording
  - e) Video motion detection
  - f) Snapshot
  - g) User Activated - The user shall be able to configure the following parameters for each camera:
  - h) Pre-record Duration: The amount of pre-recorded video that will be associated with a user request for recorded video. This will allow the camera server to capture video prior to the user request, as well as after. Shall be selectable from a list of values ranging between 0 seconds and 5 minutes.
  - i) Frame Rate: Video quality required for user activated recording. It shall be possible to have different frame rates for user and event-activated recordings. Shall be selectable from the entire range

of frame rates supported for the camera. For MPEG encoding, support shall be provided to record only the index frames, or a subset of the index frames.

- j) Record Duration: User activated recordings shall terminate after this period. Shall be selectable from a list of pre-defined manufacturer default values ranging between 0 seconds and 5 minutes.
- k) Retention Period: The default period that the camera server shall retain user-activated recordings before being deleted. The retention period of individual recordings shall be able to be changed on a per-recording basis. Shall be selectable from a list of pre-defined manufacturer default values ranging between one hour and forever.
- l) Event Activated - There shall be at least four priorities of alarms/events:
  - (1) Event (journal priority)
  - (2) Low priority
  - (3) High priority
  - (4) Urgent priority

(15) The following settings shall be individually configurable for each alarm and each camera:

- a) Pre-record Duration: The amount of pre-recorded video that will be associated with an alarm/event. This shall allow the camera server to capture video prior to the alarm/event, as well as after the alarm/event. Shall be selectable from a list of pre-defined manufacturer default values ranging between 0 seconds and 5 minutes.
- b) Post-record Duration: Event activated recordings shall terminate after this period. Shall be selectable from a list of pre-defined manufacturer default values ranging between 0 seconds and 5 minutes.
- c) Frame Rate. Video quality required for event activated recording. It shall be possible to have different frame rates for user, event-activated, scheduled and motion detection activated recordings. Shall be selectable from the entire range of frame rates supported for the camera/encoder. For MPEG encoding, support shall be provided to record only the index frames, or a subset of the index frames.
- d) Retention period. The default period the camera server will retain event-activated recordings before being deleted. The retention period of individual recordings shall be able to be changed as necessary.

Shall be selectable from a list of pre-defined manufacturer default values ranging between one hour and forever.

- (16) The pre-record and post-record durations in the paragraph above define the maximum allowable limits for each camera. They shall be configured on a camera-by-camera basis. However each alarm or event causing video to be recorded shall also be capable of individual configuration with pre- and post-alarm periods being selected from a range defined by the maximum settings for the camera.
- (17) DVRMS systems requiring a single pre- and post-record event period to be defined for all alarms and events on an individual camera are not acceptable. DVRMS systems requiring a single pre- and post-event period to be defined for all alarms and events on all cameras are also not acceptable.
- (18) In the case of multiple alarms/events relating to the same camera, a video clip shall be created for each alarm/event.
- (19) For cameras that support Pan/Tilt/Zoom presets, a specified preset location shall be selected automatically when the alarm/event occurs prior to the event activated recording commencing. For example, when an alarm is detected on a security door, the alarm shall trigger a PTZ camera to move to a preset position, which is pointing at the door prior to the DVRMS commencing recording.
- (20) Scheduled - The system shall support the ability to schedule recordings for each individual camera for times in the future. For each scheduled recording the user shall be able to configure:
  - a) Start time
  - b) Stop time
  - c) Frame rate for the recording
  - d) Retention period before the recording will be deleted
  - e) Recurrence (if this is to be a recurring schedule)
  - f) Description (at least 255 characters)
  - g) There shall be no limit on the number of schedules that can be entered for the system. There shall be no limit to the number of schedules per camera.
- (21) Continuous background recording - The system shall support the ability to provide continuous background recording from any cameras managed by the system. Background recordings will be stored as a discrete series of clips and will continue to operate in the event that communication between the camera server and the database server is lost. Once communication is restored, all relevant information will be updated to the database server.
- (22) For each camera the user shall be able to configure:
  - a) Enable/disable background recording
  - b) Duration of the recorded clip
  - c) Frame rate for the recording

- d) Enable/disable archiving of the clip and the period after which to archive
  - e) Retention period before the recording will be deleted
  - f) Enable or disable audio recording (if available)
  - g) Systems that require the configuration of multiple time periods to manage background recordings will not be accepted.
- (23) Video Analytics - The IP Engine system must be able to activate recordings automatically based on events generated by the real-time analysis of video from any camera on the system that has video analytics enabled. The real time analysis comprises several algorithms as follows:
- a) Video motion detection
  - b) Object tracking
  - c) Object classification (and tracking)
- (24) Video Motion Detection - The IP Engine system must be able to support video motion detection algorithms, which can be executed by the video encoder or the camera server. The enabling of video motion detection shall be either:
- a) On a continuous basis
  - b) Scheduled for particular times, dates, days, months, and so on
- (25) The camera server-based algorithm must be able to provide the following functionality:
- a) Detect and track objects
  - b) Learn the scene
  - c) Adapt to a changing outdoor environment
  - d) Ignore environmental changes including rain, hail, wind, swaying trees and gradual light changes
- (26) The user shall be able to configure the following parameters for each camera:
- a) Detection type: Continuous or scheduled
  - b) Actions to perform when motion is detected: When motion is detected, the following actions shall be performed automatically
- (27) Start a recording, with the following configurable settings:
- a) Pre-record Duration: The amount of pre-recorded video, allowing the camera server to capture video prior to the detection of motion, as well as after the detection of motion. Shall be selectable from a list of pre-defined manufacturer default values ranging between 0 seconds and 5 minutes.
  - b) Post-record Duration: Motion detection activated recordings will terminate after this period. Shall be selectable from a list of pre-defined manufacturer

default values ranging between 0 seconds and 5 minutes or until motion has stopped.

- c) Frame Rate. Video quality required for motion detection activated recordings. Shall be selectable from the entire range of frame rates supported for the camera/encoder. For MPEG encoding, support shall be provided to record only the index frames, or a subset of the index frames.
- d) Retention period. The default period that motion detection activated recordings will be retained by the camera server before being deleted. The retention period of individual recordings shall be able to be changed as necessary. Shall be selectable from a list of pre-defined manufacturer default values ranging between one hour and forever.
- e) Send video to an operator station or alarm monitor: Automatically switch an operator station or alarm monitor to view the camera which has motion detected.
- f) Motion Finished Time: The amount of time where no motion (inactivity) is detected before the previous motion is classified as completed. This shall be used for allowing recordings to continue until motion has finished.

(28) The IP Engine must provide a means of automatic and manual tuning of the video motion detection for each camera. Incorporated within this tuning are the following: Selection of the frame rate used for detection.

- a) Optimization for directions of movement.
- b) In any direction
- c) Across the camera view
- d) Towards and away from the camera
- e) Sensitivity level to fine tune the motion detection algorithm
- f) Specification of a minimum object size to allow noise filtering in the system to reduce false detections and alarms

B. The IP Engine must also provide the ability to only detect motion in particular regions of the camera view. The ability to graphically select these regions using the mouse must be provided, with an unlimited number of regions permitted per camera. The regions of interest will be multi-vertical shapes with a minimum of six vertices to allow the region to be properly matched to the scene being detected. It shall be possible to add and remove vertices from the defined region of interest as needed. Solutions providing only rectangular regions of interest will not be accepted. Each region must be able to be individually tuned and have separate tuning parameters. This method of tuning must also provide a live tuning window whereby these settings and

regions can be altered and tested prior to being used. This live tuning window shall show the live video as well as the regions of interest. During the time that motion is detected within a region, the border of the region shall change to a different color. In this way, tuning can be performed to achieve the desired performance. Text shall also be provided in the window to alert the user that motion has been detected.

1. Object Tracking - The IP Engine must provide the ability to acquire and track an object within a predefined field of view on selected cameras.
  2. The camera server-based algorithm must be able to provide the following functionality:
    3. Detect and track objects
    4. Learn the scene
    5. Adapt to a changing outdoor environment
    6. Ignore environmental changes including rain, hail, wind, swaying trees and gradual light changes
  7. The user shall be able to configure the following parameters for each camera:
- C. Actions to perform when an object is detected and tracked: When the event/alarm is raised, the following actions shall be performed automatically:
1. Start a recording, with the following configurable settings:
    - a. Pre-record Duration: The amount of pre-recorded video, allowing the camera server to capture video prior to the alarm/event, as well as after the alarm/event, shall be selectable from a list of pre-defined manufacturer default values ranging between 0 seconds and 5 minutes.
    - b. Record Duration: The period that the recording is active relating to the period of activity in the region of interest. Activated recordings will terminate after this period. Shall be selectable from a list of pre-defined manufacturer default values ranging between 0 seconds and 5 minutes or the object is no longer in the region of interest.
    - c. Frame Rate: Video quality required for object tracking activated recordings. Shall be selectable from the entire range of frame rates supported for the camera/encoder. For MPEG encoding, support shall be provided to record only the index frames, or a subset of the index frames.
    - d. Retention Period: The default period that object tracking activated recordings will be retained by the camera server before being deleted. The retention period of individual recordings shall be able to be

changed as necessary. Shall be selectable from a list of pre-defined manufacturer default values ranging between one hour and forever.

- e. Archive Data: enable/disable archiving and set the period after which the recording will be automatically archived.
- f. Delete Data: Set the period after which the recording will be automatically deleted.
- g. Send video to an operator station or alarm monitor: Automatically switch an operator station or alarm monitor to view the camera which has motion detected.

D. The IP Engine must provide a means of automatic and manual tuning of the object tracking for each camera. Incorporated within this tuning are the following:

1. Selection of the frame rate used for detection
2. Optimization for directions of movement:
  3. In any direction
  4. Motion to left, right, top, bottom or any direction into a region
  5. Motion to left, right, top, bottom or any direction out of a region
6. Sensitivity levels to fine tune the detection algorithm
7. Specification of a minimum object size to allow noise filtering in the system to reduce false detections and alarms

E. The IP Engine must also provide the ability to only track objects in particular regions of the camera view. The ability to graphically select these regions using the mouse must be provided, with an unlimited number of regions permitted per camera. The regions of interest will be multi-verticed shapes with a minimum of six vertices to allow the region to be properly matched to the scene being detected. It shall be possible to add and remove vertices from the defined region of interest as needed. Solutions providing only rectangular regions of interest will not be accepted.

F. Each region must be able to be individually tuned and have separate tuning parameters. This method of tuning must also provide a live tuning window whereby these settings and regions can be altered and tested prior to use. This live tuning window shall show the live video as well as the regions of interest. During the time that motion is detected within a region, the border of the region shall change to a different color. In this way, tuning can be performed to achieve the desired performance. Text shall also be provided in the window to alert the user that motion has been detected.

G. Object Tracking and Classification—The IP Engine must provide the ability to acquire and track an object within a predefined field of view on selected cameras.

The camera server-based algorithm must be able to provide the following functionality:

1. Detect and classify objects
2. Learn the scene
3. Adapt to a changing outdoor environment
4. Ignore environmental changes including rain, hail, wind, swaying trees and gradual light changes
5. Object classification will be grouped as follows:
  - a. Person
  - b. Vehicle
  - c. Other
  - d. Any
6. It must be possible to combine object tracking with object classification to allow the detection of specific objects in a region of interest while ignoring other object types. The user shall be able to configure the following parameters for each camera:
  - a. Actions to perform when an object is detected, classified and tracked: When the event/alarm is raised, the following actions shall be performed automatically:
  - b. Start a recording, with the following configurable settings:
    - (1) Pre-record Duration: The amount of pre-recorded video, allowing the camera server to capture video prior to the alarm/event, as well as after the alarm/event, shall be selectable from a list of pre-defined manufacturer default values ranging between 0 seconds and 5 minutes.
    - (2) Record Duration: The period that the recording is active relating to the period of activity in the region of interest. Activated recordings will terminate after this period. Shall be selectable from a list of pre-defined manufacturer default values ranging between 0 seconds and 5 minutes or the object is no longer in the region of interest.
    - (3) Frame Rate: Video quality required for object tracking and classification-activated recordings. Shall be selectable from the entire range of frame rates supported for the camera/encoder.



For MPEG encoding, support shall be provided to record only the index frames, or a subset of the index frames.

- (4) Retention Period: The default period that object tracking and classification-activated recordings will be retained by the camera server before being deleted. The retention period of individual recordings shall be able to be changed as necessary. Shall be selectable from a list of pre-defined manufacturer default values ranging between one hour and forever.
  - (5) Archive Data: Enable/disable archiving and set the period after which the recording will be automatically archived.
  - (6) Delete Data: Set the period after which the recording will be automatically deleted.
  - (7) Send video to an operator station or alarm monitor:  
Automatically switch an operator station or alarm monitor to view the camera which has motion detected.
7. The IP Engine must provide a means of automatic and manual tuning of the object tracking and classification for each camera. Incorporated within this tuning are the following:
- a. Selection of the frame rate used for detection
  - b. Optimization for directions of movement:
    - c. In any direction
    - d. Motion to left, right, top, bottom or any direction into a region
    - e. Motion to left, right, top, bottom or any direction out of a region
    - f. Sensitivity level to fine tune the detection algorithm
    - g. Specification of a minimum object size to allow noise filtering in the system to reduce false detections and alarms
    - h. Configuration - Live update of the configuration shall be possible
    - i. Viewer - The Viewer shall include, as a minimum, the following features/functions/specifications:
      - (1) The Viewer main video viewing screen shall be capable of showing 1, 4, 9, 16 and other customized split salvos of live or recorded video. These are standard presets, but can be customized to the user preferences.

- (2) The Viewer shall be capable of saving current salvo as a View and shall allow the user to drag this view at any later point in time.
- (3) The Viewer shall be capable of dragging a particular monitor onto a video panel and take control of that monitor.
- (4) The Viewer shall have the option to send command to the controller to switch particular analog camera onto the analog monitor through drag operation.
- (5) The Viewer shall be capable of configuring and running scan sequences.
- (6) The Viewer shall be capable of adjusting the contrast, brightness, and saturation settings for each camera independently.
- (7) The Viewer shall support both analog and digital PTZ through GUI or through the keyboard.
- (8) The Viewer shall be capable of exporting user selected image or video clips. A digital signature shall be attached to every clip getting exported.
- (9) The Viewer shall have the capability to playback the video clips exported.
- (10) Each video channel that is being recorded by the recording system shall be overlaid with text and a time stamp that is customizable by the user.
- (11) The Viewer shall allow the user to initiate recording through GUI or controller
- (12) The Viewer shall have capability of complete alarm management for the alarms coming from recorders or switchers.
- (13) The Viewer shall have the facility of operator messaging which allows operators to communicate with each other. Operators can exchange text, images and annotated video sources. Operators can hand over a video source to another operator using messaging.
- (14) The Viewer shall have the facility of surrounding camera view.

(15) The Viewer shall have the option to perform various operations through context menu on a particular video (live/recorded/sequence). These operations include:

- a) Full Screen
- b) Point and Drag
- c) Enable Square Select
- d) Maintain Aspect Ratio
- e) Toggle Text
- f) Digital PTZ
- g) Add Bookmark
- h) Send Message
- i) Start Recording
- j) Stop Recording
- k) Mark In
- l) Mark Out
- m) Save Image
- n) Save Image As
- o) Show Surrounding Cameras

(16) The Viewer shall have the facility of timeline control (currently supported for IP Engine) which provides camera recording statistics. Timeline control shall have following features:

- a) Mark in/out (with looping facility)
- b) Bookmark
- c) Snapshot
- d) Time Slider
- e) Time Jump
- f) Play Controls

(17) The Viewer shall be controlled by a keyboard controller connected to the MAXPRO VMS server/controller and shall have following major features:

- a) Selecting salvos
- b) Sending monitor commands
- c) Switching operations
- d) PTZ control operations

(18) The Viewer shall have the facility of configuring the preferences which shall include:

- a) fps of unselected panels
- b) Rendered type
- c) Preview pane
- d) Text display format

(19) Search - The Search facility in the MAXPRO VMS shell shall include, as a minimum, the following features/functions/specifications:

- a) Search based on date and time for IP Engine
- j. Reports - The Report facility in the MAXPRO VMS shell shall include, as a minimum, the following features/functions/specifications:
  - (1) Event History Report
  - (2) Audit Log Report

## **2.02 HARDWARE**

A. MAXPRO VMS Server (MAXPRO VMS Core Server and Controller)

B. The MAXPRO VMS server shall be able to operate with no performance degradation using the following hardware and operating system configuration:

- 1. Dual Core Intel® Xeon® 5160 3.00. These are minimum clock speeds; Faster GHz clock speeds are optional
- 2. System memory (RAM) 4 GB of RAM minimum
- 3. DVD-R drive and a 3.5" 1.44 MB floppy disk drive
- 4. Two separate hard drives or two sets of RAID arrays

5. Disk/RAID set 1 utilizes 10K-15K RPM SCSI 146 GB for Windows operating system, MAXPRO VMS Server Software, Microsoft SQL Server software
6. Disk/RAID set 2 utilizes 10K-15K RPM SCSI 146 GB for MAXPRO VMS database files Microsoft SQL Server database files Note: if fault tolerance is required RAID set one is RAID 1 or 10 and RAID set two is RAID 10 or 0 + 1.
7. Dual Network Interface Card (NIC) or compatible pair of NICs. Must be 1 Gbps.
8. 12 function-key keyboard and a mouse pointing device
9. Graphics adapter which supports 32 bit color or higher
10. Video resolution 1024x768 pixels; 65K colors non-interlaced
11. Windows Server 2003 (32 bit only), the original software CDs and startup installation diskettes
12. Windows Media Player Version 9 or 10
13. Note: For installations where the MAXPRO VMS system is integrated with analog switchers with more than 500 cameras, it is recommended to install the MAXPRO VMS controller on a separate server. The specification of this server needs to be determined based on end user deployment requirements.

#### C. MAXPRO VMS Workstation

1. The MAXPRO VMS workstation shall be able to operate with no performance degradation using the following hardware and operating system configuration:
2. Intel® Core™ 2 Duo Processor E6750 2.66 GHz or Quad Core Intel® Xeon® E5405 2.0 GHz. These are minimum clock speeds; Faster GHz clock speeds are optional
3. Standard and Performance Workstation System memory (RAM) 4 GB of RAM minimum for Microsoft Windows XP Professional 32 bit only.
4. DVD-RW drive and a 3.5" 1.44 MB floppy disk drive
5. Single disk or RAID 10K SATA 80 GB or 10K to 15K SCSI 73 GB:
6. Windows Operating System RAID 0 or 0+1
7. Network Interface Card (NIC) or compatible pair of NICs. Must be 1 Gbps.
8. 12 function-key keyboard and a mouse pointing device

9. Graphic card - 2 x 256MB PCIe x16 NVIDIA Quadro NVS 285, Dual DVI or Dual VGA or DVI+VGA. This is for a four monitor setup with each monitor requiring 128 MB.
10. Video resolution 1280x1024 pixels, 32 bit
11. Windows Media Player Version 9 or 10

#### D. IP Engine Database Server

1. The database server shall be able to operate with no performance degradation using the following hardware and operating system configuration:
2. Pentium IV or Xeon 2.8 GHz. These are minimum clock speeds; faster GHz clock speeds are optional
3. 2 GB RAM minimum
4. Hard disk storage to meet Section 4 requirements
5. 1000 Mbps NIC or compatible pair for network connection to the other components of the DVRMS
6. Windows 2000 Server and Windows 2003 Server
7. The database server must provide the following system fault tolerance:
8. Support RAID 0+1 or 1 for the operating system
9. Support RAID 0+1 or 1 for the database (SQL Server 2005)

#### E. IP Engine Camera Server

1. The camera server shall be able to operate with no performance degradation using the following hardware and operating system configuration:
  - a. Pentium IV or Xeon 2.8 GHz. These are minimum clock speeds; faster GHz clock speeds are optional
  - b. 2 GB RAM minimum
  - c. Hard disk storage to meet Section 4 requirements
  - d. 1 Gbps NIC or compatible pair for video transmission to operator stations
  - e. 1 Gbps NIC or compatible pair for video transmission from camera encoders
  - f. Windows 2000 Server and Windows 2003 Server

- g. Each camera server must provide the following system fault tolerance:
  - (1) Support RAID 0+1, 1, or 5 for video recordings (clips)
  - (2) Support RAID 0+1, 1, for the operating system
- h. For the failure of a camera server, all cameras which were managed by that camera server shall be able to be dynamically reallocated to other camera servers. This shall only be done through the IP Engine software without requiring changes to cabling or the network.

#### F. Multiprocessor Support

- 1. The database server and camera server software shall be able to run on both multiple and single processor computers. Where a multiple processor system is used, the IP Engine software shall be able to make optimal use of that configuration.

#### G. System Fault Tolerance

- 1. A failure of any one of the database servers or camera servers shall NOT cause the IP Engine to cease operation. As a worst case, only the cameras controlled by the failed camera server will be temporarily unavailable until reallocated to other camera servers. No physical changes to hardware, cabling or connections shall be required.

### **2.03 ELECTRICAL POWER REQUIREMENTS**

- A. The MAXPRO VMS components must have the following electrical specifications:

- 1. Power Requirement 100-240 VAC (50 Hz/60 Hz)

### **2.04 ENVIRONMENTAL CONDITIONS**

- A. The MAXPRO VMS shall be designed to meet the following environmental conditions:

- 1. Operating Temperature 40°-104°F (5° - 40° C) non- condensing
- 2. Emissions CFR 47 Part 15 Subpart B EN55022, EN610000-3-2, EN610000-3-3V-3, CISPR 22
- 3. Immunity EN55024
- 4. Safety UL60950, NWGQ(7), IEC60950, IEC 60825-1:2001

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Submission of a proposal confirms that the contract documents and site conditions are accepted without qualification unless exceptions are specifically noted.
- B. The site shall be visited on a regular basis to appraise ongoing progress of other trades and contractors, make allowances for all ongoing work, and coordinate the requirements of this contract in a timely manner.
- C. The MAXPRO VMS must be inspected before installation, and shall be free of any cosmetic defects or damage.

### **3.02 INSTALLATION**

- A. The MAXPRO VMS must be installed, programmed, and tested in accordance with the manufacturer's instructions.
  - 1. In order to ensure a complete, functional MAXPRO VMS for bidding purposes where information is not available from the Owner upon request, the worst-case condition shall be assumed.
  - 2. Interfaces shall be coordinated with the Owner's representative, where appropriate.
  - 3. All necessary backboxes, racks, connectors, supports, conduit, cable, and wire must be furnished and installed to provide a complete and reliable MAXPRO VMS installation. Exact location of all boxes, conduit, and wiring runs shall be presented to the Owner for approval in advance of any installation.
  - 4. All conduit, cable, and wire shall be installed parallel and square with building lines, including raised floors areas. Conduit fill shall not exceed forty percent (40%). All wires shall be gathered and tied up to create an orderly installation.

### **3.03 TESTING AND CERTIFICATION**

- A. The Contractor shall demonstrate the functionality of MAXPRO VMS upon completion of installation, documenting the result of all tests and providing these results to the Owner. MAXPRO VMS shall be tested in accordance with the following:
  - 1. The Contractor shall conduct a complete inspection and test of all installed MAXPRO VMS equipment. This includes testing and verifying operation with connected equipment.
- B. The Contractor shall provide staff to test all devices and all operational features of the system for witness by the Owner's representative and the authority having



jurisdiction. All testing must be witnessed by the Owner's representative prior to acceptance.

- C. The testing and certification shall take place as follows:
1. MAXPRO VMS shall be tested in conjunction with the manufacturer's representative.
  2. All deficiencies noted in the above test shall be corrected.
  3. Test results shall be submitted to the consultant or Owner's representative.
  4. The test and correction of any deficiencies shall be witnessed by the Owner's representative and noted.
  5. The Owner's representative shall accept the system.
  6. The system shall be witnessed by the authority having jurisdiction. Any deficiencies noted during the testing must be corrected.
  7. A letter of certification shall be provided to indicate that the tests have been performed, and all equipments are operational.

**END OF SECTION**

**SECTION 28 23 19**  
**VIDEO SYSTEMS RAPID EYE™ MULTI-MEDIA DSP, EVENT-DRIVEN DIGITAL**  
**RECORDING AND TRANSMISSION SYSTEM**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Review all Divisions' Sections for coordination items and related work execution that develops standards of construction performance of installation.

**1.02 SUMMARY**

- A. The intent of this document is to specify the minimum criteria for the design, supply, installation, and commissioning of the Event-driven Digital Recording and Transmission System.
- B. The Event-driven Digital Recording and Transmission System shall provide a powerful, intelligent enterprise-class digital storage management tool that combines Video, Audio, and Data capabilities in a single Recorder Unit (RU).

**1.03 REFERENCES**

- A. Canadian Standards Association (CSA)
- B. Conformity for Europe (CE)
- C. Consultative Committee for International Radio (CCIR)
- D. Electronic Industry Association (EIA)
- E. Federal Communications Commission (FCC)
- F. National Television System Committee (NTSC)
- G. Phase Alternation by Line (PAL)
- H. Underwriters Laboratories Inc. (UL)

**1.04 SYSTEM DESCRIPTION**

- A. The Event-driven Digital Recording and Transmission System shall provide a powerful, intelligent enterprise-class digital storage management tool that combines Video, Audio, and Data capabilities in a single RU. The system shall be designed to record, search, and transmit Video, Audio, and Data transactions, providing users with both live and post-event assessment options. The Event-driven Digital Recording and Transmission System must be available in a minimum of twelve (12) different configurations, allowing the user to select the right RU for every application.

## **1.05 SUBMITTALS**

- A. General: Submittals shall be made in accordance with the Conditions of the Contract and Submittal Procedures Section.
- B. Shop Drawings and Schematics: Shall depict the Event-driven Digital Recording and Transmission System in final proposed “as built” configuration. The following must be provided:
  - 1. Connection diagrams for interfacing equipment.
  - 2. List of connected equipment.
  - 3. Locations for all major equipment components to be installed under this specification.
- C. Product Data: The following shall be provided:
  - 1. Technical data sheets.
  - 2. A complete set of instruction manuals.
- D. Quality Assurance Submittals: The following shall be submitted:
  - 1. Checkout Report: The Contractor shall provide the Owner with a checkout report for each Event-driven Digital Recording and Transmission System. The report shall include:
    - a. A complete list of every device.
    - b. The date it was tested, and by whom.
    - c. If retested, the date it was retested, and by whom.
    - d. The final test report shall indicate that every device was tested successfully.
  - 2. Manufacturer’s Instructions: The Contractor shall deliver 2 sets of System Operation and Maintenance Manuals (if available) to the Owner.
  - 3. Notice of Completion: When the final acceptance has been satisfactorily completed, the Owner shall issue a notice of completion to the Contractor.

## **1.06 QUALITY ASSURANCE**

- A. Manufacturer’s Qualifications: The Event-driven Digital Recording and Transmission System manufacturer shall be the world’s largest and most experienced manufacturer of electronic security systems, with over seventy years of experience in the security industry. The Event-driven Digital Recording and Transmission System must be assembled in the U.S.A., and the manufacturer shall provide 24/7 technical assistance and support via a toll-free telephone number at no extra charge.

## **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. General: Delivery, storage, and handling of the Event-driven Digital Recording and Transmission System shall be in accordance with the manufacturer’s recommendations. The manufacturer’s ordering instructions and lead-time requirements must be followed in order to avoid installation delays.
- B. Delivery: The Event-driven Digital Recording and Transmission System shall be delivered in the manufacturer’s original, unopened, undamaged container with identification labels intact.

- C. Storage and Protection: The Event-driven Digital Recording and Transmission System shall be stored and protected from exposure to harmful weather conditions and at the environmental conditions recommended by the manufacturer.

## **1.08 WARRANTY**

- A. General: The warranty period shall be a minimum of twenty-four (24) months from the manufacture date code under normal use and service. The warranty period for hard drives shall be a minimum of twelve (12) months from date of manufacture.

## **1.09 MAINTENANCE**

- A. Preventative Maintenance Agreement during Warranty: As a separate price item, the Contractor shall provide preventative maintenance during the warranty period. Maintenance shall include, but not be limited to:
  - 1. Labor and materials, at no additional cost, to repair the Event-driven Digital Recording and Transmission System RU.
  - 2. Labor and materials, at no additional cost, to provide test and adjustments to the Event-driven Digital Recording and Transmission System RU.
    - a. Regular inspections.
  - 3. Preventative Maintenance Agreement: As a separate price item, the Contractor shall provide a complete Maintenance Agreement for a period of 12 months after the conclusion of the warranty period. The Maintenance Agreement shall include, but not be limited to:
    - a. Labor and materials, at no additional cost, to repair Event-driven Digital Recording and Transmission System RU.
    - b. Labor and materials, at no additional cost, to provide test and adjustments to the Event-driven Digital Recording and Transmission System RU.
      - (1) Regular inspections.

## **1.10 TRAINING**

- A. Operator training shall be conducted for a minimum session length of 2 hours at the customer's site.
- B. Training shall include, but not be limited to Event-driven Digital Recording and Transmission System operation and diagnostics.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURED RECORDER UNITS**

- A. Model Number/Descriptions RU- Rapid Eye Multi-Media DSP, 480 ips, CD-RW, 3000 GB storage, LAN/PSTN

### **2.02 SYSTEM PERFORMANCE**

- A. The Event-driven Digital Recording and Transmission System shall include, as a minimum, the following features/functions/specifications:

1. The Event-driven Digital Recording and Transmission System manufacturer must be the world's largest and most experienced manufacturer of electronic security systems, with over seventy years of experience in the security industry.
2. The Event-driven Digital Recording and Transmission System must be protected by the most extensive support services in the industry, including Customer Service, Pre-Sales Applications Assistance, After-Sales Technical Assistance, access to Technical Online Support, and Online Training using web conferencing. The Event-driven Digital Recording and Transmission System must be manufactured in the U.S.A., and the manufacturer shall provide 24/7 technical assistance and support via a toll-free telephone number at no extra charge.
3. The Event-driven Digital Recording and Transmission System shall provide a powerful, intelligent enterprise-class digital storage management tool that combines Video, Audio, and Data capabilities in a single RU. This system must be designed to record, search, and transmit Video, Audio, and Data transactions, both live and post-event.
4. The Event-driven Digital Recording and Transmission System's default priority shall be to capture and store video, audio, data, and alarms. The system must be configurable to prioritize live viewing and retrieval of video if required.
5. The Event-driven Digital Recording and Transmission System shall be compatible with most existing and new video equipment and incorporate into any TCP/IP or dialup network. Communication options shall include LAN, WAN, Internet, and PSTN, all utilizing the system's standard equipment, without the need for additional hardware. Compatibility with ISDN and DSL must be supported using additional hardware. The system shall allow for retrieval of system files, and remote software upgrades, utilizing any of the communication options. Simultaneous multiple connections utilizing different network and/or communication types shall be supported.
6. The Event-driven Digital Recording and Transmission System shall utilize an authenticated proprietary file format (REM) for integrity of evidence.
7. The Event-driven Digital Recording and Transmission System shall allow the user to regulate the data rate, defining the size, frequency, and threshold. This shall allow smaller blocks of data to pass unhindered by larger blocks of data, and ensure that images and system messages are delivered as quickly as possible within the capabilities of the network's available bandwidth.
8. The Event-driven Digital Recording and Transmission System and its components shall be thoroughly tested before shipping from the manufacturer's facility.
9. The system shall consist of three (3) major components:
  - a. Recorder Unit
  - b. Software for administrating operators on a multiple site database (ADMIN).
  - c. Software to view video (VIEW) from a Recorder Unit.
10. The RU shall include, as a minimum, the following features/functions/specifications:
  - a. The RU's operating system shall be VxWorks™, a secure, stable, and multi-tasking networked real-time operating system designed to be used in a distributed environment. Windows® and other non real-time based operating systems are not acceptable.

- b. The system's RU must be offered in a minimum of twelve (12) standard configurations, allowing the choice of length of time for storage of video, video capture rate of 480 (ips), and the option to record incident clips to a CD at the RU site. The same RU must operate on either NTSC or PAL utilizing the identical software, at either 115VAC or 230 VAC.
- c. The RU must be engineered for durability and expandability, and be of a rugged, modular design, suited for desktop or rack-mount installations. It shall be designed to fit into a 19" EIA rack without additional hardware, or in an optional slide rack-mount kit for convenient servicing and installation.
- d. The RU shall record in a continuous mode (circular buffer), offering a choice of five (5) different resolutions (NTSC) selectable on a per camera basis; 160 x 120, 320 x 240, 640 x 240, 648 x 480 or 704 x 480. The recording format shall feature 24-bit true color with over sixteen (16) million colors, in YCrCb 4:2:0, in a modified H.261/263 Discrete Cosine Transformation (DCT) format, with proprietary Dual Threshold processing, yielding high quality with low bit rate.
- e. The RU shall offer long-term digital storage for recorded Video, Audio, and Data. The RU must be available in 250, 500, 750, 1000, 1500, or 2000 GB storage versions. The manufacturer's web site shall include a storage estimator for estimating the typical number of days the RU will record, based upon RU capacity, desired update rate (ips), and the number of cameras being recorded.
- f. The RU shall be available with minimum system update rates of 480 images per second (ips) for recording and a capable of simultaneous live transmission. The individual camera rates shall be selectable from one (1) image every second, to thirty (30) images per second.
- g. A minimum of five video quality settings shall be available (10-6), with 10 being the highest quality (shortest record duration) and 6 being the lowest quality (longest record duration). Setting 1-5 were reserved and used only when connecting to legacy products. The quality settings shall be set independently for recording and transmission.
- h. For data handling, the RU shall have the capability to monitor, record, retrieve, search, and filter data obtained from connected devices for Point-Of-Sale (POS), such as cash registers and Automatic Teller Machine's (ATM's). The messages from these devices shall be treated as events, with the option of logging the occurrence of a message, or of having it trigger an alarm. A search engine for data shall be standard, allowing operators to search and review recorded data and video streams associated with the time at which the data is obtained. An operator shall have the option of designating serial data from POS/ATM to automatically initiate an action (alarm) and/or report (log). A post-event search of a specific recorded data stream qualifier must be available. Support for data handling includes: the manufacturer's protocol interface translator devices (PITS) connected to one or the serial ports on the RU, allowing for up to sixteen separate data sources, with each data stream displayed as an individual window within the VIEW software.
- i. The RU shall support at a minimum, the following simultaneous capabilities:

- (1) Live Video Sessions (all users):32 streams
  - (2) Video Retrieval Sessions (all users):32 streams
  - (3) Users Viewing Live Video: 10 sessions
  - (4) Users Retrieving Video:10 sessions
  - (5) Users Accessing Alarms:10 sessions
  - (6) Users Accessing Events:10 sessions
  - (7) Users Accessing Data:10 sessions
  - (8) Users Accessing Maintenance 1 session
- j. The RU shall provide an interface for onsite operation (LocalView) without a computer or additional software. LocalView is displayed on a monitor connected directly to the RU. LocalView must enable onsite operators to manage video settings for each camera and other basic system configurations. LocalView must start automatically when the RU is powered. An online help facility must also be included in LocalView. To access LocalView, the manufacturer shall supply a mouse for connection to the RU. The functions shall include, but not necessarily be limited to, the following:
- (1) Basic system set-up functions such as configuring network settings, including the RU's IP address.
  - (2) Camera set-up, including: name, type, recording rate, recording quality and AGC.
  - (3) Configure the system clock.
  - (4) Review and search system log.
  - (5) Monitor live video, audio, and POS data.
  - (6) View recorded video, audio, and POS data.
  - (7) View a video clip.
  - (8) Copy a video clip to the local CD-RW drive. Depends on RU model.
  - (9) Set-up a camera tour.
  - (10) PTZ control using the supplied mouse.
  - (11) Response recording Accelerated
- k. The local user interface shall include the ability to review and play back recorded video in its own "Clip Builder". The Clip Builder shall include eight (8) live video tabs that are individually configurable by selecting from one of the fifteen (15) pre-defined grids, allowing up to sixteen (16) video streams to be displayed. Clip Builder must also provide a utility to create a video clip using Start and Stop times. The user shall have the ability to store the clip to the RU's hard drive indefinitely without fear of loss or overriding the clip, or directly to a CD if the unit is equipped with the optional CD-RW drive. A Clip Player tab must also be available to review a pre-recorded clip from the RU's hard drive, or from a previously recorded CD loaded in the CD-RW drive. The Clip Player must be loaded onto the CD automatically when storing the clip using Clip Builder. Both the Clip Builder and Clip Player shall provide mouse-selectable, VCR-like controls, such as Play, Pause, Fast Forward, and Rewind.
- l. The local user interface shall feature the following four levels of password protected security:
- (1) Setup

- (2) Cycle
- (3) Make Clip
- (4) Use PTZ
- m. The RU must offer four (4) Field Upgradeable Hard Drive Bays, with all drives mounted on field serviceable carrier sleds. This shall allow for convenient upgrading of local storage utilizing the manufacturer's Hard Drive expansion kits.
- n. The addition or replacement of hard drives shall not require access to internal components or assemblies and must be accomplished without the removal or dismantling of the RU's chassis or enclosure.
- o. An optional CD-RW drive must be available for creating evidence clips of security data locally at the RU, for event backup, and archiving. If the RU is not initially ordered with a manufacturer installed CD-RW drive, a Field Upgradeable CD-RW bay to support a future upgrade to the CD-RW drive must be included.
- p. The RU must include a removable front panel with key lock to conceal the four field upgradeable/replaceable hard drive bays and the optional CD-RW drive. Also secured behind the lockable front panel shall be the Front Panel Control and Display Module, which shall include the following:
  - (1) Power Switch (low voltage control)
  - (2) System Ready LED
  - (3) Alarm State LED
  - (4) Hard Drive Activity LED
  - (5) 2x16 alphanumeric system status LCD readout to indicate operational status and system health monitoring.
- q. All physical connections shall be made directly to the RU, without the need for additional hardware.
- r. Sixteen (16) BNC composite video inputs, each with a corresponding BNC looping video output, shall be provided. The input BNC's shall be auto-terminating, so that no terminating resistors are required if not looping to other devices in the system, and each input must have the ability to auto-detect camera inputs, detecting whether the input is color or monochrome. The looping video output BNC's must be shipped "capped" from the manufacturer.
- s. The RU must include two (2) BNC composite monitor outputs, one used as a spot or sequential real-time switcher, the other for future TBD feature, shall be present.
- t. All video inputs and video outputs must be on an easily detachable sub-panel, allowing for servicing or replacement of the unit while preserving the camera wiring.
- u. The RU must be equipped with two independent, bi-directional audio channels that offer users the ability to monitor and record synchronized audio streams. The audio channels must synchronize with the video and data streams. The audio inputs and audio outputs shall utilize 3.5mm stereo mini jack connections.



- v. The RU shall include sixteen (16) 5V TTL or 12V compatible alarm/control inputs on removable 3.5mm terminal block plugs. The inputs must be configurable via software as Normally Closed (NC), Normally Open (NO), or 2K End-of-Line (EOL) resistor sense.
- w. The RU shall incorporate a Fault Relay to interface with an external alarm panel. The RU must have the ability to signal failure to operate or failure to report alarms.
- x. Eight (8) 5V TTL general purpose outputs on removable 3.5mm terminal block plugs to interface with devices such as lights, warning sirens, locks, etc., shall be present. Each control output shall be rated 50mA maximum @ 5V or 12V (100mA current sink).
- y. The RU shall include two (2) RS-232 serial ports:
  - (1) Port 1: DB9 (M) external modem, PTZ control or POS/ATM connections.
  - (2) Port 2: DB9 (M) PTZ control or hyper terminal configuration.
- z. The manufacturer must provide cables and/or adapters for connections to these serial ports. RS232/485 converters are required on either serial port, support connection of PTZ domes telemetry signals directly to the RU.
  - aa. The RU shall include eight (8) user configurable serial ports:
    - (1) Ports 3-10: RJ-45 jack, independently user configurable to RS232, RS422 or RS485, used for data input, external modem or PTZ control.
  - bb. Utilizing an of the 10 available serial ports, support for the following PTZ domes shall be standard in all RU's:
    - (1) Honeywell Video Systems RapidDome/Orbiter
    - (2) Honeywell Video Systems HD6/KD6 using MaxPro
    - (3) Honeywell Video Systems HD6/KD6 using VCL
    - (4) Javelin 308 Series
    - (5) Kalatel
    - (6) Pelco P
    - (7) Pelco D
    - (8) Sensormatic RS422
  - cc. One (1) V.90 Multi-Protocol Internal Modem shall be included in the RU (model dependent), with a standard RJ11 handset cable interface cable provided by the manufacturer as standard equipment.
  - dd. One (1) 10/100 Base T Fast Ethernet internal Network Interface Card (NIC) shall be included in the RU, with a standard RJ45 supporting CAT5 cable provided by the manufacturer as standard equipment.
  - ee. The RU shall work with either a 115 VAC or 230VAC 50/60 Hz input, 6A or 3A and shall automatically select the correct supply.
  - ff. The RU shall have the ability to connect to a designated PC, using either a telephone connection or network connection, when an alarm is triggered by an event.
  - gg. The RU shall automatically adjust for Daylight Savings Time changes, with no loss of video. When the hour falls back, the unit shall record both duplicated hours, and allow the operator to select which duplicated hour to play back.

- hh. The RU shall have the ability to be configured as a SNTP client (Simple Network Time Protocol), allowing the unit to automatically synchronize to a SNTP server.
- ii. The RU shall have the ability to be configured as a client of Dynamic Host Configuration Protocol (DHCP), allowing the RU to be automatically assigned an IP Address on networks utilizing Dynamic Network Service (DNS) to resolve host names and IP Addresses.
- jj. The Administrative software (ADMIN) shall include, as a minimum, the following features/functions/specifications:
  - (1) The ADMIN software shall be a workstation/server based administration tool capable of enterprise-wide site, user, tour, and alarm station management.
  - (2) The administration software shall be Windows based, and must be compatible with Microsoft Windows 98, NT, ME, 2000, or XP, and must provide a user-friendly Graphical User Interface (GUI) for creating the Event-driven Digital Recording and Transmission System's database.
- kk. Utilizing the manufacturer's standard administration software (ADMIN), support of both of the following must be available:
  - (1) A database that can be as small as a single site, with a sole user, based on a single computer, using the Microsoft Access as the default database. This Microsoft Access database shall be included with the administration software.
  - (2) A database serving thousands of sites and thousands of users, hosted on a network server using common networked database protocols, including Microsoft Access or Microsoft SQL-Server/MSDE.
  - (3) The administration software shall allow the administrator to generate a database template, upon which subsequent operator accounts or Administrator accounts can be based. This template shall make it easy to set up operator accounts with a predefined set of rights.
- ll. A record of each event shall be entered in the alarm log of the central database during an alarm session. The unit must have the ability to sort the alarms in true chronological order. The alarm log must contain a minimum of the following information for each event:
  - (1) Name of user logged on to alarm station or using alarm session.
  - (2) Name of site
  - (3) Alarm action taken (e.g. new, acknowledge, rearm).
  - (4) Time and date action taken.
  - (5) Time and date of alarm.
  - (6) Sensor input of alarm.
  - (7) Name of alarm event.
- mm. The administrative software shall allow for definable user names and privileges. The administrator must have the ability to restrict any, or all, of the following:
  - (1) The right to use the administration software.

- (2) The right to use maintenance functions, including modifying configuration settings, modifying security settings, and modifying system settings.
  - (3) The right to obtain live video from a site.
  - (4) The right to obtain recorded video from a site.
  - (5) The right to listen, and/or talk, utilizing the audio feature.
    - a) The right to use pan, tilt, and zoom (PTZ) commands, on cameras that have the capability, during a live session.
    - b) The right to operate outputs (for controlling gates, lights, etc.), during a live session.
    - c) The right to process alarms using an alarm session to acknowledge and reset alarms.
    - d) The right to access certain sites.
    - e) The right to access certain camera at a specific site, while allowing access to other cameras.
- nn. The administrative software shall feature encrypted password protection. Passwords can be up to 50 alphanumeric characters, and the system administrator shall have the option of assigning individual unique passwords, or assigning the same password to a group of users. The password must block access to unauthorized users, regardless of whether they have access to the administration or viewing software, and /or the dial-up or IP address. oo.
- The Viewing software (VIEW) shall include, as a minimum, the following features/functions/specifications:
- (1) The viewing software shall be a feature rich, workstation based operator program that provides a user friendly Graphical User Interface (GUI) for complete operation and configuration of one or many different RU's simultaneously. The user must have the ability to observe and monitor live or recorded video, audio and data from any RU. The user shall also have the ability to connect to multiple sites simultaneously using multiple connection methods from the same or multiple workstations and connect to the same RU site using multiple connection methods for live and/or recorded information.
  - (2) The viewing software shall be Windows based, and must be compatible with Microsoft Windows 98, NT, ME, 2000, or XP.
  - (3) The viewing software must be able to interpret the display of time in reference to Universal Coordinated Time (UTC), the RU's Time Zone (RTZ), or the operators own Local Time Zone (LTZ).
- pp. Individual camera configuration shall be available within the viewing software. The configuration shall include camera name, camera type, brightness, contrast, hue, saturation, AGC, recording resolution, recording quality, and recording image rate, all configurable on a per camera basis. Automatic changeover of camera type from color to monochrome in low light conditions shall be available when using color/monochrome cameras.
- qq. The operator shall be able to dynamically move, size, and tile individual camera and/or text windows, either during a live or retrieval session, within

the viewing software. The viewing windows shall be detachable and scaleable without preset limitations.

- rr. During a retrieval session, the operator must have the ability to access the recordings from many cameras, and/or many RU's simultaneously. A playback control toolbar shall be available, with many of the controls designed to mimic the controls on VCR's. The controls must include:
  - (1) Print Image
  - (2) Print Preview
  - (3) Copy One Image
  - (4) Start/Stop Record
  - (5) Detailed Seek
  - (6) Jump-to-Time
  - (7) Pause
  - (8) Next Image
  - (9) Play
  - (10) Fast Forward (2x, 3x, 5x, 10x)
  - (11) Playback Speed Slider
  - (12) Best Fit Image
  - (13) Tile Image
- ss. Simply by "double-clicking" the title bar of the camera window, the operator shall have the ability to quadruple the size of the video displayed.
- tt. The viewing software shall include "video smoothing", to significantly improve the display of enlarged video images on the PC monitor. This feature must be available for both live and retrieved video.
- uu. The viewing software shall be able to copy live or recorded video into a "clip". Clips shall allow the user to view portions of video without having to connect to a site, retrieve video for review at a later time, and store and/or copy video on other computers. The software shall allow the operator to specify folders for storage of clips.
- vv. Separate software must also be available free of charge on the manufacturer's web site that can play back clips on personal computers that are not part of the Event-driven Digital Recording and Transmission System. This software shall use standard Windows techniques to install to a workstation.
- ww. The viewing software shall allow bitmaps to be saved from the video, at a rate that equals the camera frame rate. The size of each bitmap file shall not exceed 180 KB. Producing bitmaps must be available when running either a live, retrieval, or clip session. The user shall have the ability to view and print bitmaps using any bitmap reading software (e.g. Corel *Paint Studio*, Adobe *PhotoShop*, Microsoft *Paintbrush*, etc.). The user must also be able to copy/paste or import images directly into e-mail, word processing, or presentation applications.
- xx. The viewing software shall have the ability to control multiple pan/tilt/zoom (PTZ) cameras, control to include multiple pan/tilt speeds, zoom control, iris control (including return to auto-iris), and focus control (including return to auto-focus), programming presets, and calling presets. The software shall

- also have the installer programmable option of automatically returning the PTZ to preset position #1 when the PTZ is no longer part of a live session.
- yy. The viewing software shall allow an operator to listen to live audio, broadcast audio from the operators PC to the remote site, and review recorded audio. zz. The viewing software shall include the ability to monitor and/or search up to sixteen (16) streams of POS or ATM generated data, such as from cash registers, door access sensors, and guest registration Systems. The sixteen streams must be viewed in separate viewing windows, not as an overlay on the video, so as not to obstruct the video. The operator shall have the ability to search for specific strings of text, (such as “no sale”) and be able to either view video for the time of the event, print the details of the event, or save the event details to a \*.txt file.
- aaa. The viewing software shall have the option of receiving and processing alarms/events automatically from multiple RU’s, either by LAN/WAN, dialup, or both. The view operator must have the ability to receive, view, acknowledge, and rearm alarms. A notification of an alarm occurrence can either be immediate, within the minute, or deferred. An alarm bell icon must appear to vibrate, and the operators PC must produce an electronic bell tone, even if the PC does not have speakers or a sound card. The following video delivery options must be available during an alarm.
- (1) Run live alarm session on alarm: An alarm causes live video of all cameras at a site to be displayed full screen, as soon as the alarm reaches the operator’s PC.
  - (2) Launch a retrieval on selection from alarm list: During an alarm, the operator retrieves the video from the *time of the event* by selecting an alarm from the alarm list.
  - (3) Automatic record for live alarm: Recording of a clip starts immediately and automatically when an alarm is received at the operator’s PC.
- bbb. The following Alarm/Events shall be recorded and/or reported and/or ignored by the view operator:
- (1) Session Request
  - (2) Session Rejection
  - (3) Session Disconnect
  - (4) Run-time Failure
  - (5) Self Restart
  - (6) Reboot
  - (7) Synchronize Time
  - (8) System Configuration
  - (9) Security Modification
  - (10) System File Modification
  - (11) Clear Storage
  - (12) Input Sensor Activation/Deactivation
  - (13) Output Sensor Activation/Deactivation
  - (14) Video Loss/Restore
  - (15) Video Motion Detection
  - (16) POS/ATM Data

- ccc. The viewing software shall include RapidSearch™, an industry leading search tool that allows the operator to search for events, logs, and data strings and instantly review the associated video, audio, and data. The search tool shall have (10) user selectable tabs as follows: Session, System, Maintenance, Inputs, Outputs, Video, Motion, User Boost, Response and Data Recording.
- ddd. The viewing software must have the ability to control eight (8) auxiliary outputs, to remotely control onsite devices such as lights, door locks, warning sirens, or gates. These general purpose outputs shall be automatically displayed to the operator on the PC during a live video session.
- eee. The viewing software shall incorporate advanced video motion detection, allowing the operator to set motion detection parameters, such as region-of-interest, mass, and motion intensity on a per-camera basis. The following motion detection features/parameters must be available:
- (1) Enable: Enables motion detection on selected camera.
  - (2) Sensitivity: Adjusts the sensitivity to motion.
  - (3) Motion Preview: Allows the operator to see the motion that the unit will detect. The color of objects change to red, green, or blue as they move to indicate the level of detection that would trigger an alarm or log entry.
  - (4) Log: When enabled, the motion will trigger a log entry.
  - (5) Alarm: When enabled, the motion will trigger an alarm.
  - (6) Delay: Time, in seconds, before motion triggers another alarm. When motion continues to occur within the delay period, it is reported as a single motion event.
  - (7) Edit motion mask: Enables the “show gridlines” button.
  - (8) Show gridlines: Enables a grid overlaying the video image to toggle masking. Masking allows the operator to “hide” areas of no concern from motion detection.
  - (9) Invert mask: Unmasks masked areas and masks unmasked areas.
  - (10) Clear mask: Removes all masking from the image area.
  - (11) Fill mask: Add masking to entire image area. Useful as a first step when most of the image area needs masking.
  - (12)Undo: Cancels the last mouse click.
  - (13)Undo all: Returns the mask to its state before any edits were performed.
- fff. The viewing software shall have the ability to simultaneously connect to as many as 16 RU’s minimum as the memory and CPU of the PC running the software will allow.
- ggg. The viewing software shall have the ability to run site tours, viewing all of the available video and data from a series of sites, one at a time, automatically. The operator may close, add, and adjust camera settings while the site tour is in progress. The order in which sites are toured, the time spent at each site, and the connection to be used to reach the site must be selectable during programming of the site tour with the administration software. The operator shall have the ability to temporarily suspend the tour if required, such as to investigate an event. The operator must then have the ability to resume the tour, at the point the tour was suspended, when the event is resolved.

- hhh. Utilizing the viewing software, the operator shall have the ability to view a RU's storage statistics. The statistics must include, but not necessarily be limited to, the following:
- (1) The system's nominal storage capacity in Gigabytes (GB).
  - (2) The system's average daily usage, averaged over the last seven (7) days of activity, and shown as a percentage of the total storage amount.
  - (3) The effective amount of storage in days based on the RU's actual configuration settings such as number of cameras, resolution, capture rate and quality settings.
  - (4) The amount of time since configuration or reboot of the RU.
  - (5) The amount of storage in use, shown as a percentage of storage amount.
  - (6) The devices connected to a RU.
  - (7) The RU's start time, the time of earliest data.
  - (8) The RU's end time, the time of the latest data.
  - (9) The portion of storage used by an individual device, shown as a percentage of storage.
- iii. The viewing software must have the ability to "trace" events, caused by natural causes, operator error, or misuse of the system, which may be compromising the effectiveness of the Event-driven Digital Recording and Transmission System.
- jjj. The view operator shall have the ability to obtain a report on the RU's hardware. It must include the serial number of the RU, the version of software running on the RU, the date of manufacture, and internal hardware used by the unit.

## **2.03 MECHANICAL SPECIFICATIONS**

- A. The RU must have the following mechanical specifications:
1. Unit Dimensions (H x W x D) 5.23" (3U) x 17.3" x 18.8" (133mm x 440mm x 478mm)
  2. Maximum Unit Weight 43 lbs. (19.5 kg.)
  3. Maximum Shipping Weight 55 lbs. (25 kg.)

## **2.04 ELECTRICAL POWER REQUIREMENTS**

- A. The RU must have the following electrical specifications:
1. Power Requirement 115-23 VAC, 60-50Hz, 6-3A
  2. Auto Sensing 120V/240V Operation

## **2.05 ENVIRONMENTAL CONDITIONS**

- A. The RU shall be designed to meet the following environmental conditions:
- B. Operating Temperature 40° to 104°F (5° to 40°C) non-condensing
- C. Emissions FCC: Part 15, Class B CE: EN61000-6-3:2001 CE: EN61000-3-2:2000
- D. Immunity CE: EN50130-4, with use of an Uninterruptible Power Supply (UPS)

- E. Safety      UL: cUL listed, UL60950-1:2003 IEC/EN 60950-1:2001

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Submission of a proposal confirms that the contract documents and site conditions are accepted without qualifications unless exceptions are specifically noted.
- B. The site shall be visited on a regular basis to appraise ongoing progress of other trades and contractors, make allowances for all ongoing work, and coordinate the requirements of this contract in a timely manner.
- C. The Event-driven Digital Recording and Transmission System must be inspected before installation, and shall be free of any cosmetic defects or damage.

### **3.02 PREPARATION**

- A. Prior to installation, the Event-driven Digital Recording and Transmission System shall be configured and tested in accordance with the manufacturer's instructions.

### **3.03 INSTALLATION**

- A. The Event-driven Digital Recording and Transmission System must be installed, programmed, and tested in accordance with the manufacturer's instructions.
- B. In order to ensure a complete, functional Event-driven Digital Recording and Transmission System, for bidding purposes, where information is not available from the Owner upon request, the worst-case condition shall be assumed.
- C. Interfaces shall be coordinated with the Owner's representative, where appropriate.
- D. All necessary black boxes, racks, connectors, supports, conduit, cable, and wire must be furnished and installed to provide a complete and reliable Event-driven Digital Recording and Transmission System installation. Exact location of all boxes, conduit, and wiring runs shall be presented to the Owner for approval in advance of any installation.
- E. All conduit, cable, and wire shall be installed parallel and square with building lines, including raised floor areas. Conduit fill shall not exceed forty percent (40%). All wires shall be gathered and tied up to create an orderly installation.

### **3.04 TESTING AND CERTIFICATION**

- A. The Contractor shall demonstrate the functionality of the Event-driven Digital Recording and Transmission System upon completion of installation, documenting the result of all tests and providing these results to the Owner. The Event-driven Digital Recording and Transmission System shall be tested in accordance with the following:



1. The Contractor shall conduct a complete inspection and test of all installed Event-driven Digital Recording and Transmission System equipment. This includes testing and verifying operation with connected equipment.
  2. The Contractor shall provide staff to test all devices and all operational features of the system for witness by the Owner's representative and the Authority Having Jurisdiction. All testing must be witnessed by the Owner's representative, prior to acceptance.
- B. The testing and certification shall take place as follows:
1. The Event-driven Digital Recording and Transmission System shall be tested in conjunction with the manufacturer's representative
  2. All deficiencies noted in the above test shall be corrected.
  3. Test results shall be submitted to the consultant or Owner's representative.
  4. The test and correction of any deficiencies shall be witnessed by the owner's representative, and note.
  5. The Owner's representative shall accept the system.
  6. The system test shall be witnessed by the Authority Having Jurisdiction. Any deficiencies noted during the testing must be corrected.
- C. A letter of certification shall be provided to indicate that the tests have been performed, and all devices are operational.

### **3.05 FIELD QUALITY CONTROL**

- A. Inspect each wiring device for defects.

### **3.06 CLEANING**

- A. Clean exposed surfaces to remove splatters and restore finish.

**END OF SECTION**

## **SECTION 311000**

### **SITE CLEARING**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

This Section includes the following:

1. Protecting existing trees and grass to remain.
2. Removing existing plants and grass.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and removing site utilities.
7. Temporary erosion and sedimentation control measures.

##### **1.02 DEFINITIONS**

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel and other objects more than 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

B. Tree Protection Zone: Are a surrounding individual trees or groups of tree to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

##### **1.03 MATERIAL OWNERSHIP**

A. Except for stripped topsoil or other materials indicated to remain Owner's property. Cleared material shall become Contractor's property and shall be removed from Project site.

##### **1.04 SUBMITTALS**

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings, according to Division 1 Requirements identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

## **1.05 PROJECT CONDITIONS**

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Utility Locator Service: Notify PA One Call (1-900-242-1776) before site clearing.

D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

## **PART 2 – EXECUTION**

### **2.01 PREPARATION**

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damage improvements to their original condition, as acceptable to Owner.

### **2.02 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to approved Sediment and Erosion control drawings.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

- C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### **2.03 TREE PROTECTION**

- A. Erect and maintain temporary fencing and tree protection zones before starting site clearing. Remove fence when construction is complete.
- B. Do not excavate within tree protection zones, unless otherwise indicated.
- C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
  - 1. Cover exposed roots with burlap and water regularly.
  - 2. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
  - 3. Coat cut faces of roots more than 1-1/2 inches in diameter with emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
  - 4. Backfill with soil as soon as possible.
- D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.
  - 1. Employ an arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
  - 2. Replace trees that cannot be repaired and restored to full-growth status, as determined by Architect.

### **2.04 UTILITIES**

- A. Owner will arrange for shut-off to indicated utilities that serve existing structures before site clearing, when requested by Contractor.
  - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
  - 1. Arrange with utility companies to shut off indicated utilities.
  - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or other unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify OWNER not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Architect's written permission.

D. Excavate for and remove underground utilities indicated to be removed.

E. Removal of underground utilities is included in Division 2 Sections covering site utilities.

## **2.05 CLEARING AND GRUBBING**

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.

1. Do not remove trees and other vegetation indicated to remain or to be relocated.

2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.

3. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.

4. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

## **2.06 TOPSOIL STRIPPING**

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Limit height of topsoil stockpiles to 72 inches.
2. Dispose of excess topsoil as specified for waste material disposal.
3. Do not stockpile within tree protection zone.

## **2.07 SITE IMPROVEMENTS**

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove slabs, paving curbs, gutters, and aggregate base as indicated.
  1. Unless existing full-depth joint coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
  2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.
- C. Remove below grade footings and utilities within 4' of finished grade.

## **2.08 DISPOSAL**

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
  1. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.
  2. Comply with projects requirements as defined in Section 017419 Construction Waste Management.

**END OF SECTION**

## **SECTION 312000**

### **EARTH MOVING**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. This Section includes the following:
  - 1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and grasses and exterior plants.
  - 2. Excavating and backfilling for buildings and structures.
  - 3. Drainage course for slabs-on-grade.
  - 4. Subbase course for concrete walks, pavements.
  - 5. Subbase course for asphalt paving.
  - 6. Excavating and backfilling for utility trenches.
- B. Related Documents: Project NPDES Permit.

##### **1.02 DEFINITIONS**

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
  - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
  - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Course placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above and below subgrade elevations and to lines and dimensions indicated.
  - 1. Authorized Additional Excavation: No additional excavation will be authorized. Unclassified excavation requires the removal of all excavated materials regardless of their nature or consistency.

- G. Fill: Soil materials used to raise existing grades.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

### **1.03 SUBMITTALS**

- A. Product Data: For the following:
  - 1. Each type of plastic warning tape.
  - 2. Geotextile.
- B. Samples: 12-by-12-inch sample of geotextiles.
- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
  - 1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
  - 2. Laboratory compaction curve according to ASTM D 1557 for each on-site and borrow soil material proposed for fill and backfill.
- D. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

### **1.04 QUALITY ASSURANCE**

- A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.
- B. Preexcavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."



## **1.05 PROJECT CONDITIONS**

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by OWNER and then only after arranging to provide temporary utility services according to requirements indicated.
  - 1. Notify OWNER not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Architect's written permission.
  - 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

## **PART 2 - PRODUCTS**

### **2.01 SOIL MATERIALS**

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
  - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

- H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.
- I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.
- J. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

## **2.02 GEOTEXTILES**

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
  1. Survivability: Class 2; AASHTO M 288.
  2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
  3. Sewn Seam Strength: 142 lbf ; ASTM D 4632.
  4. Tear Strength: 56 lbf ; ASTM D 4533.
  5. Puncture Strength: 56 lbf; ASTM D 4833.
  6. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
  7. Permittivity: 0.5 per second, minimum; ASTM D 4491.
  8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
  1. Survivability: Class 2; AASHTO M 288.
  2. Grab Tensile Strength: 247 lbf; ASTM D 4632.
  3. Sewn Seam Strength: 222 lbf; ASTM D 4632.
  4. Tear Strength: 90 lbf; ASTM D 4533.
  5. Puncture Strength: 90 lbf ; ASTM D 4833.
  6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
  7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
  8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

## **2.03 ACCESSORIES**

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
  - 1. Red: Electric.
  - 2. Yellow: Gas, oil, steam, and dangerous materials.
  - 3. Orange: Telephone and other communications.
  - 4. Blue: Water systems.
  - 5. Green: Sewer systems.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 31 Section "Site Clearing."
- C. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 Section "Site Clearing," during earthwork operations.
- D. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

### **3.02 DEWATERING**

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
  - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
  - 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

### **3.03 EXPLOSIVES**

- A. Explosives: Do not use explosives.

### **3.04 EXCAVATION, GENERAL**

- A. Unclassified Excavation: Excavate to elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
  - 2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
    - a. 24 inches outside of concrete forms other than at footings.
    - b. 12 inches outside of concrete forms at footings.
    - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
    - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    - e. 6 inches beneath bottom of concrete slabs on grade.
    - f. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

### **3.05 EXCAVATION FOR STRUCTURES**

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
  - 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

### **3.06 EXCAVATION FOR WALKS AND PAVEMENTS**

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

### **3.07 EXCAVATION FOR UTILITY TRENCHES**

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
  - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
  - 1. Clearance: 12 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
  - 1. For pipes and conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
  - 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
  - 3. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.
  - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

### **3.08 SUBGRADE INSPECTION**

- A. Notify OWNER when excavations have reached required subgrade.
- B. If OWNER determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
  - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.

2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
  3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

### **3.09 UNAUTHORIZED EXCAVATION**

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by OWNER.
1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

### **3.10 STORAGE OF SOIL MATERIALS**

- B. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

### **3.11 BACKFILL**

- C. Place and compact backfill in excavations promptly, but not before completing the following:
1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
  2. Surveying locations of underground utilities for Record Documents.
  3. Testing and inspecting underground utilities.
  4. Removing concrete formwork.
  5. Removing trash and debris.
  6. Removing temporary shoring and bracing, and sheeting.
  7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- D. Place backfill on subgrades free of mud, frost, snow, or ice.

### **3.12 UTILITY TRENCH BACKFILL**

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 3 Section "Cast-in-Place Concrete."
- D. Provide 4-inch thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.
- E. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.
  - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Backfill voids with satisfactory soil while installing and removing shoring and bracing.
- G. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- H. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

### **3.13 FILL**

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use satisfactory soil material.
  - 2. Under walks and pavements, use satisfactory soil material.
  - 3. Under steps and ramps, use engineered fill.
  - 4. Under building slabs, use engineered fill.
  - 5. Under footings and foundations, use engineered fill.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

### **3.14 SOIL MOISTURE CONTROL**

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

### **3.15 COMPACTION OF SOIL BACKFILLS AND FILLS**

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
  - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
  - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
  - 3. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
  - 4. For utility trenches, compact each layer of initial and final backfill soil material at 92 percent.

### **3.16 GRADING**

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  - 1. Provide a smooth transition between adjacent existing grades and new grades.
  - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:



1. Lawn or Unpaved Areas: Plus or minus 1 inch.
  2. Walks: Plus or minus 1 inch.
  3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

### **3.17 SUBSURFACE DRAINAGE**

- A. Subdrainage Pipe: Specified in Division 33 Section "Subdrainage."
- B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.
- C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with 1 layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.
  2. Place and compact impervious fill over drainage backfill in 6-inch- thick compacted layers to final subgrade.

### **3.18 SUBBASE AND BASE COURSES**

- A. Place subbase course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbasecourse under pavements and walks as follows:
1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
  2. Place base course material over subbase course under hot-mix asphalt pavement.
  3. Shape subbase course to required crown elevations and cross-slope grades.
  4. Place subbase course 6 inches or less in compacted thickness in a single layer.
  5. Place subbase course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.

6. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

### **3.19 DRAINAGE COURSE**

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
  1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
  2. Place drainage course 6 inches or less in compacted thickness in a single layer.
  3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

### **3.20 FIELD QUALITY CONTROL**

- A. Testing Agency: Contractor to engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests may be performed at the following locations and frequencies:
  1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.
  2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests.
  3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than 2 tests.

- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

### **3.21 PROTECTION**

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
  - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### **3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS**

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.
  - 1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.
  - 2. Comply with project requirements as defined in Section 017419 Construction Waste Management.

**END OF SECTION 312000**

## **SECTION 315000**

### **EXCAVATION SUPPORT AND PROTECTION**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. This Section includes excavation support and protection systems.

##### **1.02 PERFORMANCE REQUIREMENTS**

- A. Design, provide, monitor, and maintain an anchored and braced excavation support and protection system capable of resisting soil and hydrostatic pressure and supporting sidewalls of excavations.
  - 1. Work includes removing excavation support and protection systems when no longer needed.
  - 2. Prevent surface water from entering excavations by grading, dikes, or other means.
  - 3. Install excavation support and protection systems without damaging existing buildings, pavements, and other improvements adjacent to excavation.

##### **1.03 SUBMITTALS**

- A. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer for excavation support and protection systems. System design and calculations must be acceptable to authorities having jurisdiction.
  - 1. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by excavation support and protection systems.

## **1.04 QUALITY ASSURANCE**

- A. **Installer Qualifications:** Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing excavation support and protection systems similar to those required for this Project and with a record of successful in-service performance.
- B. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services for designing excavation support and protection systems that are similar to those indicated for this Project in material, design, and extent.
  - 1. **Engineer Responsibility:** Engage a qualified profession engineer to prepare or supervise the preparation of data for the excavation support and protection system including drawings and comprehensive engineering analysis that shows the system's compliance with specified requirements.

## **1.05 PROJECT CONDITIONS**

- A. **Existing Utilities:** Do not interrupt utilities serving facilities occupied by the Owner or others unless permitted in writing by the Architect and then only after arranging to provide temporary utility services according to requirements indicated.
- C. **Survey adjacent structures and improvements,** employing a qualified professional engineer or surveyor; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
  - 1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- B. **Materials** need not be new but must be in serviceable condition.
- C. **Structural Steel:** ASTM A 36
- D. **Steel Sheet Piling:** ASTM A 328 or ASTM A 572
- E. **Wood Lagging:** Lumber, mixed hardwood, nominal rough thickness of 3 inches.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
  - 1. Shore, support, and protect utilities encountered.
- B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent of occupied and used facilities.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- C. Locate excavation support and protection systems clear of permanent construction and to permit forming and finishing of concrete surfaces.
- D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure excavation support and protection systems remain stable.
- E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

### **3.02 SOLDIER BEAMS AND LAGGING**

- A. Install steel soldier piles before starting excavation. Space soldier piles at intervals indicated. Accurately align exposed faces of flanges to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:120 out of vertical alignment.
- B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.
- C. Install wales horizontally at centers indicated and secure to soldier piles.

### **3.03 SHEET PILING**

- D. Install one-piece sheet piling and tightly interlock to form a continuous barrier. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.

### **3.04 TIEBACKS**

- E. Tiebacks: Drill for, install, tension, and grout tiebacks into position. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

### **3.05 BRACING**

- F. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing before removing original brace.
  1. Do not place bracing where it will be cast into or included in permanent concrete work, unless otherwise approved by Architect.
  2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
  3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

### **3.06 REMOVAL AND REPAIRS**

- G. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils and damaging structure, pavements, facilities, and utilities.
  1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.
  2. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.

**END OF SECTION**

**SECTION 321216**  
**ASPHALT PAVING**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

- A. PADOT Publication 408 (latest edition)

**1.02 SUMMARY**

- 1. Hot-mix asphalt paving.
- 2. Pavement-marking paint.

**1.03 DEFINITION**

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

**1.04 SUBMITTALS**

- A. Quality Control Plan Provide a Quality Control Plan in accordance with PennDOT Publication 408, latest edition, Section 401.
- B. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
  - 1. Job-Mix Formulas: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
  - 2. Job-Mix Formulas: For each job mix proposed for the Work.
- C. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
- D. Qualification Data: The manufacturer of the bituminous mixtures shall be approved by PennDOT, as listed in publication 41, latest edition. The manufacturer/supplier of the pavement marking paint shall be approved by PennDOT, as listed in Publication 35, latest edition.
- E. Material Certificates: For each paving material, from manufacturer.
- F. Material Test Reports: For each paving material.



- G. Compaction Tests: Provided in accordance with PennDOT Publication 408/2007 latest edition, Section 401.

## **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: The manufacturer of the bituminous mixtures shall be approved by PennDOT, as listed in publication 41, latest edition. The manufacturer/supplier of the pavement marking paint shall be approved by PennDOT, as listed in Publication 35, latest edition.
- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.
- C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Section 401 of PennDOT Publication 408/2007, latest edition for asphalt paving work.
  - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

## **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver pavement-marking materials to Project Site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

## **1.07 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not apply asphalt materials if subbase is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
  - 1. Prime Coat: Minimum surface temperature of 60 deg F.
  - 2. Tack Coat: Minimum surface temperature of 60 deg F.
  - 3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
  - 4. Asphalt Base Course: Minimum air or surface temperature of 35 deg F and rising at time of placement.
  - 5. Asphalt Surface Course: Minimum air or surface temperature of 40 deg F at time of placement.

- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F and not exceeding 95 deg F.

## **PART 2 - PRODUCTS**

### **2.01 AGGREGATES**

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Aggregate shall be in accordance with PennDOT Publication 408, latest edition, Section 401 and 703.

### **2.02 ASPHALT MATERIALS**

- A. Asphalt Binder: AASHTO M 320 or AASHTO MP 1a, PG 64-22, or in accordance with PennDOT Publication 408, latest edition, Sections 401 and 702, whichever is more restrictive.
- B. Asphalt Cement: In accordance with PennDOT Publication 408/2007, latest edition, Section 401.
- C. Prime Coat: Asphalt emulsion prime coat complying with PennDOT Publication 408, latest edition, Section 461.
- D. Tack Coat: Asphalt emulsion tack coat complying with PennDOT Publication 408, latest edition, Section 460.
- E. Water: Potable and in accordance with PennDOT Publication 408, latest edition, Section 720.
- F. Undersealing Asphalt: ASTM D 3141, pumping consistency.

### **2.03 AUXILIARY MATERIALS**

- A. In accordance with PennDOT Publication 408, latest edition, Section 401.
- B. Joint Sealant: In accordance with PennDOT Publication 408, latest edition, Section 401
- C. Pavement-Marking Paint: Epoxy resin in accordance with PennDOT Publication 408/2207, latest edition, Section 964. Type N, Type F, Type S; colors complying with FS TT-P-1952.
  - 1. Colors: White and Blue at ADA spaces.

## **2.04 MIXES**

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes in accordance with PennDOT Publication 408, latest edition, Section 401 and site details.
  - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that subbase is dry and in suitable condition to begin paving.
- B. Proof-roll subbase below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subbases.
  - 1. Completely proof-roll subbase in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
  - 2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
  - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by OWNER, and replace with proper compacted backfill or fill as directed.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

### **3.02 SURFACE PREPARATION**

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subbase is ready to receive paving.
- B. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.30 to 0.70 gal./sq. yd. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.
  - 1. Apply in accordance with PennDOT Publication 408, latest edition, Section 461.
  - 2. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
  - 3. Protect primed substrate from damage until ready to receive paving.

- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.02 gal./sq. yd.
  - 1. Apply in accordance with PennDOT Publication 408, latest edition, Section 460.
  - 2. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 3. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
  - 4. Mix asphalt paving overlay the same day.

### **3.03 HOT-MIX ASPHALT PLACING**

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
  - 1. Apply in accordance with PennDOT Publication 408, latest edition, Section 401.
  - 2. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
  - 3. Place hot-mix asphalt surface course in single lift.
  - 4. Spread mix at minimum temperature of 265 deg F.
  - 5. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
  - 6. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
  - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

### **3.04 JOINTS**

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
  - 1. Construct joint in accordance with PennDOT Publication 408/2207, latest edition, Section 401.
  - 2. Clean contact surfaces and apply tack coat to joints.
  - 3. Offset longitudinal joints, in successive courses, a minimum of 6 inches.

4. Offset transverse joints, in successive courses, a minimum of 24 inches.
5. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints in accordance with PennDOT Publication 408, latest edition, Section 401.
6. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
7. Compact asphalt at joints to density within 2 percent of specified course density.

### **3.05 COMPACTION**

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
  1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
  1. Average Density: 96 percent of reference laboratory density according to ASTM D 6927, but not less than 94 percent nor greater than 100 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### **3.06 INSTALLATION TOLERANCES**

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
  - 1. Base Course: Plus or minus 1/2 inch.
  - 2. Surface Course: Plus 1/4 inch, no minus.
  
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the 3/16 inches tolerance as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas.

### **3.07 PAVEMENT MARKING**

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with OWNER.
  
- B. Allow paving to age for 30 days before starting pavement marking.
  
- C. Sweep and clean surface to eliminate loose material and dust.
  
- D. Apply in accordance with PennDOT Publication 408, latest edition, Section 964.

### **3.08 FIELD QUALITY CONTROL**

- A. Testing Agency: Contractor to engage a qualified testing agency to perform tests and inspections.
  
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549 or in accordance with PennDOT Publication 408, latest edition, Section 401, whichever is more restrictive.
  
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
  
- D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to PennDOT Publication 408, latest edition, Section 401, and the following:
  - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
  - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

- a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
  - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- E. Replace and compact hot-mix asphalt where core tests were taken.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements, in accordance with PennDOT Publication 408, latest edition, Section 401.

### **3.10 DISPOSAL**

- G. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
- 1. Do not allow milled materials to accumulate on-site.
  - 2. Comply with project requirements as defined in Section Construction Waste Management.

**END OF SECTION 321216**

**SECTION 321313**  
**CONCRETE PAVING**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

- A. PADOT Publication 408 (latest edition).

**1.02 SUMMARY**

- A. This Section includes exterior cement concrete pavement for the following:
  - 1. Trash Enclosure Pads.
  - 2. Curbs.
  - 3. Sidewalks.

**1.03 DEFINITIONS**

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

**1.04 SUBMITTALS**

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Qualification Data: The manufacturer of the cement concrete shall be approved by PennDOT Publication 42, latest edition, or in accordance with PennDOT Publication 408, latest edition, Sections 501, 630 and 704.
- D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
  - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.



- E. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
  - 1. Cementitious materials.
  - 2. Steel reinforcement and reinforcement accessories.
  - 3. Admixtures.
  - 4. Curing compounds.
  - 5. Applied finish materials.
  - 6. Bonding agent or epoxy adhesive.
  - 7. Joint fillers.
- F. Field quality-control test reports.
- G. Compaction Tests: Provided in accordance with PennDOT Publication 408, latest edition, Sections 501, 630 and 704.
- H. Scoring and Joint Plan: Provide site plan illustrating proposed location of joints and joint-types for approval by the Architect.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: The manufacturer of the cement concrete shall be approved by PennDOT Publication 42, latest edition, or in accordance with PennDOT Publication 408, latest edition, Sections 501, 630 and 704.
- B. Testing Agency Qualifications: in accordance with PennDOT Publication 408/2007, latest edition, Sections 704.
- C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.
- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

#### **1.06 PROJECT CONDITIONS**

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Weather Limitations: Do not place cement concrete materials if subbase is not or expressively damp. Place cement concrete materials in accordance with PennDOT Publication 408, latest edition, Sections 501 and 630.

## **PART 2 - PRODUCTS**

### **2.01 FORMS**

- A. Form Materials: in accordance with PennDOT Publication 408, latest edition, Sections 501 and 630.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

### **2.02 STEEL REINFORCEMENT**

- A. In accordance with PennDOT Publication 408, latest edition, Sections 709.

### **2.03 CONCRETE MATERIALS**

- A. Cementitious Material: In accordance with PennDOT Publication 408, latest edition, Section 701.
- B. Normal-Weight Aggregates: In accordance with PennDOT Publication 408, latest edition, Section 703.
- C. Exposed Aggregate: In accordance with PennDOT Publication 408, latest edition, Section 703.
- D. Water: In accordance with PennDOT Publication 408, latest edition, Section 720.
- E. Air-Entraining Admixture: In accordance with PennDOT Publication 408, latest edition, Section 711.
- F. Chemical Admixtures: In accordance with PennDOT Publication 408, latest edition, Section 711.

### **2.04 CURING MATERIALS**

- A. As approved in PennDOT Publication 408, latest edition, Section 501.

### **2.05 RELATED MATERIALS**

- A. Joint Material: In accordance with PennDOT Publication 408, latest edition, Section 705.

- B. Epoxy Bonding Compound: In accordance with PennDOT Publication 408, latest edition, Section 706.

## **2.06 PAVEMENT MARKINGS**

- A. Pavement-Marking Paint: Epoxy resin in accordance with PennDOT Publication 408, latest edition, Section 964.

## **2.07 CONCRETE MIXTURES**

- A. Prepare design mixtures, proportioned according to PennDOT Publication 408, latest edition, Section 704, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
- B. Proportion mixtures to provide normal-weight concrete with the following properties: in accordance with PennDOT Publication 408, latest edition, Section 704, as shown in the Plans.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content in accordance with PennDOT Publication 408, latest edition, Sections 704 and 706.
- D. Chemical Admixtures: In accordance with PennDOT Publication 408, latest edition, Section 704 and 706. Use admixtures according to manufacturer's written instructions.
- E. Cementitious Materials: In accordance with PennDOT Publication 408, latest edition, Section 701 and 704.

## **2.08 CONCRETE MIXING**

- A. Ready-Mixed Concrete: In accordance with PennDOT Publication 408, latest edition, Section 7054

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine exposed subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

- B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
- C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subbase is ready to receive pavement.

### **3.02 PREPARATION**

- A. In accordance with PennDOT Publication 408, latest edition, Section 501 unless a more restrictive method is given below.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.

### **3.03 EDGE FORMS AND SCREED CONSTRUCTION**

- A. In accordance with PennDOT Publication 408, latest edition, Section 501 unless a more restrictive method is given below.
- B. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- C. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

### **3.04 STEEL REINFORCEMENT**

- A. In accordance with PennDOT Publication 408, latest edition, Section 501 unless a more restrictive method is given below.
- B. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- C. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- D. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- E. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

### 3.05 JOINTS

- A. Construct joints in accordance with PennDOT Publication 408, latest edition, Section 501 unless a more restrictive method is given below.
- B. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
  - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- C. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
  - 1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
  - 2. Provide tie bars at sides of pavement strips where indicated.
  - 3. Butt Joints: Use epoxy bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  - 4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
  - 5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
- D. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
  - 1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated.
  - 2. Extend joint fillers full width and depth of joint.
  - 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
  - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
  - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
  - 6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
  2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
  3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
- F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

### **3.06 CONCRETE PLACEMENT**

- A. Place cement concrete in accordance with PennDOT Publication 408, latest edition, Section 501, unless a more restrictive method is given below.
- B. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- C. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- D. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- E. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- F. Do not add water to concrete during delivery or at Project site.
- G. Do not add water to fresh concrete after testing.
- H. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- I. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

- J. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
  - 1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.
- K. Screed pavement surfaces with a straightedge and strike off.
- L. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- M. Curbs: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.
- N. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 90 deg F at point of placement.
  - 2. Do not use frozen materials or materials containing ice or snow.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.
- O. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
  - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water shall be used to control temperature.
  - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
  - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

### **3.07 FLOAT FINISHING**

- A. Finish in accordance with PennDOT Publication 408, latest edition, Section 501, unless a more restrictive method is given below.

- B. General: Do not add water to concrete surfaces during finishing operations.
- C. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
  - 1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

### **3.08 CONCRETE PROTECTION AND CURING**

- A. Protect and cure concrete in accordance with PennDOT Publication 408, latest edition, Section 501, unless a more restrictive method is given below.
- B. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- C. Comply with ACI 306.1 for cold-weather protection.
- D. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- E. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- F. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
  - 1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.



3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

### **3.09 PAVEMENT TOLERANCES**

- A. Comply with tolerances of PennDOT Publication 408, latest edition, Section 501.

### **3.10 PAVEMENT MARKING**

- B. Do not apply pavement-marking paint until layout, colors, and placement have been verified with OWNER.
- C. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.
- D. Sweep and clean surface to eliminate loose material and dust.
- E. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

### **3.11 FIELD QUALITY CONTROL**

- F. Field Quality Control shall be in accordance with PennDOT Publication 408, latest edition, Section 501, unless a more restrictive method is given below.
- G. Testing Agency: Contractor to engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- H. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
  1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
  4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 85 deg F and above, and one test for each composite sample.
  5. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
  6. Compressive-Strength Tests: ASTM C 39; test 1 specimen at 7 days and 2 specimens at 28 days.
    - a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.
- I. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- J. Test results shall be reported in writing to OWNER, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- K. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by OWNER but will not be used as sole basis for approval or rejection of concrete.
- L. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by OWNER.
- M. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
- N. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### **3.12 REPAIRS AND PROTECTION**

- O. Repairs and protection of the concrete shall be in accordance with PennDOT Publication 408, latest edition, Section 501, unless a more restrictive method is given below.
- P. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

- Q. Drill test cores, where directed by OWNER, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- R. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- S. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

**END OF SECTION 321313**

## SECTION 323223

### SEGMENTAL RETAINING WALLS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes single-depth segmental retaining walls without soil reinforcement.

##### 1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design segmental retaining walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Engineering design shall be based on the following loads and be according to NCMA's "Design Manual for Segmental Retaining Walls."
  - 1. Gravity loads due to soil pressures resulting from grades and sloped backfill indicated.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For concrete units.
- C. Samples for Verification: For each color and texture of concrete unit required. Submit sections of units not less than 3 inches square.
  - 1. Include one full-size unit for each type of concrete unit required.
- D. Delegated-Design Submittal: For segmental retaining walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Compliance Review: Qualified professional engineer responsible for segmental retaining wall design shall review and approve submittals and source and field quality-control reports for compliance of materials and construction with design.
- E. Product Certificates: For segmental retaining wall units and soil reinforcement, from manufacturer.

## **1.4 QUALITY ASSURANCE**

- A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects.
  - 1. Build mockup of segmental retaining wall approximately 72 inches long by not less than 18 inches high above finished grade at front of wall.
    - a. Include typical base and cap or finished top construction.
    - b. Include backfill to typical finished grades at both sides of wall.
    - c. Include typical end construction at one end of mockup.
    - d. Include 36-inch return at 1 end of mockup, with typical corner construction.
  - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- B. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to segmental retaining walls including, but not limited to, the following:
    - a. Structural load limitations.
    - b. Construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    - c. Field quality-control procedures.

## **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Store and handle concrete units and accessories to prevent deterioration or damage due to contaminants, breaking, chipping, or other causes.

## **PART 2 - PRODUCTS**

### **2.1 SEGMENTAL RETAINING WALL UNITS**

- A. Concrete Units: ASTM C 1372, Normal Weight solid units, except that units shall not differ in height more than plus or minus 1/16 inch from specified dimension.
  - 1. Provide units that comply with requirements for freeze-thaw durability.
  - 2. Provide units that interlock with courses above and below by means of pins.
- B. Color: As selected by Architect from manufacturer's full range.
- C. Shape and Texture: Provide units of basic shape and dimensions indicated with machine-split textured exposed faces.

- D. Batter: Provide units that offset from course below to provide 1:24 batter.
- E. Cap Units: Provide cap units of same shape as other units with smooth, as-cast top surfaces without holes or lugs.
- F. Special Units: Provide corner units, end units, and other shapes as needed to produce segmental retaining walls of dimensions and profiles indicated and to provide texture on exposed surfaces matching face.

## **2.2 INSTALLATION MATERIALS**

- A. Pins: Product supplied by segmental retaining wall unit manufacturer for use with units provided, made from nondegrading polymer reinforced with glass fibers.
- B. Cap Adhesive: Product supplied or recommended by segmental retaining wall unit manufacturer for adhering cap units to units below.
- C. Leveling Base: Comply with requirements Section "Earth Moving" for base material.
  - 1. Leveling Course: Lean concrete with a compressive strength of not more than 500 psi.
- D. Drainage Fill: Comply with requirements in Section "Earth Moving."
- E. Nonreinforced-Soil Fill: Comply with requirements in Division 31 Section "Earth Moving" for satisfactory soils.
- F. Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent.
  - 1. Apparent Opening Size: No. 70 to 100 sieve, maximum; ASTM D 4751.
  - 2. Minimum Grab Tensile Strength: 110 lb; ASTM D 4632.
  - 3. Minimum Weight: 4 oz./sq. yd.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas and conditions, with Installer present, for compliance with requirements for excavation tolerances, condition of subgrades, and other conditions affecting performance of segmental retaining walls.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 RETAINING WALL INSTALLATION**

- A. General: Place units according to NCMA's "Segmental Retaining Wall Installation Guide" and segmental retaining wall unit manufacturer's written instructions.
  - 1. Lay units in running bond.
  - 2. Form corners and ends by using special units.
- B. Leveling Base: Place and compact base material to thickness indicated and with not less than 95 percent maximum dry unit weight according to ASTM D 698.
  - 1. Leveling Course: Place unreinforced lean concrete over leveling base 1 to 2 inches thick. Compact and screed concrete to a smooth, level surface.
- C. First Course: Place first course of segmental retaining wall units for full length of wall. Place units in firm contact with each other, properly aligned and level.
  - 1. Tamp units into leveling base as necessary to bring tops of units into a level plane.
- D. Subsequent Courses: Remove excess fill and debris from tops of units in course below. Place units in firm contact, properly aligned, and directly on course below.
  - 1. For units with pins, install pins and align units.
- E. Cap Units: Place cap units and secure with cap adhesive.

### **3.3 FILL PLACEMENT**

- A. General: Comply with requirements in Division 31 Section "Earth Moving," NCMA's "Segmental Retaining Wall Installation Guide," and segmental retaining wall unit manufacturer's written instructions.
- B. Fill voids between and within units with drainage fill. Place fill as each course of units is laid.
- C. Place, spread, and compact drainage fill and soil fill in uniform lifts for full width and length of embankment as wall is laid. Place and compact fills without disturbing alignment of units. Where both sides of wall are indicated to be filled, place fills on both sides at same time. Begin at wall and place and spread fills toward embankment.
  - 1. Use only hand-operated compaction equipment within 48 inches of wall, or one-half of height above bottom of wall, whichever is greater.
  - 2. Compact reinforced-soil fill to not less than 95 percent maximum dry unit weight according to ASTM D 698.
    - a. In areas where only hand-operated compaction equipment is allowed, compact fills to not less than 90 percent maximum dry unit weight according to ASTM D 698.
  - 3. Compact nonreinforced-soil fill to comply with Division 31 Section "Earth Moving."

- D. Place a layer of drainage fill at least 12 inches wide behind wall to within 12 inches of finished grade. Place a layer of drainage geotextile between drainage fill and soil fill.
- E. Wrap subdrainage pipe with filter fabric and place in drainage fill as indicated, sloped not less than 0.5 percent to drain.
- F. Slope grade at top of wall away from wall unless otherwise indicated. Slope grade at base of wall away from wall. Provide uniform slopes that will prevent ponding.

### **3.4 CONSTRUCTION TOLERANCES**

- A. Variation from Level: For bed-joint lines along walls, do not exceed 1-1/4 inches in 10 feet, 3 inches maximum.
- B. Variation from Indicated Batter: For slope of wall face, do not vary from indicated slope by more than 1-1/4 inches in 10 feet.
- C. Variation from Indicated Wall Line: For walls indicated as straight, do not vary from straight line by more than 1-1/4 inches in 10 feet.

### **3.5 ADJUSTING**

- A. Remove and replace segmental retaining wall construction of the following descriptions:
  - 1. Broken, chipped, stained, or otherwise damaged units. Units may be repaired if Architect approves methods and results.
  - 2. Segmental retaining walls that do not match approved Samples and mockups.
  - 3. Segmental retaining walls that do not comply with other requirements indicated.
- B. Replace units so segmental retaining wall matches approved Samples and mockups, complies with other requirements, and shows no evidence of replacement.

**END OF SECTION 323223**



**SECTION 329200**  
**TURF AND GRASSES**

**PART 1 - GENERAL**

**1.1 WORK INCLUDED**

- A. This Section includes the following:
  - 1. Seeding.
  - 2. Sodding.
  - 3. Lawn renovations.
- B. Related Sections include the following:
  - 1. Section "Earthwork: for excavation, filling and backfilling, and rough grading.

**1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. 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.
  - 2. Product Certificates: For fertilizers, signed by product manufacturer.

**1.3 QUALITY ASSURANCE**

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment.

**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. 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: 30 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.
  - 2. Sodded Lawns: 30 days from date of Substantial Completion.
- B. Maintain and establish lawn watering, fertilizing, mowing, and other operations.
  - 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 contractor's source and to keep lawn uniformly moist.
  - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.
  - 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.
- E. Lawn Postfertilization: Apply fertilizer after initial mowing and when grass is dry.
  - 1. Use fertilizer that will provide actual nitrogen of at least 1 lb/100 sq. ft. to lawn area.

## **PART 2 - PRODUCTS**

### **2.1 SEED**

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOS's "Journal of Seed Technology; rules for Testing Seeds; for purity and germination tolerances.
- B. Seed Species: State-certified seed for grass species, as follows:

- C. 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 0.5 percent weed seed:
  - 1. Proportioned by weight as follows:
    - a. 50 percent Kentucky bluegrass (*Poa pratensis*)
    - b. 30 percent chewings red fescue (*Festuca rubra* variety).
    - c. 20 percent perennial ryegrass (*Lolium perenne*).

## **2.2 SOD**

- A. Sod: State certified consistency of 2 or more varieties of Kentucky Blue Grass compromising 90% of the grass species.

## **2.3 TOPSOIL**

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.
  - 1. Topsoil Source: Amend existing in-place surface soil to produce topsoil. Verify suitability of surface soil to product topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
    - a. Surface soil may be supplemented with imported or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from bogs or marshes.

## **2.4 FERTILIZER**

- A. Commercial Fertilizer: Commercial-grad complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
  - 1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

## **2.5 MULCHES**

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

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, and plantings from damage caused by planting operations.

### **3.3 LAWN PREPARATION**

- A. Limit lawn subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
  - 1. Apply fertilizer directly to subgrade before loosening.
- 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 6 inches. Apply and mix thoroughly into top of soil.
    - a. Apply superphosphate fertilizer directly to surface soil before loosening.
  - 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 SEEDING**

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
  - 1. Do not use wet seed or seed that is moldy or otherwise damaged.
- B. Sow seed at the rate of 3 to 4 lb/1000 sq. ft.
- C. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1 inch in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

### **3.5 SODDING**

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
  - 1. Lay sod across angle of slopes exceeding 1:3.
  - 2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples, spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week, water daily or more frequently as necessary to maintain moist soil to a minimum dept of 1-1.2 inches below sod.

### **3.6 LAWN RENOVATION**

- A. Renovate existing lawn.
- B. Renovate existing lawn damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
  - 1. Reestablish lawn where settlement or washouts occur or where minor regarding is required.
- C. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury in soil.

- D. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.
- E. Mow, dethatch, core aerate, and rake existing lawn.
- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them of Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.
- I. Apply soil amendments and initial fertilizers required for establishing new lawns and mix thoroughly into top 4 inches of existing soil. Provide new planting soil to fill low spots and meet finish grades.
- J. Apply seed and protect with straw mulch as required for new lawns.
- K. Water newly planted areas and keep moist until new lawn is established.

### **3.7 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.
- B. Satisfactory Sodded Lawn: At end of maintenance period, a healthy, well-rooted, even-colored, viable lawn has been established, free of weeds, open joints, bare areas, and surface irregularities.
- C. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

### **3.8 CLEAN UP 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**

## SECTION 329300

### PLANTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Trees.
  - 2. Shrubs/Grasses.
  - 3. Selective Tree Pruning.

##### 1.2 DEFINITIONS

- A. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum-laced as recommended by ANSI Z60.1.
- B. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for kind, type, and size of exterior plant required.
- C. Finish Grade: Elevation of finished surface of planting soil.
- D. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- E. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- F. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each of the following:
  - 1. Mulch material, 1cu. ft. sample
- C. Product Certificates: For each type of manufactured product, signed by product manufacturer, and complying with the following:
  - 1. Manufacturer's certified analysis for standard products.

2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- E. Material Test Reports: For imported topsoil.
- F. Planting Schedule: Indicating anticipated planting dates for exterior plants.

#### **1.4 QUALITY ASSURANCE**

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of exterior plants.
- 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; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
- D. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."
- E. Tree and Shrub Measurements: measure according to ANSI A60.12 with branches and trunks or canes in their normal position. Do not rootprune to obtain required sizes. Take caliper measurements 6 inches above ground for trees up to 4-inch caliper size, and 12 inches above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.
- F. Arborist Qualifications: Submit qualifications of state certified arborist for work associated with selective tree pruning.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver exterior plants freshly dug.
  1. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.
- B. Do not prune trees and shrubs before delivery, except as approved by Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during deliver. Do not drop exterior plants during delivery.
- C. Handle planting stock by root ball.
- D. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist.



1. Heel-in bare-root stock. Soak roots in water for two hours if dried out.
2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of exterior plants store on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

## **1.6 COORDINATION**

- A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.
- B. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns, unless otherwise acceptable to Architect.
  1. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.

## **1.8 WARRANTY**

- A. Special Warranty: Warrant the following exterior plants, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, or incidents that are beyond Contractor's control.
  1. Warranty Period for Trees, Shrubs, and Groundcover: One year from date of Substantial Completion.
  2. Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season.
  3. Replace exterior plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
  4. A limit of one replacement of each exterior plant will be required, except for losses or replacements due to failure to comply with requirements.

## **1.9 MAINTENANCE**

- A. Trees and Shrubs: Maintain for the following maintenance period by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings.
  1. Maintenance period: three months from date of Substantial Completion.
  2. Maintain groundcover for a period of one year.

## **PART 2 - PRODUCTS**

### **2.1 TREE AND SHRUB MATERIAL**

- A. General: Furnish nursery-grown trees and shrubs complying with ANSI A60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects' eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
- B. Grade: provide trees and shrubs of sized and grades complying with ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Label at least one tree and one shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.
- D. If formal arrangements or consecutive order of trees or shrubs is show, select stock for uniform height and spread, and number label to assure symmetry in planting.

### **2.2 SHADE AND FLOWERING TREES**

- A. Shade Trees: Single-stem trees with straight trunk, well-balanced crown, an intact leader, of height and caliper indicated, complying with ANSI Z60.1 for type of trees required.
  - 1. Provide balled and burlapped trees.
  - 2. Branching Height: one-third to one-half of tree height.
- B. Small Trees: Branched or pruned naturally according to species and type with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows:
  - 1. Stem Form: multistem, clump, with two or more main stems
  - 2. Provide balled and burlapped or container-grown trees.

### **2.3 TOPSOIL**

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.
  - 1. Topsoil Source: Import topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs or marshes.

## **2.4 INORGANIC SOIL AMENDMENTS**

- A. Lime; ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:
  - 1. Provide lime in form of dolomitic limestone.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 (3.35-mm) sieve and a maximum 10 percent passing through No. 40 (0.425-mm) sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite; Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.
- G. Sand: Clean, washed, natural or manufactured, free of toxic materials.
- H. Diatomaceous Earth: Calcined, diatomaceous earth, 90 percent silica, with approximately 140 percent water absorption capacity by weight.

## **2.5 ORGANIC SOIL AMENDMENTS**

- A. Peat: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with a pH range of 3.4 to 4.8.
- B. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.

## **2.6 FERTILIZER**

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 10 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
  - 1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen 4 percent phosphorous, and 2 percent potassium, by weight.
  - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

## **2.8 MULCHES**

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
  1. Type: Shredded hardwood.

## **2.9 MISCELLANEOUS PRODUCTS**

- A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed and fully labeled containers and mix according to manufacturer's written instructions.
- B. Trunk-Wrap Tape: Two layers of crinkled paper cemented together with bituminous material, 4-inch- (100-mm-I wide minimum, with stretch factor of 33 percent.

## **2.10 PLANTING SOIL MIX**

- A. Planting Soil Mix: Mix topsoil with the following soil amendments [and fertilizers] in the following quantities:
  1. Ratio of Loose Peat to Topsoil by Volume: 1:3.

# **PART 3 - EXECUTION**

## **3.1 EXAMINATION**

- A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance. Proceed with installation only after unsatisfactory conditions have been corrected.

## **3.2 PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting operations.
- 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.
- C. Lay out individual tree and shrub locations and areas for multiple exterior plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before planting. Make minor adjustments as required.

- D. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks, branches, stems twigs, and foliage to protect during digging, handling, and transportation.
  - 1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

### **3.3 TREE AND SHRUB EXCAVATION**

- A. Pits and Trenches: Excavate circular pits with sides sloped inward. Trim base leaving center area raise slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of pit smeared or smoothed during excavation.
  - 1. Excavate approximately three times as wide as ball diameter for balled and burlapped and container-grown stock.
  - 2. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
  - 3. If drain tile is shown or required under planted areas, excavate to top of porous backfill over tile.
- B. Subsoil removed from excavations may not be used as backfill.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.
- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

### **3.4 TREE AND SHRUB PLANTING**

- A. Set balled and burlapped stock plumb and in center of pit or trench with top of root ball 1 inch above adjacent finish grades.
  - 1. Remove burlap and wire baskets from tops of root balls and partially from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
  - 2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.
- B. Set container-grown stock plumb and in center of pit or trench with top of root ball 1 inch above adjacent finish grades.
  - 1. Carefully remove root ball from container without damaging root ball or plant.

2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

- C. Organic Mulching: Apply 3-inch average thickness of organic mulch extending 12 inches beyond edge of planting pit or trench. Do not place mulch within 3 inches of trunks or stems.
- D. Wrap trees of 2-inch caliper and larger with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Inspect tree trunks for injury, improper pruning, and insect infestation; take corrective measures required before wrapping.

### **3.5 SELECTIVE TREE AND SHRUB PRUNING**

- A. Prune, thin, and shape new trees and shrubs as directed by Architect.
- B. Prune, thin, and shape existing trees identified according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise required by Arborist, do not cut tree leaders. Remove dead and crossed branching.

### **3.6 CLEANUP AND PROTECTION**

- A. During exterior planting, keep adjacent pavings and construction clean and work area in an orderly condition.
- B. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting.

### **3.7 DISPOSAL**

- A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property

**END OF SECTION 329300**

## **SECTION 334100**

### **STORM UTILITY DRAINAGE PIPING**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. This Section includes storm drainage outside the building.
- B. Related Sections include the following:
  - a. Storm drainage piping.
  - b. Pre-cast concrete drainage structures
  - c. Polymer drainage structures

##### **1.02 DEFINITIONS**

- A. PE: Polyethylene plastic.
- B. PVC: Polyvinyl chloride plastic.

##### **1.03 PERFORMANCE REQUIREMENTS**

- A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

##### **1.04 SUBMITTALS**

- A. Shop Drawings: Include plans, elevations, details, and attachments for the following:
  - 1. Precast concrete manholes, including frames, covers, and grates.
  - 2. Polymer inlets including grates.
- B. Coordination Drawings: Show manholes and other structures, pipe sizes, locations, and elevations. Include details of underground structures and connections. Show other piping in same trench and clearances from sewerage system piping. Indicate interface and spatial relationship between piping and proximate structures.

## **E. DELIVERY, STORAGE, AND HANDLING**

- A. Do not store plastic structures, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

## **1.05 PROJECT CONDITIONS**

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
- B. Locate existing structures and piping to be closed and abandoned
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Architect's written permission.

## **PART 2 - PRODUCTS**

### **2.01 PIPING MATERIALS**

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

### **2.02 PIPES AND FITTINGS**

- A. Corrugated PE Pipe and Fittings: AASHTO M 294, Type S, with smooth waterway for coupling joints.
  - 1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings to form silttight joints.



## **2.03 CATCH BASINS**

- A. Normal-Traffic, Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
  - 1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
  - 2. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
  - 3. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
  - 4. Gaskets: ASTM C 443, rubber.
  - 5. Grade Rings: Include two or three reinforced-concrete rings, of 6-to 9-inch total thickness, that match 24-inch-diameter frame and grate.
  - 6. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
  - 7. Steps: ASTM C 478, individual steps or ladder. Omit steps for catch basins less than 60 inches deep.
  - 8. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
  
- B. Frames and Grates: ASTM A536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include flat grate with small square or short-slotted drainage openings.
  - 1. Size: 24 by 24 inches minimum, unless otherwise indicated.
  - 2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

## **2.04 STORMWATER INLETS**

- A. Curb Inlets: Vertical curb opening, of materials and dimensions indicated.
  
- B. Frames and Grates: Dimensions, opening pattern, free area, and other attributes indicated.
  - 1. Material: ASTM A 536, Grade 60-40-18 minimum, ductile-iron casting.
  - 2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

## **2.05 PROTECTIVE COATINGS**

- A. Description: One – or two-coat, coal-tar epoxy; 15-mil minimum thickness, unless otherwise indicated; factor or field applied.

## **PART 3 - EXECUTION**

### **3.01 EARTHWORK**

- A. Excavating, trenching, and backfilling are specified in Division 31 Section “Earthwork”.

### **3.02 IDENTIFICATION**

- A. Materials and their installation are specified in Division 31 Section “Earthwork”. Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

### **3.03 PIPING APPLICATIONS**

- A. General: Include water tight, silttight, or soiltight joints, unless watertight or silttight joint area indicated.
- B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.
- C. Gravity-Flow Piping: Use the following:
  1. Corrugated PE pipe and fittings; PE sleeve silttight couplings; and coupled joints.

### **3.04 INSTALLATION, GENERAL**

- A. General Locations and arrangements: Drawing plans and details indicated general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer’s written instructions for using lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

- C. Use manhole inlets for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.
- D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Extend storm drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

### **3.05 CATCH-BASIN INSTALLATION**

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

### **3.07 FIELD QUALITY CONTROL**

- A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
  - 1. In large, accessible piping, brushes and brooms may be used for cleaning.
  - 2. Place plug in end of incomplete piping at end of day and when work stops.
  - 3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.
- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
  - 1. Submit separate reports for each system inspection.
  - 2. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    - c. Crushed, broken, cracked, or otherwise damaged piping.
    - d. Infiltration: Water leakage into piping.
    - e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  4. Re-inspect and repeat procedure until results are satisfactory.
- C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
  2. Test completed piping systems according to authorities having jurisdiction.
  3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
  4. Leaks and loss in test pressure constitute defects that must be repaired.
  5. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

**END OF SECTION 334100**

**ASBESTOS ABATEMENT**  
**TECHNICAL SPECIFICATIONS**

STATEMENT OF ACCREDITATION/CERTIFICATION

This asbestos abatement project was designed by an EPA accredited person in accordance with 40 CFR Part 763 (AHERA), by a Pennsylvania certified Asbestos Project Designer under PA ACT 194 the Commonwealth of Pennsylvania Asbestos Occupations and Certification Act, and in accordance with 29 CFR 1910 and 1926 (OSHA), and 40 CFR 61 Subpart M (NESHAPS).



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Greg M. Matty, CIH  
PA Project Designer No. 024009

3/27/19

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Date

PART 1 - GENERAL

1.1 SCOPE OF WORK

1.1.1 This specification includes asbestos abatement work described herein at the Harrisburg Housing Authority's William Howard Day (WHD) Homes, specifically Buildings K, L & M located at 1300 Community Drive, Harrisburg, Pennsylvania. The work is to be conducted in phases and coordinated with the Owner and Architect.

1.1.2 The scope of work include the abatement and proper disposal of the known asbestos containing materials indentified in Attachment 1.

1.2 SUBMITTALS

1.2.1 In addition to the requirements for bidding included in the Instructions To Bidders, the following information shall be required prior to the start of work.

1.2.1.1 Detailed description of the abatement methods that will be employed for each of the asbestos abatement tasks defined in the scope of work. The information shall include the manufacturer and material type for all products used in the abatement work. No methods for asbestos removal that are not included herein or specified without option in the specifications shall be used.

1.2.1.2 Plans for a typical containment area to be set up to handle work defined in the Scope.

1.2.1.3 Names of any proposed subcontractors and a complete description of the work to be performed by the subcontractors. No subcontractors shall be used that have not been described as required. Subcontractors shall not use subcontractors.

1.3 REGULATIONS

1.3.1 This work shall be performed in accordance with these specifications, EPA, OSHA and NIOSH regulations and any other applicable federal and Commonwealth government regulations concerning asbestos or related construction activities.

1.3.2 In the event of conflicting requirements, the most stringent provisions shall be applicable.

1.3.3 Governing regulations include but are not limited to the following:

1.3.3.1 EPA Regulation 40 CFR Part 61, Subparts A, C, and M;

1.3.3.2 EPA Regulation 40 CFR 763 Subpart E;

1.3.3.3 DOT Regulation 49 CFR 172.101;

1.3.3.4 OSHA Regulations 29 CFR 1910.120, 1910.134, 1910.1001, 1910.1200, 1926.1101, 1926.451, and 1926.500-.503 in their entireties; and

1.3.3.5 Commonwealth of Pennsylvania Asbestos Regulations, Department of Labor and Industry Act of 1990, P.L. 805, No. 194.

1.3.4 The Contractor's attention is directed to the fact that work under this contract shall be performed in strict accordance with amended OSHA asbestos standard.

1.4 AUTHORITY TO STOP WORK

- 1.4.1 The Contracting Officer has the authority to stop the abatement work at any time if he/she determines, either personally or through results of air sample tests that the work area is not within these specifications and/or all applicable regulations. The work shall not continue until the conditions have been corrected to the satisfaction of the Contracting Officer. The period of inactivity which is required to resolve the violation(s) shall be at the Contractor's expense. No extension in time will be granted.
- 1.5 PRE-ABATEMENT MEETING
- 1.5.1 The Contractor shall attend a mandatory pre-abatement meeting scheduled by the Owner. This meeting shall also be attended by a designated representative of the Owner (if he/she wishes), and the Architect. At this meeting, the Contractor shall present to the Architect three (3) copies of the following in writing:
- 1.5.1.1 Project Schedule breakdown in accordance with the time restraints.
- 1.5.1.2 A plan for preparation of work site, decontamination chambers, and shower waste water.
- 1.5.1.3 Description of protective clothing and approved respirators to be used, including make and model number.
- 1.5.1.4 Delineation of responsibility of work site supervision including a listing of emergency home phone numbers.
- 1.5.1.5 Explanation of decontamination sequence and isolation techniques.
- 1.5.2 Brief description of removal methods to be used and specific equipment to be utilized, including make and model.
- 1.5.3 Description of the final clean-up procedures to be used.
- 1.5.4 Brief explanation of the handling of asbestos contaminated waste and the dump site to be utilized, including a completed Asbestos Disposal Form and EPA and Commonwealth identification numbers of waste haulers, if utilized.
- 1.5.5 Detailed information including catalog cuts, manufacturer's data, etc., including material concerning pressure differential monitoring device as specified in Section 2.2.4.4 of these Technical Specifications.
- 1.6 LOGBOOK
- 1.6.1 The Contractor shall maintain a logbook at the job site, which shall be available at all times to the Architect and the Owner. Complete copies shall be submitted to the Architect and the Owner at the end of the project.
- 1.6.2 The logbook serves as a ready reference for each project and may be used in legal proceedings, thus care must be taken to assure its completeness in documentation.
- 1.6.3 The logbook shall contain the following information at a minimum and be presented in a three (3) ring binder as part of pre-work submittals at the pre-abatement meeting as specified in Paragraph 1.5 above.
- 1.6.3.1 Copies of correspondence with all federal and Commonwealth of Pennsylvania agencies with an interest in the project, including the ten-day federal EPA and Pennsylvania Notification forms.

- 1.6.3.2 All permits and licenses received by such agencies.
- 1.6.3.3 Evidence of compliance with the medical requirements, OSHA Asbestos Standard (29 CFR 1926.1101), and certification by a physician of each employee's capability to wear a respirator per the OSHA Respiratory Protection Standard (29 CFR 1910.134).
- 1.6.3.4 Notice of verification that local fire, police and rescue services have been informed of safe decontamination procedures.
- 1.6.3.5 Copies of documents certifying that participating Contractor employees have been given instruction, as previously described, on the hazards of asbestos and measures to control exposure to it including the use, care, and fit-testing of respirators. In lieu of certification papers, a signed statement by each employee will suffice.
- 1.6.3.6 Names and telephone numbers of key personnel including the on-the-job supervisor's immediate supervisor, emergency numbers for police, fire and rescue personnel, the building owner's chief representative, security personnel, and appropriate federal and Commonwealth of Pennsylvania regulatory personnel.
- 1.6.3.7 Contractor's standard operating procedures and any deviations therefrom.
- 1.6.3.8 Project technical specifications including plans and drawings, and any deviations therefrom.
- 1.6.3.9 Contract between the Contractor and Owner and Contractor's Subcontractors and change orders thereto.
- 1.6.3.10 Sign-in and sign-out sheets noting any persons entering the work area, their affiliation, time and purpose of entry and departure time.
- 1.6.3.11 Records of all accidents and injuries occurring on the job.
- 1.6.3.12 Copies of all results of area, personal, bulk and wipe samples.
- 1.6.3.13 Copies of daily inspection reports, including who performed the inspections, the date, and time.
- 1.6.3.14 EPA waste disposal identification number, manifest, trip ticket and disposal site used. If a Subcontractor is used, all information required above must still be provided, plus the Subcontractor's identification. A completed copy of Asbestos Disposal Form or Forms must also be included.
- 1.6.3.15 Reports of inspections by federal and Commonwealth of Pennsylvania authorities.
- 1.6.3.16 Detailed reports of any problems and incidents that arose, the date and time, and how they were handled. These reports must be signed by supervisory personnel.
- 1.6.3.17 Emergency procedures.
- 1.6.3.18 Insurance certificates, including workers compensation coverage.
- 1.6.3.19 Copy of the project schedule and any deviations therefrom.
- 1.6.3.20 Organization of personnel at the job site including delineation of supervisory responsibility.
- 1.6.3.21 Material Safety Data Sheets in accordance with the OSHA Hazard Communication Standard



(29 CFR 1910.1200) for materials such as spray glue proposed for use on this project.

1.6.4 ASBESTOS WORK SHALL NOT PROCEED UNTIL CONTRACTING OFFICER AND CONTRACTOR AGREE ON THE DETAILS REQUIRED ABOVE. ALL ITEMS REQUIRED IN THIS SECTION ARE TO BE PROVIDED IN WRITING.

1.7 CONTRACTOR LICENSING

1.7.1 Contractors performing work in the Commonwealth of Pennsylvania must be licensed to perform asbestos work in Commonwealth of Pennsylvania. Licensing requirements may be obtained from:

PA Department of Labor & Industry  
Certification, Accreditation & Licensing Division  
Room 1623, L&I Building  
651 Boas Street  
Harrisburg, Pennsylvania 17121

1.8 PERSONNEL QUALIFICATIONS

1.8.1 All personnel of the Contractor involved with the asbestos abatement work must be trained and tested prior to any work and shall be familiar with the standard operating procedures of the Contractor.

1.8.2 The superintendent and the foreman shall be thoroughly familiar with all applicable regulations and practices for asbestos abatement work.

1.8.3 All personnel shall be trained in the use and care of respirators.

1.8.4 All personnel shall have successfully completed an AHERA approved training course for asbestos removal as stipulated in 40 CFR 763 Subpart E, Asbestos-Containing Materials in Schools, Revised Appendix C to Subpart E, Asbestos Model Accreditation Plan.

1.8.5 Personnel without the above qualifications shall not be allowed to work in the work area at any time.

1.8.6 The Contractor shall provide a signed statement that enough trained workers are employed to complete this project within the time constraints given.

1.9 AVAILABILITY OF QUALIFIED PERSONNEL

1.9.1 There shall be a sufficient number of workers, foremen, and superintendents trained according to requirements given in section 1.8 above to accomplish the work within the required schedules.

1.9.2 No person who has not been fully trained, qualified as above, and pre-approved, shall be employed to enhance completion of the work.

1.10 TERMINOLOGY

1.10.1 Abatement - procedures to control fiber release from asbestos-containing materials to include removal, encapsulation, and enclosure.

1.10.2 Air Monitoring - the process of measuring the fiber content of a specific volume of air in a stated period of time.

EXISTING CONDITIONS  
ASBESTOS CONTAINING MATERIAL ABATEMENT

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- 1.10.3 Air Monitoring Firm - the firm retained by the Owner to ensure compliance with the Technical Specifications and all applicable regulations concerning asbestos. In addition, the Air Monitoring Firm shall be responsible for all air sampling and analysis within the premises. Compliance Management International, Inc. (CMI) shall act as the Air Monitoring Firm on this project.
- 1.10.4 Airlock - a system for permitting ingress or egress without permitting air movement between a contaminated area and an uncontaminated area, typically consisting of two airlock doorways at least three (3) feet apart.
- 1.10.5 Airlock Doorway - a device to allow ingress or egress from one room to another while permitting minimal air movement between the rooms. Two of these doorways three (3) feet apart form an airlock.
- 1.10.6 Amended Water - water to which an approved surfactant has been added.
- 1.10.7 Authorized visitor - the building Owner, or a representative of any regulatory or other agency having jurisdiction over the project.
- 1.10.8 Building Owner - the Owner or his/her authorized representative.
- 1.10.9 Clean Room - an uncontaminated area or room which is part of the worker decontamination enclosure system, with provisions for storage of workers' street clothes and protective equipment (coveralls, respirators, filters, etc.).
- 1.10.10 Contaminated Waste - materials that, though not necessarily greater than 1% asbestos by weight, shall be handled and removed as asbestos-containing materials.
- 1.10.11 Contractor - the proprietor or his authorized representative to whom this contract pertains. Regardless of whether or not the asbestos removal firm is a sub-contractor on the project, the term "Contractor" names the asbestos removal firm, in this specification.
- 1.10.12 Consultant - the firm retained by the building Owner to manage the asbestos abatement work. CMI shall act as the Consultant on this project.
- 1.10.13 Decontamination Enclosure System - a series of connected rooms, with airlocks between any two adjacent rooms, for the decontamination of workers or of materials and equipment. A decontamination enclosure system always contains at least three (3) air locks.
- 1.10.14 Equipment Decontamination Enclosure System - a decontamination enclosure system for materials and equipment, typically consisting of a designated area of the work area, an airlock, a washroom, another airlock, a holding area, and an uncontaminated area (outside).
- 1.10.15 Equipment Room - a contaminated area or room which is part of the worker decontamination enclosure system, with provision for storage of contaminated clothing and equipment.
- 1.10.16 Fixed object - a unit of equipment or furniture in the work area which cannot be removed from the work area.
- 1.10.17 HEPA Filter - a High Efficiency Particulate Air (Absolute) Filter capable of trapping and retaining 99.97% of asbestos fibers greater than 0.3 microns in length.
- 1.10.18 HEPA Vacuum Equipment - high efficiency particulate air (absolute) filtered vacuuming equipment with a filter system capable of collecting and retaining asbestos fibers.

- 1.10.19 Holding Area - a chamber between the washroom and an uncontaminated area in the equipment enclosure system. The holding area must have an airlock to the wash room and must have a lockable door to the outside.
- 1.10.20 Movable Object - a unit of equipment or furniture in the work area which can be removed from the work area.
- 1.10.21 Negative Pressure - a local exhaust system capable of maintaining a minimum pressure differential of minus 0.02 inches of water column relative to adjacent unsealed areas. The exhaust is to be filtered through a HEPA Filtration System.
- 1.10.22 Removal - procedures specified herein necessary to strip all asbestos-containing materials from the designated areas and to dispose of these materials at an acceptable disposal site.
- 1.10.23 Shower Room - a room between the clean room and the equipment room, with an airlock at each end, located in the worker decontamination enclosure system, with hot and cold or warm running water and suitably arranged for complete showering during decontamination.
- 1.10.24 Sub-Contractor - any firm working for the asbestos removal firm on this project.
- 1.10.25 Surfactant - an approved chemical wetting agent added to water to improve penetration, thus reducing the quantity of water required for a given operation or area.
- 1.10.26 Washroom - a room between the work area and the holding area in the equipment decontamination enclosure system, with an airlock to each.
- 1.10.27 Wet Cleaning - the process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with amended water, and by afterwards disposing of these cleaning tools as asbestos-contaminated waste.
- 1.10.28 Worker Decontamination Enclosure System - a decontamination enclosure system for personnel, typically consisting of the following, when entering from outside the work area to within the work area: a clean room, an airlock, a shower room, a second airlock, an equipment room or area, and the work area.
- 1.10.29 All terms not defined herein shall have the same meaning given in the applicable documents, publications, regulations, and as used commonly within the field of asbestos abatement.
- 1.11 BUILDING SECURITY
  - 1.11.1 The security of the premises is the responsibility of the Owner. The Contractor is to be provided with a key, permitting him access to the premises.
  - 1.11.2 The security of the work area against inadvertent or willful entry of unauthorized persons is the responsibility of the Contractor.
- 1.12 EMERGENCY PRECAUTIONS
  - 1.12.1 The Contractor shall establish emergency and fire exits from the work area. All emergency exits shall be equipped with at least two (2) full sets, for emergency entrance, of protective clothing and respirators at all times.
  - 1.12.2 The Contractor shall notify the local police and fire department in writing of the asbestos

abatement project. A copy of this notice must also be provided to the Consultant. The Contractor must coordinate with the police all security aspects of the project. All emergency evaluation and safety aspects must be coordinated with the local fire department and/or rescue squad.

- 1.12.2.1 Before the Contractor begins actual abatement procedures, the local police and fire departments shall be notified as to the danger of entering the work area. The Contractor shall make every effort to assist these agencies in forming plans of action should their personnel need to enter the contaminated area.
- 1.12.3 Local medical emergency personnel; (i.e., ambulance crews) shall be notified prior to the commencement of the abatement operation as to the possibilities of having to handle contaminated or injured workers, and shall be advised on safe decontamination procedures.
- 1.12.3.1 A notice of verification that all of the above parties have been notified must be presented to the Consultant prior to commencement of abatement work.
- 1.12.4 The Contractor shall be prepared to administer immediate first aid to injured personnel before and after decontamination. Seriously injured personnel shall be treated immediately or evacuated without delay for decontamination. When an injury occurs, the Contractor shall stop work and implement fiber reduction techniques (e.g. water misting the work area air) until the injured person has been removed from the work area.
- 1.13 TEMPORARY SERVICES
  - 1.13.1 Contractor shall provide temporary heating services within his work area, if necessary, to maintain a minimum temperature of 53 degrees Fahrenheit. Temperature heating may not be propane or any combustible type unit. Temporary heat shall be in accordance with OSHA Safety Regulations and local fire codes.
  - 1.13.2 The Owner shall provide all temporary water services from site location. The Contractor must provide all temporary connections, valves fittings, hoses, etc. to accommodate his/her needs. Contractor shall take all necessary precautions against freezing. The Owner shall provide a site location to which hook-ups can be made.
  - 1.13.3 The Owner shall provide electrical power from existing high amperage circuit boards. The Contractor shall provide all temporary connections, lines, distribution circuit breakers, safety facilities, boxes, cords, etc. to accommodate all of his needs.
    - 1.13.3.1 Contractor is to provide area distribution boxes so located that the individual crews may furnish and use 50 ft. maximum length extension cords to obtain power and lighting at points needed for work, inspection and safety.
    - 1.13.3.2 All temporary connections shall be in accordance with OSHA, local safety codes, and U.L. Design. Ground Fault Circuit Interrupters shall be placed at each power source.
- 1.14 DAMAGE CAUSED BY CONTRACTOR
  - 1.14.1 The Contractor shall provide all labor, materials, and equipment necessary for protection of furnishings, equipment, and/or building structures from damage. The Contractor shall replace or repair, at his own cost, any items damaged due to work performed under this Contract, equal to their original construction or finish, to the satisfaction of the Contracting Officer.
- 1.15 BLACK PLASTIC
  - 1.15.1 The Contractor shall provide black plastic sheeting when constructing the outer layer of the

containment between the work area and occupied spaces to prohibit viewing of the Contractor's activities by the occupant.

1.16 PROJECT SIGNS

1.16.1 There shall be no project or company signs displayed of any type by the Contractor. There shall be only those signs required by the Commonwealth of Pennsylvania and OSHA Regulations.

1.17 NOTIFICATION STATEMENTS

1.17.1 As soon as possible upon award of the contract, the Contractor shall provide to the Consultant in writing a copy of the Notification Statements sent to the EPA, and the Commonwealth of Pennsylvania as required by law. The required notification forms shall be submitted to the following agencies:

1.17.1.1 U.S. Environmental Protection Agency, Region III, Air Protection Division, 1650 Arch Street (3AP00), Philadelphia, PA 19103;

1.17.2 Asbestos Notification, Department of Environmental Protection, Bureau of Air Quality; PO Box 8468, Harrisburg, Pennsylvania 17105-8468.

1.17.3 The Notification shall include the following information:

1.17.3.1 Name and address of the Contractor;

1.17.3.2 Name and description of the building, including size, age, prior use of the building(s) or area(s), and the amount of asbestos-containing material present (square or linear feet). Room numbers or other locations should be designated unless entire building is included;

1.17.3.3 Scheduled start and completion dates for entire project;

1.17.3.4 Procedures and equipment (including ventilation system(s)) that will be employed to comply with the Code of Federal Regulations (CFR) Title 40, Part 61 of the U.S. Environmental Protection Agency; and

1.17.3.5 The name and address of the waste disposal site where the asbestos-containing material will be taken to, together with the names, addresses and license numbers of any hauler or transport company used.

1.17.4 The Contractor shall not begin his removal of asbestos and asbestos-containing material until such Notification has been provided.

1.17.5 Any failure on the part of the Contractor to provide this information in a timely manner shall not result in any extension of the completion date set forth in the Contract.

1.18 ASBESTOS ABATEMENT WORK SHALL NOT COMMENCE UNLESS

1.18.1 Arrangements have been made for disposal of waste at an acceptable site.

1.18.2 Arrangements have been made for containment and disposal of waste water resulting from wet stripping.

1.18.3 Work areas and decontamination enclosure systems and parts of the building required to remain in use are effectively segregated.

- 1.18.4 Tools, equipment, material and waste receptacles are on hand.
- 1.18.5 Arrangements have been made for work area security.
- 1.18.6 All other preparatory steps have been taken, applicable notices posted, and permits obtained.

End of Section 1:  
General Section of the Technical Specifications

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1. All materials delivered to the job site must be in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name.
- 2.1.2. The Contractor shall store all materials that are subject to damage off the ground, away from wet or damp surfaces, and under sufficient cover to prevent damage or contamination.
- 2.1.3. Damaged or deteriorating materials shall not be used and shall be removed from the premises. Materials that become contaminated with asbestos shall be disposed of in accordance with all applicable regulations and procedures herein.
- 2.1.4. The Contractor shall provide plastic sheeting of 6 mil. thickness. This plastic shall be black where specified.
- 2.1.5. The tape used for sealing joints of adjacent sheets of plastic sheeting and for attachment of plastic sheets to finished and unfinished surfaces of dissimilar material must be capable of adhering under dry and wet conditions including the use of amended water.
- 2.1.6. The surfactant (wetting agent) to be used shall consist of 50% polyoxyethylene ether and 50% polyoxyethylene ester, or the equivalent as approved by the Contracting Officer. This shall be mixed with water to provide a concentration of one (1) ounce surfactant to five (5) gallons of water or to the manufacturer's recommendation.
- 2.1.7. The Contractor shall have available a sufficient quantity of equipment to mix and spray the wetting agent. Airless spraying equipment is mandatory, and is the only type acceptable.
- 2.1.8. The Contractor shall supply a sufficient number of 6 mil. plastic bags and metal or fiber drums with tightly fitting lids suitable to receive and retain any asbestos-containing or contaminated materials until disposal at an approved site. These containers must be both air and water tight.
  - 2.1.8.1. These containers shall be labeled in accordance with OSHA, EPA, and DOT.
- 2.1.9. The Contractor shall supply all warning signs and labels as required by OSHA and EPA.
- 2.1.10. Encapsulants - The Contractor shall provide an encapsulant of the bridging and/or penetrating type to be approved by the Contracting Officer.
  - 2.1.10.1. The encapsulants shall be able to withstand most impact or abrasion and protect the encapsulated surface.
  - 2.1.10.2. The encapsulants selected for use by the Contractor shall be one of those demonstrating probable effective performance in tests conducted by an independent testing laboratory and are subject to approval by the Contracting Officer.
  - 2.1.10.3. The encapsulant shall have high flame retardant characteristics and a low toxic fume and smoke emission rating. Ratings shall be as follows:
    - 2.1.10.3.1. Factory Mutual approval for Class 1A Construction.
    - 2.1.10.3.2. Underwriters Laboratory approval for Class 1A.
    - 2.1.10.3.3. Flame Spread Class A - 0 to 25

- 2.1.10.4. They shall not be noxious or toxic to application workers, or to subsequent users of the building.
- 2.1.10.5. They shall be of acceptable weathering and aging characteristics.
- 2.1.10.6. They shall be compatible with all materials that may be used on the surface at a later date.
- 2.1.10.7. They shall be capable of adhering to the surfaces of the substrate.
- 2.1.11. Other Materials - the Contractor shall provide all other materials, such as lumber, nails and hardware, etc. which may be required to construct and dismantle the decontamination area and the barriers that isolate the work area.

## 2.2 TOOLS AND EQUIPMENT

- 2.2.1. The Contractor shall provide tools and equipment required for the removal of asbestos materials, construction of work areas, demolition, containment of contaminated waste, hoisting and removal of contaminated waste from the building and transport of contaminated waste to the dump site.
- 2.2.2. Scaffolding - the Contractor shall provide scaffolding as required to accomplish the specified work and shall meet all applicable safety regulations concerning the use of scaffolding.
- 2.2.3. The Contractor shall also have on-site industrial dry/wet vacuum(s) equipped with High Efficiency Particulate Air (Absolute) Filtration approved for asbestos removal.
- 2.2.4. Negative Air - The Contractor shall have available air filtering equipment capable of filtering asbestos fibers of 0.3 microns or larger at 99.97% efficiency.
  - 2.2.4.1. There shall be sufficient numbers of units to provide a minimum of four (4) complete air changes per hour in the work area, and exhaust the filtered air outside the building, unless otherwise indicated and approved by the Contracting Officer, to maintain a negative pressure inside the work area, and sufficient flow through the decontamination chambers to prevent escape of airborne fibers.
  - 2.2.4.2. The Contractor shall provide, along with the negative air machines, all necessary accessories including but not limited to, manifolds for hookup to vacuum cleaners, flexible intake duct, flexible exhaust duct, etc.
  - 2.2.4.3. The negative air system shall maintain a negative pressure of 0.02 inches of water. Should negative pressure drop below 0.01 inches of water, the job will be shut down until negative pressure of 0.02 inches of water is reestablished. This system shall operate on a twenty-four (24) hour schedule throughout the abatement process and through the final wet cleaning process.
  - 2.2.4.4. The Contractor shall monitor the work area air pressure differential on a twenty four (24) hour a day basis, by means of a pressure differential sensing device equipped with a chart recorder and an audible alarm, as approved by the Consultant. Copies of chart graphics shall be submitted to the Consultant on a daily basis.
  - 2.2.4.5. The negative air system shall be in accordance with EPA Regulations and recommendations included in the "Guidance for Controlling Friable Asbestos-Containing Materials in Buildings," Appendix J.
  - 2.2.4.6. Contractor shall take whatever action necessary, including the installation of additional circuit



breaker panel boards, if required, to ensure adequate circuit of sufficient amperage, capable of powering negative air units uninterrupted for the duration of the project.

- 2.2.5. HEPA Filtration and HEPA filters shall be accompanied by a Certification. The Certification shall consist of a test performed within 1,000 use hours on the particular HEPA filter. Testing shall be the DOP Smoke Challenge procedure and shall conform to Federal Standard 209B and Air Force Technical Order No. 00-25-203. Certification and test report shall be submitted to the Consultant, and shall be included in the Contractor's logbook. Subsequent testing shall be conducted at every 1,200 hours of use.

2.3 WORKER PROTECTION

2.3.1. Respiratory Protection

- 2.3.1.1. The Contractor shall provide appropriate respiratory protection in accordance with OSHA regulations for each phase of work. The respiratory protection shall be applicable for the activity and fiber level within the work area. Respiratory protection shall be in accordance with 29 CFR 1926.1101. Protection factors for various respiratory protection devices are defined by this regulation as follows:

<u>Airborne Concentration</u>	<u>Respiratory Required</u>
Not in excess of 1 f/cc (10 x PEL)	Half mask air-purifying respirator equipped with high-efficiency filters
Not in excess of 5 f/cc (50 x PEL)	Full facepiece air-purifying respirator equipped with high-efficiency filters
Not in excess of 10 f/cc (100 x PEL)	Any powered air-purifying respirator equipped with high-efficiency filters
Not in excess of 100 f/cc (1000 x PEL)	Full facepiece supplied-air respirator operated in pressure demand mode
Greater than 100 f/cc (>1,000 x PEL) or unknown concentration	Full facepiece supplied-air respirator operated in pressure demand mode, equipped with an auxiliary positive pressure self-contained breathing apparatus

- 2.3.1.2. Workers are required to be instructed and knowledgeable in personnel protection and asbestos material removal.

- 2.3.1.3. Facial hair, beards, sideburns, etc., that would interfere with the seal of a respirator are not permitted.

- 2.3.1.4. The Contractor must provide workers with personally issued and labeled respiratory equipment.

- 2.3.1.5. The Contractor shall provide authorized visitors, inspectors, etc., with properly fitted respirators, filters and protective clothing etc., as specified.

2.3.2. Protective Clothing

- 2.3.2.1. The Contractor shall provide his employees and authorized visitors with the following protective equipment at a minimum:
  - 2.3.2.1.1. Full-body coverall;
  - 2.3.2.1.2. Head covers or hoods;
  - 2.3.2.1.3. Gloves;
  - 2.3.2.1.4. 18" high boot-type foot cover or reusable footwear;
  - 2.3.2.1.5. Hard hat (if applicable); and
  - 2.3.2.1.6. Eye protection devices (if applicable).
  - 2.3.2.1.7. The Contractor shall have available for authorized visitors two (2) extra or spare air hoses and connectors or appropriate respirators to allow entry into work area at any time without removing a worker from the work area.

End of Section 2:  
Products of the Technical Specifications

## PART 3 - EXECUTION

### 3.1 PRELIMINARY WORK AREA PREPARATION

- 3.1.1. Post caution signs meeting the specifications of OSHA 29 CFR 1926.1101 at any location and approaches to the work area. Signs shall be posted at a distance from the work area to permit an employee to read the sign and take the necessary protective measures to avoid exposure. Additional signs may need to be posted following construction of work place barriers.
- 3.1.2. Verify that the electric power to the work area has been shut down and locked out. Provide temporary power and lighting. Insure safe installation (including ground faulting) of temporary power sources and equipment by compliance with all applicable electrical code requirements and OSHA requirements for temporary electrical systems.
  - 3.1.2.1. The Contractor must provide temporary power and lighting and ensure safe installation of temporary power sources and equipment per applicable electrical code requirement and OSHA regulations for temporary electrical systems.
  - 3.1.2.2. The Contractor shall provide 24V safety lighting and ground-fault interrupter circuits as power source for electrical systems.
- 3.1.3. Verify that the heating, cooling and air conditioning system (HVAC) components that are in, supply or pass through the work area, have been shut down and locked out or have been equipped with HEPA filters on the intake.
  - 3.1.3.1. The Contractor shall isolate, with duct tape and two (2) layers of 6 mil. plastic sheeting all heating, cooling, and ventilating air systems in the area to prevent contamination and fiber dispersal to other areas of the building.
- 3.1.4. The Contractor will need to provide a temporary water supply for use during the abatement of asbestos containing materials.
- 3.1.5. The installation of plastic sheeting and wooden barriers must be conducted with great care and should not occur until the negative air filtration machines are in operation.
- 3.1.6. Any asbestos-containing material dislodged in this installation must be immediately cleaned up with HEPA vacuum equipment and/or wet wiping methods, as appropriate.
- 3.1.7. The clean side of these barriers shall be monitored by the Consultant. If at any time airborne concentrations exceed 0.010 fibers/cc, the Contractor shall halt all operations and shall be required to completely clean all areas as directed by the Contracting Officer.

### 3.2 WORK AREA ISOLATION

#### 3.2.1 Full Containment

- 3.2.1.1. Abatement friable asbestos containing material or non-friable asbestos containing material that will be made friable during abatement is to take place under full containment with negative pressure operating continuously and with full worker and equipment decontamination systems set up contiguous to the work area.
- 3.2.1.2. The Contractor shall pre-clean fixed objects within the work area using HEPA filtered vacuum equipment and/or wet wiping methods as appropriate, and enclose with 6 mil plastic sheeting sealed with tape. All equipment, including HVAC equipment that exists within work areas, shall be cleaned and wrapped as described.

- 3.2.1.3. The Contractor shall seal off all openings, including but not limited to corridors, doorways, elevator doors, skylights, ducts, grills, diffusers and any other penetrations of the work area, with two (2) layers of 6 mil. plastic sheeting and tape. These enclosures of the work areas are defined herein as critical barriers.
- 3.2.1.4. Sealing Doorways and Corridors
  - 3.2.1.4.1. A barrier shall be constructed, by the Contractor, between the work area and any doorway leading to an occupied area.
  - 3.2.1.4.2. This barrier shall consist of first closing any existing doors and taping all seams on both sides.
  - 3.2.1.4.3. Two (2) layers of 6 mil plastic sheeting shall then be applied and taped over the entire door structure on the work area side, as well as two (2) layers of 6 mil of plastic sheeting on the clean side.
  - 3.2.1.4.4. Warning signs, as specified, shall be displayed on the clean side.
- 3.2.1.5. The area where asbestos is to be removed is to be isolated from other portions of the building, after all the furniture, equipment and other items stored in this area have been properly cleaned, removed and stored, as described herein.
- 3.2.1.6. Isolation shall be done by sealing the openings and penetrations in the work area with two layers of 6 mil polyethylene sheeting.
  - 3.2.1.6.1. Two (2) layers shall be applied to all the floors in the work area. These layers shall be applied in such a manner as to remove the top layer and separate it without causing any disturbance to the bottom layer.
  - 3.2.1.6.2. The first layer to be put down is the first floor sheet. This sheet is to be cut at least twenty-four (24) inches larger than the actual floor size. This will facilitate a twelve (12) inch overlap to be attached to the wall.
  - 3.2.1.6.3. The second floor layer shall be placed next. This layer shall overlap 16 inches onto the wall surfaces. This layer shall be sealed in place by tape.
- 3.2.1.7. The Contractor may need use additional layers to protect surfaces not scheduled for abatement from damage, especially water damage.
- 3.2.1.8. All objects that cannot be removed from the work area shall be sealed with 2 layers of 6 mil polyethylene sheeting to ensure a leak proof isolation barrier surrounding the object.
- 3.2.1.9. Disassemble all removable items from the work area, such as, but not limited to; lights, grills, registers, etc. Thoroughly decontaminate through HEPA vacuum equipment and/or wet wiping techniques, as appropriate, all furniture, lighting fixtures, and other removable. Any items that are not to return to the space shall be disposed of as asbestos waste.
- 3.2.2. Mini-Enclosure
  - 3.2.2.1. The Contractor shall seal off all openings, including but not limited to corridors, doorways, elevator doors, skylights, ducts, grills, diffusers and any other penetrations of the work area, with two (2) layers of 6 mil. plastic sheeting and tape.
  - 3.2.2.2. Isolation shall be done by sealing the entire work area with two layers of 6 mil polyethylene

sheeting. Two (2) layers shall be applied to all the walls and the floor.

3.2.3. Glovebags

3.2.3.1. Establish a regulated work area around all access points to the crawlspace.

3.2.3.2. Each glovebag shall be installed so that it completely covers the circumference of pipe or other structure where the work is to be done.

3.2.3.3. Glovebags will be smoke tested for leaks prior to removal of ACM. Leaks must be sealed prior to use.

3.2.3.4. Glovebags may only used once and may not be moved.

3.2.3.5. Glovebags will be collapsed prior to disposal by removing the air in the bag with a HEPA vacuum.

3.2.4. Floor Tile and Vinyl Sheet Flooring Containment

3.2.4.1. The Contractor shall seal off all openings, including but not limited to corridors, doorways, ducts, grills, diffusers and any other penetrations of the work area, with two (2) layers of 6 mil. plastic sheeting and tape.

3.2.4.2. Abatement is to take place under full containment with negative pressure operating continuously and with full worker and equipment decontamination systems set up contiguous to the work area.

3.2.4.3. One (1) layer of 6 mil polyethylene sheeting shall be applied to all the walls for areas with only floor tile removal.

3.3 WORKER DECONTAMINATION SYSTEM

3.3.1. The Contractor shall construct a Worker Decontamination System consisting of at least three chambers as follows:

3.3.1.1. An equipment room (or area) with airlocks to the shower room.

3.3.1.2. A shower room with two airlocks, one to the equipment room and one to the clean room. The shower room shall consist of at least one shower with hot and cold running water. Careful attention shall be paid to the shower enclosure to ensure against leaks of any kind.

3.3.1.2.1. Ensure a supply of soap and shampoo, and bath size disposable towels at all times in the shower room.

3.3.1.2.2. The waste water shall be either stored to be removed and disposed of as asbestos waste or shall be filtered through a 5.0 micron filter to an available and suitable drain.

3.3.1.3. The clean room shall have one airlock into the shower room and one entrance/exit to uncontaminated areas of the building. The clean room shall have sufficient space for storage of the workers' street clothes, towels, and other non-contaminated items.

3.3.2. The entrance of the clean room must display a sign reading as follows:

DANGER  
ASBESTOS  
MAY CAUSE CANCER  
CAUSES DAMAGE TO LUNGS  
AUTHORIZED PERSONNEL ONLY  
WEAR RESPIRATORY PROTECTION AND  
PROTECTIVE CLOTHING IN THIS AREA

3.3.3. Signs, as such, shall be posted at all entrances to the work area including all sealed and/or locked entrance ways.

3.3.4. The floor immediately outside the clean room shall be protected by 6 mil plastic sheeting. The Contractor shall also cover all areas of the unit's floor outside the work area where equipment shall be placed and/or personnel shall travel with 6 mil plastic. This area includes any areas between the entrance to the unit and the work area over which personnel will walk.

#### 3.4 EQUIPMENT DECONTAMINATION SYSTEM

3.4.1. The Contractor shall provide or construct a separate Equipment Decontamination System, consisting of two (2) totally enclosed chambers as follows:

3.4.1.1. Washroom: The washroom shall be outfitted with two (2) airlocks, one to the work area, and the other to the holding area.

3.4.1.1.1. Water is to be available in the washroom to wet clean the outside of containers.

3.4.1.1.2. The waste water must be filtered through a 5.0 micron filter to an available and suitable drain or be discarded into barrels as asbestos contaminated material and disposed of as stated herein.

3.4.1.2. Holding room: The holding room consists of a room for storage of clean waste containers. An airlock, to the washroom, must be constructed or provided.

3.4.1.3. The entrance to the holding room from the clean side (outside) must be able to be locked and have a sign, as stated in Section 3.3.2, posted at the entrance clearly visible to any approaching person.

#### 3.5 INSPECTION OF WORK AREA AND DECONTAMINATION ENCLOSURES

3.5.1. Prior to any asbestos-containing material being encased, enclosed or removed, the Contractor shall notify the Consultant that the decontamination system is completed so that it may be inspected.

3.5.2. All plasticizing and sealing of work area, building of worker and equipment decontamination enclosure systems, preparation of the negative air system, and all preparation of equipment required for the project shall be completed prior to notification of the Consultant.

#### 3.6 MAINTENANCE OF THE WORK AREA AND THE DECONTAMINATION ENCLOSURES

3.6.1. The Contractor shall stop and repair any tear or leak discovered, to the satisfaction of the Consultant.

3.6.2. The Contractor shall visually inspect all enclosures and plastic barriers at the beginning and end of each work period.

3.6.3. The Contractor shall provide confirmation as to the security and integrity of the work areas and

the uninterrupted operation of the air purifying filtration units during the hours between the asbestos work shifts.

3.6.4. The Contractor shall provide at least one (1) ten (10) lb., ABC Multipurpose fire extinguisher per work area to be present and in operational condition.

3.6.5. The Contractor shall ensure that all other preparatory steps have been taken and applicable notices and signs have been posted and all applicable permits obtained prior to the commencement of any asbestos abatement procedures.

### 3.7 NEGATIVE AIR SYSTEMS

3.7.1. The negative air systems for containment areas will be exhausted outside the building, unless otherwise approved by the Consultant.

### 3.8 WORKER DECONTAMINATION

3.8.1. The Contractor shall supply written decontamination and work procedures, posted in the Clean Room.

3.8.2. The Contractor shall supply lockers or other clothing storage equipment for the workers and sufficient space for two (2) authorized visitors.

#### 3.8.3. Entering the Work Area

3.8.3.1. Personnel shall remove all clothes and put on protective disposable coveralls.

3.8.3.2. Personnel shall put on clean respirators.

3.8.3.3. Personnel shall now enter the work area.

3.8.3.4. No clothing, other than disposable coveralls, shall be worn into the work area and subsequently be removed from the work area (i.e., all clothing worn into the work area shall be treated as asbestos waste).

#### 3.8.4. Decontamination Procedures

3.8.4.1. Each worker or visitor shall, each time he/she leaves the work area:

3.8.4.1.1. Remove gross contamination from clothing before leaving the work area.

3.8.4.1.2. Proceed to the Equipment Room and remove all protective clothing EXCEPT RESPIRATORS.

3.8.4.1.3. While still wearing the respirator, proceed naked to the shower room.

3.8.4.1.4. Clean the outside of the respirator with soap and water while showering.

3.8.4.1.5. Finally, after thorough cleaning, remove the respirator.

3.8.4.1.6. Thoroughly shampoo and wash themselves.

3.8.4.1.7. If applicable, remove the filters from the respirators, wet them and dispose of the filters in the container provided by the Contractor for that purpose.

3.8.4.1.8. Wash and rinse the inside of the respirator.

3.8.4.1.9. Following showering and drying off, each worker or visitor shall proceed directly to the clean change room and dress.

3.8.5. Workers shall not eat, drink, smoke, or chew gum or tobacco in the work area.

3.8.6. Workers shall be fully protected with respirators and protective clothing immediately prior to the first disturbance of asbestos-containing or contaminated materials and until final clean-up is completed.

### 3.9 REMOVAL / ABATEMENT METHODS

3.9.1. Removal of Mudded Pipe Fittings and Tank Insulation Using Glovebags and/or Mini Enclosure

3.9.1.1. Prepare work area as stated in Section 3.1.

3.9.1.2. The Contractor shall provide, to the Consultant, documentation that the workers who are to perform the glovebag procedure have done it successfully and are capable of performing the task without fiber dispersion.

3.9.1.3. When feasible, prepare a worker mini-decontamination system.

3.9.1.4. The Contractor shall strictly adhere to the containment bag manufacturer's instruction as to the proper use of these containment devices.

3.9.1.5. Negative pressure must be established inside the glovebag before pipe insulation compound removal can start, negative pressure must be maintained throughout the duration of the removal until the bag is sealed for removal as waste.

3.9.1.6. Glovebags cannot be slid from one pipe section to another. A glovebag is to be used to remove only the section of pipe insulation compound it is originally attached to.

3.9.1.7. All work procedures described in this section (3.9.2) pertain only to the use of containment bags.

3.9.1.8. After completely sealing the bags around the pipe insulation to be removed, the Contractor shall completely saturate the insulation with amended water by placing the nozzle of the sprayer into the specially provided orifice of the bag.

3.9.1.9. The Contractor shall then remove the insulation. While the bag is still in place, the Contractor shall clean all of the residual insulation material from the pipe utilizing brushing and wet wiping techniques.

3.9.1.10. Spray encapsulant. After the completion of the removal process, the surface from which the asbestos insulation was removed shall then receive one (1) coating of an approved bridging encapsulant. Additionally, all rough, exposed edges of remaining insulation shall be encapsulated and thoroughly sealed before removal of the bag.

3.9.1.11. When the bag is collapsed and the HEPA vacuum still inserted and running, the bag shall be sealed then removed and placed in a 6 mil. bag lining. The double disposal bag shall then be sealed and disposed of as described herein.

3.9.1.12. All disposable suits, disposable respirator filters, and plastic used in the protection of the worker and work area shall be carefully disposed of as asbestos waste as described herein.

3.9.1.13. The entire process shall be carefully monitored by the Consultant. If at any time airborne



asbestos fiber concentrations are greater than 0.01 f/cc, the entire process shall be halted and corrective measures shall be implemented to the satisfaction of the Contracting Officer.

3.10 WASTE REMOVAL THROUGH THE EQUIPMENT DECONTAMINATION ENCLOSURE SYSTEM

- 3.10.1. The plastic bags shall be sealed by the Contractor in the work area.
- 3.10.2. The Contractor shall place caution labels on the containers in accordance with Regulations. These labels shall be clearly visible.
- 3.10.3. The external surfaces of the containers shall be thoroughly cleaned of gross contamination in the work area before they are placed into the equipment decontamination enclosure system.
- 3.10.4. The containers shall then be moved to the washroom. The Contractor shall wet clean each container thoroughly.
- 3.10.5. Upon completion of the wet cleaning process, each container shall be moved to the holding area pending removal to uncontaminated areas. At this point the Contractors shall be placed in another clean container or disposal bag with proper labels.
- 3.10.6. The Contractor shall ensure that the containers are removed from the holding area by workers who have entered from the uncontaminated side of the equipment decontamination enclosure system.
- 3.10.7. These workers shall be protected as described in Section 2.3.
- 3.10.8. The Contractor shall ensure that workers do not enter the uncontaminated areas through the washroom or the holding area.
- 3.10.9. The Contractor shall ensure that workers do not exit from the work area through the equipment decontamination enclosure system.
- 3.10.10. Workers who only move drums from the holding area to uncontaminated areas (trailers, trucks, etc.) may utilize half-face, dual-cartridge type respirators and must be outfitted with proper protection clothing.

3.11 CLEAN UP SEQUENCE

- 3.11.1. Gross Clean Up
  - 3.11.1.1. The Contractor shall remove any remaining accumulation of visible asbestos-containing material, including debris and dust, from all surfaces and plastic sheeting.
  - 3.11.1.2. The removal of containers, materials, and equipment no longer needed is required. This shall take place via the equipment decontamination enclosure systems and performed as described herein.
  - 3.11.1.3. The Contractor shall wet clean and HEPA vacuum all surfaces in the work area and in contaminated areas.
  - 3.11.1.4. After thorough cleaning, Contractor shall then remove first layer of plastic sheeting from floors by folding it inward trapping any debris.

- 3.11.1.5. The decontamination chamber shall remain in place during the gross clean-up sequence.
- 3.11.1.6. Gross clean-up shall be performed using proper respiratory protection as described herein, disposable coveralls, and decontamination procedures.
- 3.11.1.7. The Contractor, upon completion of the gross cleaning process, shall notify the Consultant for inspection.
- 3.11.1.8. The Contractor shall provide, if necessary, rolling scaffolding and/or other access equipment for the complete inspection of the work site.
- 3.11.1.9. The Contractor shall provide temporary lighting to properly illuminate the surfaces for inspection.
- 3.11.1.10. The Contractor shall be put on notice that the Construction Manger inspection(s) does not relieve the Contractor of his responsibility to remove the asbestos-containing material from all surfaces, and to provide surfaces free of dust, dirt, and debris.
- 3.11.2. Final Cleaning
  - 3.11.2.1. Final wet cleaning and HEPA vacuuming of surfaces should be performed by Contractor.
  - 3.11.2.2. Final clean-up should be performed using proper respiratory protection as described herein, disposable coveralls, and decontamination procedures.
  - 3.11.2.3. If the surfaces and crevices are free of dust, dirt, and debris, the Contractor shall encapsulate the following surfaces only upon the approval of the Consultant:
    - 3.11.2.3.1. Surfaces where asbestos material was removed;
    - 3.11.2.3.2. Structural deck, beams, joints;
    - 3.11.2.3.3. Piping and conduit present;
    - 3.11.2.3.4. All plastic sheeting
    - 3.11.2.3.5. All mechanical equipment that would not be damaged by the encapsulant;
    - 3.11.2.3.6. Any surface the Consultant deems fit for encapsulation.
  - 3.11.2.4. Only after the work area has passed the visual inspection, shall the final clearance air sampling be performed.
- 3.11.3. Final Inspection of Cleaning
  - 3.11.3.1. The Consultant will conduct the final inspection of the job site after the last cleaning sequence. All surfaces, pipes, ducts, etc. should be free of any dust, debris, or encapsulant material residue.
  - 3.11.3.2. The Contractor will be put on notice in the event that asbestos-containing materials such as encapsulated material residue, or debris, were not removed during previous work activity. These and all other similar materials shall be removed from the work area using previously specified procedures of plasticizing, decontamination of personnel using showers, respirators, cleaning, encapsulation, and an additional final clearance testing shall be required.
  - 3.11.3.3. Should this occur, all extra costs must be paid by the Contractor. The Consultant and Owner

shall incur no additional costs.

- 3.11.3.4. The extra work required by the Contracting Officer shall be deducted from the Contractor's Contract Sum.

### 3.12 AIR MONITORING

- 3.12.1. The Consultant shall during construction relative to this contract collect the following samples and minimum volumes each day until completion of scheduled work.

Area Samples Outside Containment Area .....	400 Liters
Area Sample by Negative Air Exhaust .....	400 Liters
Area Samples Inside the Work Area .....	400 Liters

- 3.12.2. These in-progress air samples will be analyzed using Phase Contrast Microscopy.
- 3.12.3. The final clearance air sample shall be analyzed through either Transmission Electron Microscopy (TEM) or Phase Contrast Microscopy (PCM) at the discretion of the Contracting Officer.
- 3.12.4. Final clearance sampling shall be conducted in each area until the level of final clearance is achieved. The standard for final clearance shall be set at less than 0.010 fibers per cubic centimeter (f/cc) using PCM or 70 structures per millimeter squared (s/mm<sup>2</sup>) using TEM.
- 3.12.4.1. The air final clearance sample volume for TEM analysis shall be at least 1,200 liters.
- 3.12.5. The final clearance air sampling shall be collected using aggressive air sampling techniques. Contractor shall supply leaf blower to agitate the space.
- 3.12.6. Should the Contractor fail the initial final clearance sampling, the area shall be re-cleaned and re-sampled at the expense of the Contractor including time incurred by the Consultant and with no increase in the contract time, until the standard of cleaning is achieved.
- 3.12.7. After achieving the Standard of Final Clearance and the work area is free of dust, dirt, and debris, the Contractor shall remove the plastic and tape seals from doors, windows, vents, etc., and all other openings from the work area.
- 3.12.8. The Contractor, at this time, shall remove the decontamination enclosure system.
- 3.12.9. The Contractor shall wet clean and/or HEPA vacuum all surfaces exposed by the removal of the seals and the decontamination Enclosure System.
- 3.12.10. The Contractor shall re-secure all mounted objects previously removed, establish plumbing and electrical systems to their previous working order.
- 3.12.11. Any damage caused by the Contractor shall be repaired to its previous state.

### 3.13 DISPOSAL OF ASBESTOS WASTE

- 3.13.1. All materials containing asbestos, or that may be contaminated with asbestos, must be disposed of as asbestos waste. This includes, but is not limited to: asbestos-containing waste, all plastic sheeting, contaminated protective suits, filters, foot covering, tape, etc.
- 3.13.2. As work progresses, the Contractor shall remove sealed and labeled containers so that available storage space is not exceeded.

- 3.13.3. Disposal of such containers shall be at an authorized disposal site in accordance with the requirements of the appropriate disposal authorities.
- 3.13.4. Contractor shall submit to the Consultant the completed Disposal of Asbestos Waste Form, Manifest and receipt from landfill.
- 3.13.5. Waste materials must be transported in enclosed or covered trucks to prevent loose containers from falling off the vehicle.
- 3.13.6. At the disposal site, sealed bags must be carefully lowered into the burial site unless the bags have been broken or damaged, and if the disposal site allows bags to be buried.
- 3.13.6.1. Damaged bags shall remain in the drum and the entire contaminated sealed drum shall be buried.
- 3.13.6.2. Uncontaminated drums may be recycled, if applicable.
- 3.13.7. At the dumpsite, the bags or barrels must be carefully lowered into approved landfills by the workers.
- 3.13.8. Contractor shall notify Consultant of proposed date and time of transporting waste to the landfill.
- 3.13.9. The workers shall perform this activity in approved disposal suits and appropriate respirators.
- 3.14. TEMPORARY STORAGE
- 3.14.1. If temporary storage at the job site is to occur, the area must be secured from entrance by unprotected persons.
- 3.14.2. Temporary storage off the job site is not permissible.
- 3.14.3. Ownership of asbestos waste shall pass from the Owner to the Contractor once waste is placed in proper bags and/or containers. Contractor shall assume all responsibilities relating thereto.
- 3.15. FINAL CLOSING PAPERS (Coordinate with Section pertaining to Notices and Submittals)
- 3.15.1. The Contractor shall submit notarized certification listing additional employees who were not employed when the first certifications were submitted regarding instructions, hazards, respirators, etc.
- 3.15.2. The Contractor shall provide the Consultant with a Certificate of Employees' Release for the additional employees who have not provided specified certificate.
- 3.15.3. The Contractor shall provide the Consultant receipts from the landfill operator which acknowledges the Contractor's delivery(s) of asbestos waste material.
- 3.15.4. The Contractor, at this time, shall submit the Final Application for Payment, Contractor's Affidavit of Payments of Debts and Claims and Contractor's Affidavit of Release of Liens.

End of Section 3:  
Execution of the Technical Specifications for Asbestos Abatement

ATTACHMENT 1  
KNOWN ASBESTOS CONTAINING MATERIALS

**Attachment 1  
Buildings K, L, M - Asbestos Containing Materials Summary**

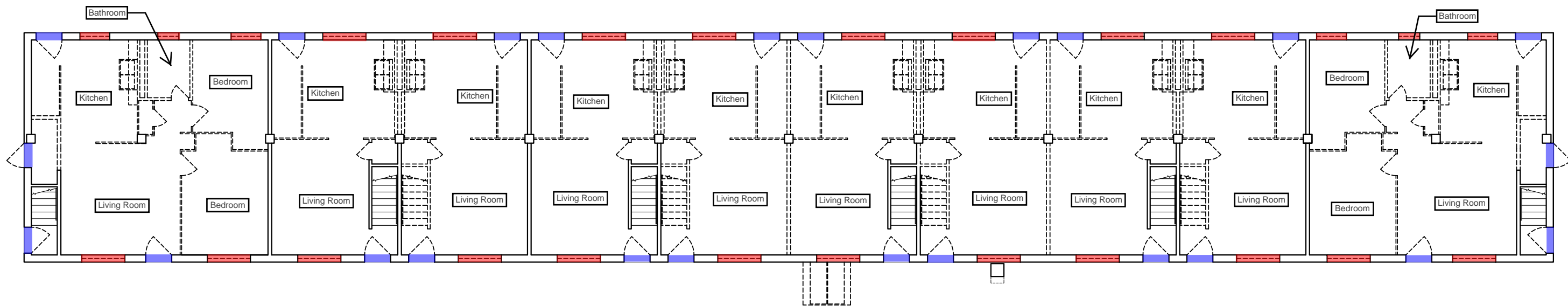
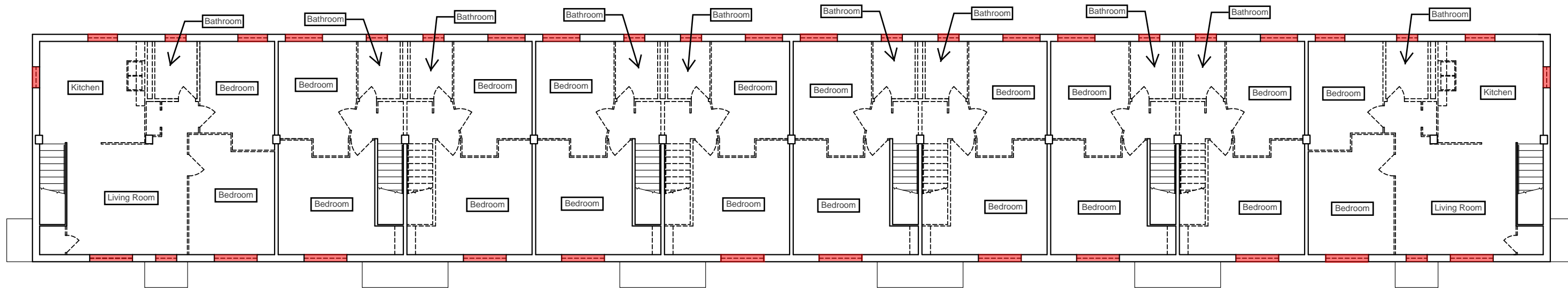
<b>Material</b>	<b>Sample #</b>	<b>Material Location</b>	<b>Laboratory Result (%)</b>	<b>Estimated Quantity</b>	<b>Condition</b>	<b>EPA Category</b>
Caulk	2A, 2B	Exterior Doors	7% Chrysotile	800 LF	Good	NF II
Caulk	3A, 3B	Exterior Window	<1% Chrysotile	800 LF	Good	NF II
12"x12" White with Brown Floor Tile	5A, 5B	Apartment Kitchens	4% Chrysotile	5,500 SF	Good	NF I
12"x12" Beige with Brown Floor Tile	7A, 7B	Apartment Living Rooms	4% Chrysotile	8,200 SF	Good	NF I
12"x12" White with Tan & Brown Floor Tile	8A, 8B	Apartment Bedrooms	4% Chrysotile	5,500 SF	Good	NF I
Caulk	14A, 14B	Old Window Frames under New Metal Windows	7% Chrysotile	800 SF	Poor	NF II

Table Notes:

1. SF = Square Feet
2. LF = Linear Feet
3. RACM = Regulated Asbestos Containing Material
4. NF I = Non-Friable Category 1
5. NF II = Non-Friable Category 2
6. CMI personnel onsite made every effort to estimate the quantities of ACM observed. However, additional quantities may be present in inaccessible areas. During the abatement bidding process contractors should be responsible for obtaining their own quantities for bidding purposes.

ATTACHMENT 2  
FLOOR PLANS

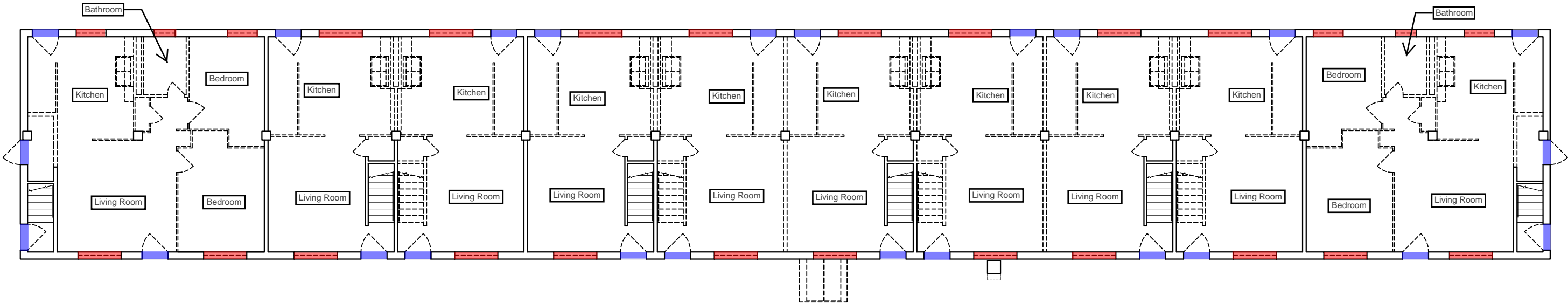
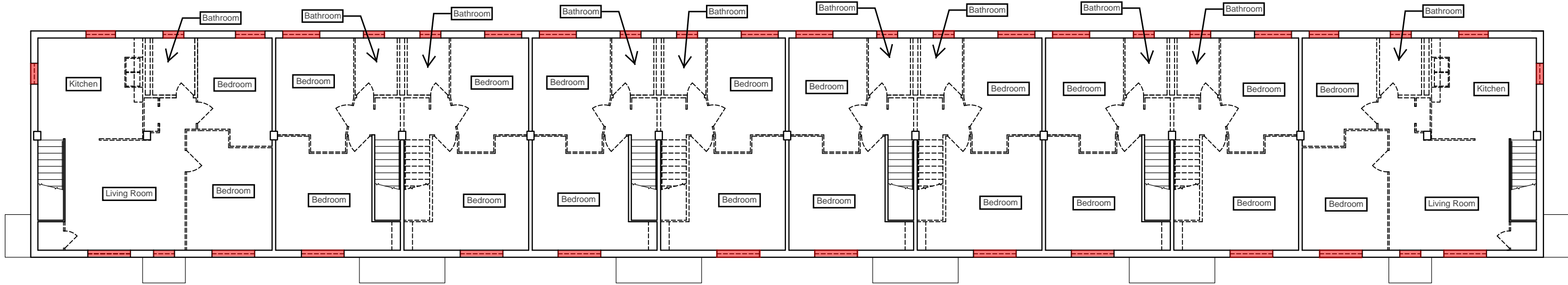
# Building K Asbestos Demo



- Asbestos Items to be removed:**
1. Exterior Door Caulking [All Exterior Door Casings] = —
  2. Exterior Window Caulking (New) [All Exterior Window Frames] = —
  3. Exterior Window Caulking (Old) [Under All Brown Metal Window Frames] = —
  4. All 12"x12" Floor Tiles (Living Rms, Kitchens, Bathrms, Bedrms & Hallways)

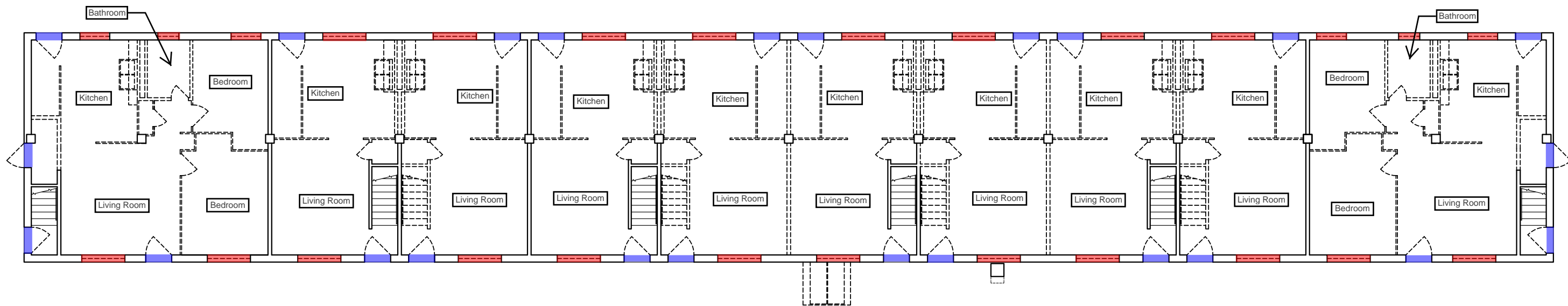
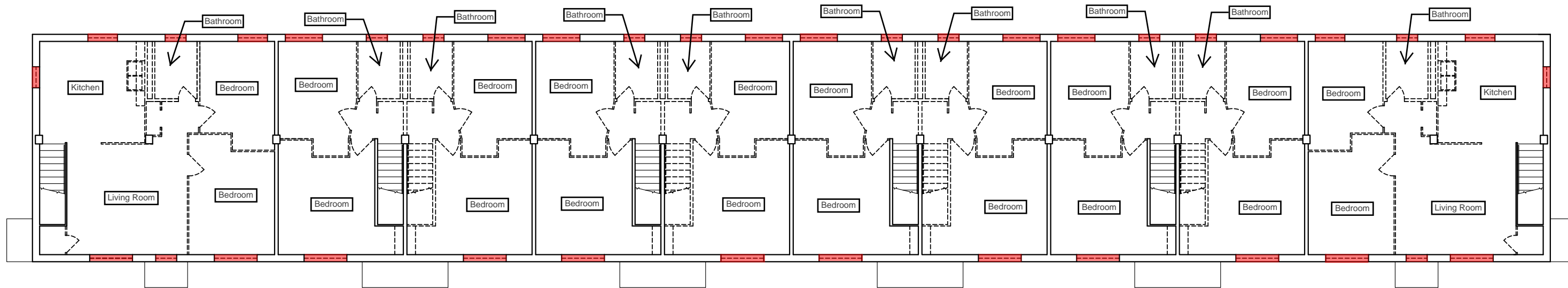


# Building L Asbestos Demo



- Asbestos Items to be removed:**
1. Exterior Door Caulking [All Exterior Door Casings] = —
  2. Exterior Window Caulking (New) [All Exterior Window Frames] = —
  3. Exterior Window Caulking (Old) [Under All Brown Metal Window Frames] = —
  4. All 12"x12" Floor Tiles (Living Rms, Kitchens, Bathrms, Bedrms & Hallways)

# Building M Asbestos Demo



**Asbestos Items to be removed:**

1. Exterior Door Caulking [All Exterior Door Casings] = —
2. Exterior Window Caulking (New) [All Exterior Window Frames] = —
3. Exterior Window Caulking (Old) [Under All Brown Metal Window Frames] = —
4. All 12"x12" Floor Tiles (Living Rms, Kitchens, Bathrms, Bedrms & Hallways)

**LEAD-CONTAINING PAINT  
TECHNICAL SPECIFICATIONS**



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Eric S. Ritchey, CHMM

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March 27, 2019  
Date

PART 1 - GENERAL

1.1 SCOPE OF WORK

1.1.1 This specification includes lead-based paint (LBP) renovation work described herein in the Harrisburg Housing Authority's William Howard Day (WHD) Homes, specifically Buildings K, L & M located at 1300 Community Drive, Harrisburg, Pennsylvania. The renovation work is to be conducted in coordination with the (OWNER) and their representatives. Any activity at the buildings that disturbs lead must be performed by properly trained workers using appropriate personal protective equipment, engineering controls and work practices in accordance with the rules and regulations as outlined in 29 CFR 1926.62: Lead in Construction Regulations and in 40 CFR 745, Subpart E: Lead-Based Paint Poisoning Prevention in Certain Residential Structures (Lead Renovation, Repair and Painting Rule).

1.1.2 The scope of work includes the renovation and proper disposal of the known lead-based paint (LBP) and LBP coated components identified in Attachment 1: Known Lead-Based Paint and as followed:

1.1.2.1 Walls will be removed and disposed of or have paint stabilization performed on them if not being called to be removed in the demo specification;

1.1.2.2 Ceilings will have paint stabilization performed on them;

1.1.2.3 Removal and disposal of the staircase leading to the second floor as per demo specification or have paint stabilization performed on them if not being called to be removed in the demo specification;

1.1.2.4 Removal and disposal of the metal window sills;

1.1.2.5 Removal and disposal of the metal baseboards in the living rooms;

1.1.2.6 Removal and disposal of the wood chair rails in the bathrooms;

1.1.2.7 Removal and disposal of the radiators and associated piping;

1.1.2.8 Removal and disposal of the metal door components;

1.1.3 The contractor shall comply with the Occupation Safety and Health Administration (OSHA) Lead in Construction regulation, 29 CFR 1926.62 and in 40 CFR 745, Subpart E: Lead-Based Paint Poisoning Prevention in Certain Residential Structures, during the demolition and LBP disturbance at the WHD Homes Buildings K, L & M located at 1300 Community Drive, Harrisburg, Pennsylvania.

1.2 SUBMITTALS

1.2.1 In addition to the requirements for bidding included in the "Instructions To Bidders", the following information shall be required prior to the start of work.

1.2.1.1 Detailed description of the renovation methods that will be employed for each of the LBP renovations tasks defined in the scope of work. The information shall include the manufacturer and material type for all products used in the renovations work. No methods for LBP removal that are not included herein or specified without option in the specifications shall be used.

1.2.1.2 Plans for a typical containment area to be set up to handle work defined in the Scope.

- 1.2.1.3 Names of any proposed subcontractors and a complete description of the work to be performed by the subcontractors. No subcontractors shall be used that have not been described as required. Subcontractors shall not use subcontractors.
- 1.3 REGULATIONS
  - 1.3.1 This work shall be performed in accordance with these specifications, EPA, OSHA and NIOSH regulations and any other applicable federal and Commonwealth government regulations concerning lead or related construction activities.
  - 1.3.2 In the event of conflicting requirements, the most stringent provisions shall be applicable.
  - 1.3.3 Governing regulations include but are not limited to the following:
    - 1.3.3.1 EPA Regulation 40 CFR Part 172, Part 178, Part 260, Part 261, Part 262, Part 263, Part 264, Part 265, Part 268 and Part 745 Subpart E;
    - 1.3.3.2 ANSI Z9.2, Z88.2;
    - 1.3.3.3 OSHA Regulations 29 CFR 1910.134, 1910.1025, 1910.1200, 1926.62, 1926.55, and 1926.57 in their entireties; and
    - 1.3.3.4 Commonwealth of Pennsylvania Lead-Based Paint Occupations Accreditation and Certification Regulations.
- 1.4 AUTHORITY TO STOP WORK
  - 1.4.1 The Contracting Officer has the authority to stop the renovations work at any time if he/she determines, either personally or through results of air sample tests that the work area is not within these specifications and/or all applicable regulations. The work shall not continue until the conditions have been corrected to the satisfaction of the Contracting Officer. The period of inactivity which is required to resolve the violation(s) shall be at the Contractor's expense. No extension in time will be granted.
- 1.5 PRE-RENOVATION MEETING
  - 1.5.1 The Contractor shall attend a mandatory pre-renovations meeting scheduled by the Construction Manager. This meeting shall also be attended by a designated representative of the Owner (if he/she wishes), and the Construction Manager. At this meeting, the Contractor shall present to the Construction Manager three (3) copies of the following in writing:
    - 1.5.1.1 Project Schedule breakdown in accordance with the time restraints.
    - 1.5.1.2 A plan for preparation of work site, decontamination chambers, and shower waste water.
    - 1.5.1.3 Description of protective clothing and approved respirators to be used, including make and model number.
    - 1.5.1.4 Delineation of responsibility of work site supervision including a listing of emergency home phone numbers.
    - 1.5.1.5 Explanation of decontamination sequence and isolation techniques.

- 1.5.2 Brief description of removal methods to be used and specific equipment to be utilized, including make and model.
- 1.5.3 Description of the final clean-up procedures to be used.
- 1.5.4 Brief explanation of the handling of LBP contaminated waste and the waste disposal site to be utilized, including EPA and Commonwealth identification numbers of waste haulers, if utilized.
- 1.5.5 Detailed information including catalog cuts, manufacturer's data, etc., including material concerning pressure differential monitoring device as specified in Section 2.2.4.4 of these Technical Specifications.
- 1.6 LOGBOOK
  - 1.6.1 The Contractor shall maintain a logbook at the job site, which shall be available at all times to the Construction Manager and the Owner. Completed copies shall be submitted to the Construction Manager and the Owner at the end of the project.
  - 1.6.2 The logbook serves as a ready reference for each project and may be used in legal proceedings, thus care must be taken to assure its completeness in documentation.
  - 1.6.3 The logbook shall contain the following information at a minimum and be presented in a three (3) ring binder as part of pre-work submittals at the pre-renovations meeting as specified in Paragraph 1.5 above.
    - 1.6.3.1 Copies of correspondence with all federal and Commonwealth of Pennsylvania agencies with an interest in the project, including the ten-day federal EPA and Pennsylvania Notification forms.
    - 1.6.3.2 All permits and licenses received by such agencies.
    - 1.6.3.3 Evidence of compliance with the medical requirements, OSHA Lead Standard (29 CFR 1926.62), and certification by a physician of each employee's capability to wear a respirator per the OSHA Respiratory Standard (29 CFR 1910.134).
    - 1.6.3.4 Notice of verification that local fire, police and rescue services have been informed of safe decontamination procedures.
    - 1.6.3.5 Copies of documents certifying that participating Contractor employees have been given instruction, as previously described, on the hazards of lead and measures to control exposure to it including the use, care, and fit-testing of respirators. In lieu of certification papers, a signed statement by each employee will suffice.
    - 1.6.3.6 Names and telephone numbers of key personnel including the on-the-job supervisor's immediate supervisor, emergency numbers for police, fire and rescue personnel, the building owner's chief representative, security personnel, and appropriate federal and Commonwealth of Pennsylvania regulatory personnel.
    - 1.6.3.7 Contractor's standard operating procedures and any deviations therefrom.
    - 1.6.3.8 Project technical specifications including plans and drawings, and any deviations therefrom.
    - 1.6.3.9 Contract between the Contractor and Owner and Contractor's Subcontractors and change orders thereto.

- 1.6.3.10 Sign-in and sign-out sheets noting any persons entering the work area, their affiliation, time and purpose of entry and departure time.
- 1.6.3.11 Records of all accidents and injuries occurring on the job.
- 1.6.3.12 Copies of all results of area, personal, bulk and wipe samples.
- 1.6.3.13 Copies of daily inspection reports, including who performed the inspections, the date, and time.
- 1.6.3.14 EPA waste disposal identification number, manifest, trip ticket and disposal site used. If a Subcontractor is used, all information required above must still be provided, plus the Subcontractor's identification. A completed copy of Waste Manifest Form or Forms must also be included.
- 1.6.3.15 Reports of inspections by federal and Commonwealth of Pennsylvania authorities.
- 1.6.3.16 Detailed reports of any problems and incidents that arose, the date and time, and how they were handled. These reports must be signed by supervisory personnel.
- 1.6.3.17 Emergency procedures.
- 1.6.3.18 Insurance certificates, including workers compensation coverage.
- 1.6.3.19 Copy of the project schedule and any deviations therefrom.
- 1.6.3.20 Organization of personnel at the job site including delineation of supervisory responsibility.
- 1.6.3.21 Material Safety Data Sheets in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200) for materials such as spray glue proposed for use on this project.
- 1.6.4 LBP WORK SHALL NOT PROCEED UNTIL CONTRACTING OFFICER AND CONTRACTOR AGREE ON THE DETAILS REQUIRED ABOVE. ALL ITEMS REQUIRED IN THIS SECTION ARE TO BE PROVIDED IN WRITING.
- 1.7 CONTRACTOR LICENSING
  - 1.7.1 Contractors performing work in the Commonwealth of Pennsylvania must be EPA certified to perform Lead Renovation, Repair and painting (RRP) work in the Commonwealth of Pennsylvania.
- 1.8 PERSONNEL QUALIFICATIONS
  - 1.8.1 All personnel of the Contractor involved with the LBP renovation work must be trained prior to any work and shall be familiar with the standard operating procedures of the Contractor.
  - 1.8.2 The superintendent and the foreman shall be thoroughly familiar with all applicable regulations and practices for Lead RRP work.
  - 1.8.3 All personnel shall be trained in the use and care of respirators.
  - 1.8.4 At least one Contractor employee shall have successfully completed an EPA approved training course for Lead Hazard Control as stipulated in 40 CFR 745.

- 1.8.5 Personnel without the above qualifications shall not be allowed to work in the work area at any time.
- 1.8.6 The Contractor shall provide a signed statement that enough trained workers are employed to complete this project within the time constraints given.
- 1.9 AVAILABILITY OF QUALIFIED PERSONNEL
- 1.9.1 There shall be a sufficient number of workers, foremen, and superintendents trained according to requirements given in section 1.8 above to accomplish the work within the required schedules.
- 1.9.2 No person who has not been fully trained, qualified as above, and pre-approved, shall be employed to enhance completion of the work.
- 1.10 TERMINOLOGY
- 1.10.1 Action Level - Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8-hour period. As used in this Specification, "30 micrograms per cubic meter of air" refers to the action level.
- 1.10.2 Area Monitoring - Sampling of lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead concentrations which may reach the breathing zone of personnel potentially exposed to lead.
- 1.10.3 Industrial Hygiene Firm - the firm retained by the Owner to ensure compliance with the Technical Specifications and all applicable regulations concerning lead. In addition, the Industrial Hygiene Firm shall be responsible for all wipe sampling and analysis within the premises.
- 1.10.4 Airlock - a system for permitting ingress or egress without permitting air movement between a contaminated area and an uncontaminated area, typically consisting of two airlock doorways at least three (3) feet apart.
- 1.10.5 Airlock Doorway - a device to allow ingress or egress from one room to another while permitting minimal air movement between the rooms. Two of these doorways three (3) feet apart form an airlock.
- 1.10.6 Authorized visitor - the building Owner, or a representative of any regulatory or other agency having jurisdiction over the project.
- 1.10.7 Building Owner - the Owner or his authorized representative.
- 1.10.8 Clean Room - an uncontaminated area or room which is part of the worker decontamination enclosure system, with provisions for storage of workers' street clothes and protective equipment (coveralls, respirators, filters, etc.).
- 1.10.9 Change Rooms and Shower Facilities - Portable changing rooms within the designated physical boundary around the lead control area equipped with separate storage facilities for clean protective Work clothing and equipment and for street clothes which prevent cross-contamination.
- 1.10.10 Contractor - the proprietor or his authorized representative to whom this contract pertains. Regardless of whether or not the LBP removal firm is a sub-contractor on the project, the



term "Contractor" names the LBP removal firm, in this specification.

- 1.10.11 Construction Manager - the firm retained by the building Owner to manage the lead renovation work.
- 1.10.12 Decontamination Enclosure System - a series of connected rooms, with airlocks between any two adjacent rooms, for the decontamination of workers or of materials and equipment. A decontamination enclosure system always contains at least three (3) air locks.
- 1.10.13 Eight-hour Time Weighted Average (TWA) -Airborne concentration of lead averaged over an 8-hour Workday to which an employee is exposed.
- 1.10.14 Equipment Decontamination Enclosure System - a decontamination enclosure system for materials and equipment, typically consisting of a designated area of the work area, an airlock, a washroom, another airlock, a holding area, and an uncontaminated area (outside).
- 1.10.15 Equipment Room - a contaminated area or room which is part of the worker decontamination enclosure system, with provision for storage of contaminated clothing and equipment.
- 1.10.16 Fixed object - a unit of equipment or furniture in the work area which cannot be removed from the work area.
- 1.10.17 High Efficiency Particulate Air (HEPA) Filter Equipment - HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead-contaminated paint dust. A high efficiency particulate filter means 99.97 percent efficiency against 0.3 micron size particles.
- 1.10.18 HEPA Filter - a High Efficiency Particulate Air (Absolute) Filter capable of trapping and retaining 99.97% of lead dust or fume greater than 0.3 microns in length.
- 1.10.19 HEPA Vacuum Equipment - high efficiency particulate air (absolute) filtered vacuuming equipment with a filter system capable of collecting and retaining lead dust or fume.
- 1.10.20 Holding Area - a chamber between the washroom and an uncontaminated area in the equipment enclosure system. The holding area must have an airlock to the wash room and must have a lockable door to the outside.
- 1.10.21 Lead - Metallic lead, inorganic lead compounds, and organic lead soaps. Excluded from this definition are other organic lead compounds.
- 1.10.22 Lead Control Area - An enclosed area to prevent the spread of lead dust, paint chips, or debris of lead-containing paint removal operations. The lead control area is isolated by physical boundaries to prevent unauthorized entry of personnel.
- 1.10.23 Lead Permissible Exposure Limit (PEL) - Fifty micrograms per cubic meter of air ( $50 \mu\text{g}/\text{m}^3$ ) as an 8-hour time weighted average as determined by 29 CFR 1926.62. If an employee is exposed for more than 8 hours in a Work day, the PEL shall be determined by the following formula:  
  
$$\text{PEL (micrograms/cubic meter of air)} = 400/\text{No. hrs Worked per day}$$
- 1.10.24 Movable Object - a unit of equipment or furniture in the work area which can be removed from the work area.
- 1.10.25 Negative Pressure - a local exhaust system capable of maintaining a minimum pressure

differential of minus 0.02 inches of water column relative to adjacent unsealed areas. The exhaust is to be filtered through a HEPA Filtration System.

- 1.10.26 Personal Monitoring - Sampling of lead concentrations within the breathing zone of an employee to determine the 8-hour time weighted average concentration in accordance with 29 CFR 1926.62. Samples shall be representative of the employee's Work tasks. Breathing zone shall be considered an area within a hemisphere, forward of the shoulders, with a radius of 6 to 9 inches and the center of the nose or mouth of an employee.
- 1.10.27 Physical Boundary - Area physically roped or partitioned off around an enclosed lead control area to limit unauthorized entry of personnel. As used in this section, "inside boundary" shall mean the same as "outside lead control area."
- 1.10.28 Removal - procedures specified herein necessary to strip all LBP materials from the designated areas and to dispose of these materials at an acceptable disposal site.
- 1.10.29 Shower Room - a room between the clean room and the equipment room, with an airlock at each end, located in the worker decontamination enclosure system, with hot and cold or warm running water and suitably arranged for complete showering during decontamination.
- 1.10.30 Sub-Contractor - any firm working for the LBP removal firm on this project.
- 1.10.31 Surfactant - an approved chemical wetting agent added to water to improve penetration, thus reducing the quantity of water required for a given operation or area.
- 1.10.32 Testing Laboratory - The firm that will analyze air and dust wipe samples for lead concentrations.
- 1.10.33 Washroom - a room between the work area and the holding area in the equipment decontamination enclosure system, with an airlock to each.
- 1.10.34 Wet Cleaning - the process of eliminating lead contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with amended water, and by afterwards disposing of these cleaning tools as lead-contaminated waste.
- 1.10.35 Worker Decontamination Enclosure System - a decontamination enclosure system for personnel, typically consisting of the following, when entering from outside the work area to within the work area: a clean room, an airlock, a shower room, a second airlock, an equipment room or area, and the work area.
- 1.10.36 All terms not defined herein shall have the same meaning given in the applicable documents, publications, regulations, and as used commonly within the field of lead renovation.
- 1.11 BUILDING SECURITY
- 1.11.1 The security of the premises is the responsibility of the Owner. The Contractor is to be provided with a key, permitting him/her access to the premises.
- 1.11.2 The security of the work area against inadvertent or willful entry of unauthorized persons is the responsibility of the Contractor.
- 1.12 EMERGENCY PRECAUTIONS
- 1.12.1 The Contractor shall establish emergency and fire exits from the work area. All emergency

exits shall be equipped with at least two (2) full sets, for emergency entrance, of protective clothing and respirators at all times.

1.12.2 The Contractor shall notify the local police and fire department in writing of the LBP renovation project. A copy of this notice must also be provided to the Construction Manager. The Contractor must coordinate with the police all security aspects of the project. All emergency evaluation and safety aspects must be coordinated with the local fire department and/or rescue squad.

1.12.2.1 Before the Contractor begins actual renovation procedures, the local police and fire departments shall be notified as to the danger of entering the work area. They also shall be invited to attend an informal training program to be conducted by the Construction Manager which will provide information regarding renovation activities, decontamination practices, etc. The Contractor shall make every effort to assist these agencies in forming plans of action should their personnel need to enter the contaminated area.

1.12.3 Local medical emergency personnel; (i.e., ambulance crews) shall be notified prior to the commencement of the renovation operation as to the possibilities of having to handle contaminated or injured workers, and shall be advised on safe decontamination procedures.

1.12.3.1 A notice of verification that all of the above parties have been notified must be presented to the Construction Manager prior to commencement of renovation work.

1.12.4 The Contractor shall be prepared to administer immediate first aid to injured personnel before and after decontamination. Seriously injured personnel shall be treated immediately or evacuated without delay for decontamination. When an injury occurs, the Contractor shall stop work and implement dust reduction techniques (e.g. water misting the work area air) until the injured person has been removed from the work area.

#### 1.13 TEMPORARY SERVICES

1.13.1 Contractor shall provide temporary heating services within his work area, if necessary, to maintain a minimum temperature of 53 degrees Fahrenheit. Temperature heating may not be propane or any combustible type unit. It is suggested that a temporary steam system or steam generators be used to pre-wet the material and maintain heat. Temporary heat shall be in accordance with OSHA Safety Regulations and local fire codes.

1.13.2 The Owner shall provide all temporary water services from site location. The Contractor must provide all temporary connections, valves fittings, hoses, etc. to accommodate his needs. Contractor shall take all necessary precautions against freezing. The Owner shall provide a site location to which hook-ups can be made.

1.13.3 The Owner shall provide electrical power from existing high amperage circuit boards. The Contractor shall provide all temporary connections, lines, distribution circuit breakers, safety facilities, boxes, cords, etc. to accommodate all of his needs.

1.13.3.1 Contractor is to provide area distribution boxes so located that the individual crews may furnish and use 50 ft. maximum length extension cords to obtain power and lighting at points needed for work, inspection and safety.

1.13.3.2 All temporary connections shall be in accordance with OSHA, local safety codes, and U.L. Design. Ground Fault Circuit Interrupters shall be placed at each power source.

#### 1.14 DAMAGE CAUSED BY CONTRACTOR

- 1.14.1 The Contractor shall provide all labor, materials, and equipment necessary for protection of furnishings, equipment, and/or building structures from damage. The Contractor shall replace or repair, at his own cost, any items damaged due to work performed under this Contract, equal to their original construction or finish, to the satisfaction of the Contracting Officer.
- 1.15 BLACK PLASTIC
- 1.15.1 The Contractor shall provide black plastic sheeting when constructing the outer layer of the containment between the work area and occupied spaces to prohibit viewing of the Contractor's activities by the occupant.
- 1.16 PROJECT SIGNS
- 1.16.1 There shall be no project or company signs displayed of any type by the Contractor. There shall be only those signs required by the Commonwealth of Pennsylvania and OSHA Regulations.
- 1.17 LBP RENOVATION WORK SHALL NOT COMMENCE UNLESS:
- 1.17.1 Arrangements have been made for disposal of waste at an acceptable site.
- 1.17.2 Arrangements have been made for containment and disposal of waste water resulting from wet stripping.
- 1.17.3 Work areas and decontamination enclosure systems and parts of the building required to remain in use are effectively segregated.
- 1.17.4 Tools, equipment, material and waste receptacles are on hand.
- 1.17.5 Arrangements have been made for work area security.
- 1.17.6 All other preparatory steps have been taken, applicable notices posted, and permits obtained.

End of Section 1:  
General Section of the Technical Specifications

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1. All materials delivered to the job site must be in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name.
- 2.1.2. The Contractor shall store all materials that are subject to damage off the ground, away from wet or damp surfaces, and under sufficient cover to prevent damage or contamination.
- 2.1.3. Damaged or deteriorating materials shall not be used and shall be removed from the premises. Materials that become contaminated with lead shall be disposed of in accordance with all applicable regulations and procedures herein.
- 2.1.4. The Contractor shall provide plastic sheeting of 6 mil. thickness. This plastic shall be black where specified.
- 2.1.5. The tape used for sealing joints of adjacent sheets of plastic sheeting and for attachment of plastic sheets to finished and unfinished surfaces of dissimilar material must be capable of adhering under dry and wet conditions including the use of amended water.
- 2.1.6. The Contractor shall have available a sufficient quantity of equipment to mix and spray the wetting agent. Airless spraying equipment is mandatory, and is the only type acceptable.
- 2.1.7. The Contractor shall supply a sufficient number of 6 mil. plastic bags and metal or fiber drums with tightly fitting lids suitable to receive and retain any lead-containing or contaminated materials until disposal at an approved site. These containers must be both air and water tight.
- 2.1.7.1. These containers shall be labeled in accordance with OSHA, EPA, and DOT.
- 2.1.8. The Contractor shall supply all warning signs and labels as required by OSHA and EPA.
- 2.1.9. Paint removal product shall be a biodegradable alkaline product which contains no methylene chloride products and require no neutralizers. The following products meet these requirements:

Double Duty VII  
Sunnyside Corporation  
225 Carpenter Avenue  
Wheeling, Illinois 60090  
(800) 323-8611

Ledizolv  
LSZ, Inc.  
30 Glen Street, Suite 309  
White Plains, New York 10603  
(914) 948-3797

- 2.1.10. Wet Detergent Wash Products: Provide detergent or cleaning agent formulated to be effective in removing lead dust. Detergent with a high phosphate content (at least 5%) trisodium phosphate (TSP) may be used. Follow dilution ratio recommended by the manufacturer's instructions.
- 2.1.11. Other Materials - the Contractor shall provide all other materials, such as lumber, nails and hardware, etc. which may be required to construct and dismantle the decontamination area and the barriers that isolate the work area.

2.2 TOOLS AND EQUIPMENT

- 2.2.1. The Contractor shall provide tools and equipment required for the removal of LBP materials,  
Harrisburg Housing Authority  
WHD Homes K, L & M

construction of work areas, demolition, containment of contaminated waste, hoisting and removal of contaminated waste from the building and transport of contaminated waste to the dump site.

- 2.2.2. Scaffolding - the Contractor shall provide scaffolding as required to accomplish the specified work and shall meet all applicable safety regulations concerning the use of scaffolding.
- 2.2.3. The Contractor shall also have on-site industrial dry/wet vacuum(s) equipped with High Efficiency Particulate Air (Absolute) Filtration approved for lead removal.
- 2.2.4. Negative Air - The Contractor shall have available air filtering equipment capable of filtering lead dust or fume of 0.3 microns or larger at 99.97% efficiency.
  - 2.2.4.1. There shall be sufficient numbers of units to provide a minimum of four (4) complete air changes per hour in the work area, and exhaust the filtered air outside the building, unless otherwise indicated and approved by the Contracting Officer, to maintain a negative pressure inside the work area, and sufficient flow through the decontamination chambers to prevent escape of airborne lead.
  - 2.2.4.2. The Contractor shall provide, along with the negative air machines, all necessary accessories including but not limited to, manifolds for hookup to vacuum cleaners, flexible intake duct, flexible exhaust duct, etc.
  - 2.2.4.3. The negative air system shall maintain a negative pressure of 0.02 inches of water. Should negative pressure drop below 0.01 inches of water, the job will be shut down until negative pressure of 0.02 inches of water is reestablished. This system shall operate on a twenty-four (24) hour schedule throughout the renovation process and through the final wet cleaning process.
  - 2.2.4.4. The Contractor shall monitor the work area air pressure differential on a twenty four (24) hour a day basis, by means of a pressure differential sensing device equipped with a chart recorder and an audible alarm, as approved by the Construction Manager. Copies of chart graphics shall be submitted to the Construction Manager on a daily basis.
  - 2.2.4.5. Contractor shall take whatever action necessary, including the installation of additional circuit breaker panel boards, if required, to ensure adequate circuit of sufficient amperage, capable of powering negative air units uninterrupted for the duration of the project.
- 2.2.5. HEPA Filtration and HEPA filters shall be accompanied by a Certification. The Certification shall consist of a test performed within 1,000 use hours on the particular HEPA filter. Testing shall be the DOP Smoke Challenge procedure and shall conform to Federal Standard 209B and Air Force Technical Order No. 00-25-203. Certification and test report shall be submitted to the Construction Manager, and shall be included in the Contractor's logbook. Subsequent testing shall be conducted at every 1,200 hours of use.

### 2.3 WORKER PROTECTION

#### 2.3.1. Respiratory Protection

- 2.3.1.1. The Contractor shall provide appropriate respiratory protection in accordance with OSHA regulations for each phase of work. The respiratory protection shall be applicable for the activity and fiber level within the work area. Respiratory protection shall be in accordance with 29 CFR 1926.62. Protection factors for various respiratory protection devices are defined by this regulation as follows:

Airborne Concentration  
Harrisburg Housing Authority  
WHD Homes K, L & M

Respiratory Required  
12

- |   |    |  |
|---|----|--|
| Not in excess of 50 µg/m <sup>3</sup><br>(10 x PEL)                                 | 1. | Half mask air-purifying<br><br>respirator equipped with<br>high-efficiency<br>filters  |
| Not in excess of 25000 µg/m <sup>3</sup><br>(50 x PEL)                              | 1. | Full face piece air-purifying<br><br>respirator equipped with high-<br>efficiency filters  |
| Not in excess of 5000 µg/m <sup>3</sup><br>(100 x PEL)                              | 1. | Any powered air-purifying<br><br>respirator equipped with<br><br>high-efficiency filters   |
| Not in excess of 50,000 µg/m <sup>3</sup><br>(1000 x PEL)                           | 1. | Full face piece supplied-air<br><br>respirator operated in pressure<br>demand mode   |
| Greater than 50,000 µg/m <sup>3</sup><br>(>1,000 x PEL) or<br>unknown concentration | 1. | Full face piece supplied-air<br>respirator operated in pressure<br>demand mode,<br>equipped with an auxiliary positive<br>pressure self-contained breathing<br>apparatus |
- 2.3.1.2. Workers are required to be instructed and knowledgeable in personnel protection and lead material removal.
- 2.3.1.3. Facial hair, beards, sideburns, etc., that would interfere with the seal of a respirator are not permitted.
- 2.3.1.4. The Contractor must provide workers with personally issued and labeled respiratory equipment.
- 2.3.1.5. The Contractor shall provide authorized visitors, inspectors, etc., with properly fitted respirators, filters and protective clothing etc., as specified.
- 2.3.2. Protective Clothing
- 2.3.2.1. The Contractor shall provide his employees and authorized visitors with the following protective equipment at a minimum:
- 2.3.2.1.1. Full-body coverall;
- 2.3.2.1.2. Head covers or hoods;
- 2.3.2.1.3. Gloves;
- 2.3.2.1.4. 18" high boot-type foot cover or reusable footwear;

2.3.2.1.5. Hard hat (if applicable); and

2.3.2.1.6. Eye protection devices (if applicable).

2.3.2.1.7. The Contractor shall have available for authorized visitors two (2) extra or spare air hoses and connectors or appropriate respirators to allow entry into work area at any time without removing a worker from the work area.

End of Section 2:  
Products of the Technical Specifications



## PART 3 - EXECUTION

### 3.1 PRELIMINARY WORK AREA PREPARATION

- 3.1.1. Post caution signs meeting the specifications of OSHA 29 CFR 1926.62 at any location and approaches to the work area. Signs shall be posted at a distance from the work area to permit an employee to read the sign and take the necessary protective measures to avoid exposure. Additional signs may need to be posted following construction of work place barriers.
- 3.1.2. Verify that the electric power to the work area has been shut down and locked out. Provide temporary power and lighting. Insure safe installation (including ground faulting) of temporary power sources and equipment by compliance with all applicable electrical code requirements and OSHA requirements for temporary electrical systems.
  - 3.1.2.1. The Contractor shall provide temporary power and lighting, where necessary, and ensure safe installation of temporary power sources and equipment per applicable electrical code requirement and OSHA regulations for temporary electrical systems.
  - 3.1.2.2. The Contractor shall provide 24V safety lighting and ground-fault interrupter circuits as power source for electrical systems.
- 3.1.3. Verify that the heating, cooling and air conditioning system (HVAC) components that are in, supply or pass through the work area, have been shut down and locked out or have been equipped with HEPA filters on the intake.
  - 3.1.3.1. The Contractor shall isolate, with duct tape and two (2) layers of 6 mil. plastic sheeting all heating, cooling, and ventilating air systems in the area to prevent contamination and dust dispersal to other areas of the building.
- 3.1.4. The Owner will provide the source of connection to the water system. Contractor shall connect to Owner's water system. 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 pressure encountered. After completion of use, connections and fittings shall be removed without damage or alteration to existing water piping and equipment.
- 3.1.5. The installation of plastic sheeting and wooden barriers must be conducted with great care and should not occur until the negative air filtration machines are in operation.
- 3.1.6. Any lead-containing material dislodged in this installation must be immediately cleaned up with HEPA vacuum equipment and/or wet wiping methods, as appropriate.
- 3.1.7. The clean side of these barriers shall be monitored by the Construction Manager. If at any time airborne concentrations exceed  $30 \mu\text{g}/\text{m}^3$ , the Contractor shall halt all operations and shall be required to completely clean all areas as directed by the Contracting Officer.
- 3.1.8. The Construction Manager shall monitor lead concentrations in surface dust outside the Work Area. Soil lead concentrations may be monitored as applicable for exterior Work Areas. The Contractor shall maintain lead concentrations at lowest possible levels, not to exceed the current EPA guidelines. If EPA guideline levels are exceeded, stop all lead work and institute corrective actions. The Contractor shall clear the contaminated area and the Licensed Lead Risk Assessor will visually inspect the area and collect clearance samples. The clearance samples shall be at the Contractors expense.

### 3.2 WORK AREA ISOLATION

3.2.1. Containment Area

3.2.1.1. Renovation is to take place under containment with negative pressure operating continuously and with full worker and equipment decontamination systems set up contiguous to the work area.

3.2.1.2. The Contractor shall seal off all openings, including but not limited to corridors, doorways, elevator doors, skylights, ducts, grills, diffusers and any other penetrations of the work area, with two (2) layers of 6 mil. plastic sheeting and tape. These enclosures of the work areas are defined herein as critical barriers.

3.2.1.3. Sealing Doorways and Corridors

3.2.1.3.1. A barrier shall be constructed, by the Contractor, between the work area and any doorway leading to an occupied area.

3.2.1.3.2. This barrier shall consist of first closing any existing doors and taping all seams on both sides.

3.2.1.3.3. Two (2) layers of 6 mil plastic sheeting shall then be applied and taped over the entire door structure on the work area side, as well as two (2) layers of 6 mil of plastic sheeting on the clean side.

3.2.1.3.4. Warning signs, as specified, shall be displayed on the clean side.

3.2.1.3.5. Two (2) layers shall be applied to the floor. These layers shall be applied in such a manner as to remove the top layer and separate it without causing any disturbance to the bottom layer.

3.2.1.4. The Contractor may need use additional layers to protect surfaces not scheduled for renovation from damage, especially water damage.

3.2.1.5. All objects that cannot be removed from the work area shall be sealed with 2 layers of 6 mil polyethylene sheeting to ensure a leak proof isolation barrier surrounding the object.

3.2.1.6. Disassemble all removable items from the work area, such as, but not limited to; lights, grills, registers, etc. Thoroughly decontaminate through HEPA vacuum equipment and/or wet wiping techniques, as appropriate, all casings, lighting fixtures, and other removable. Any items that are not to return to the space shall be disposed of as lead waste.

3.2.2. Mini-Enclosure

3.2.2.1. The Contractor shall seal off all openings, including but not limited to corridors, doorways, elevator doors, skylights, ducts, grills, diffusers and any other penetrations of the work area, with two (2) layers of 6 mil. plastic sheeting and tape.

3.2.2.2. Isolation shall be done by sealing the entire work area with two (2) layers of 6 mil polyethylene sheeting. Two (2) layers shall be applied to all the walls and the floor.

3.3 WORKER DECONTAMINATION SYSTEM

3.3.1. The Contractor shall construct a Worker Decontamination System consisting of at least three chambers as follows:

3.3.1.1. An equipment room (or area) with airlocks to the shower room.

- 3.3.1.2. A shower room with two airlocks, one to the equipment room and one to the clean room. The shower room shall consist of at least one shower with hot and cold running water. Careful attention shall be paid to the shower enclosure to ensure against leaks of any kind.
- 3.3.1.2.1. Ensure a supply of soap and shampoo, and bath size disposable towels at all times in the shower room.
- 3.3.1.2.2. The waste water shall be either stored to be removed and disposed of as lead waste or shall be filtered through a 5.0 micron filter to an available and suitable drain.
- 3.3.1.3. The clean room shall have one airlock into the shower room and one entrance/exit to uncontaminated areas of the building. The clean room shall have sufficient space for storage of the workers' street clothes, towels, and other non-contaminated items.
- 3.3.2. The entrance of the clean room must display a sign reading as follows:

**DANGER  
LEAD WORK AREA  
MAY DAMAGE FERTILITY OR THE UNBORN CHILD  
CAUSES DAMAGE TO THE CENTRAL NERVOUS SYSTEM  
DO NOT EAT, DRINK OR SMOKE IN THIS AREA**

In addition, where the use of respirators and protective clothing is required in the regulated area under this section, the warning signs shall include the following:

**RESPIRATORS AND PROTECTIVE  
CLOTHING ARE REQUIRED IN THIS AREA**

- 3.3.3. Warning labels shall be in English and be of sufficient size to be clearly legible and display the following:

**DANGER: CLOTHING AND EQUIPMENT CONTAMINATED WITH LEAD. MAY  
DAMAGE FERTILITY OR THE UNBORN CHILD. CAUSES DAMAGE TO THE CENTRAL  
NERVOUS SYSTEM. DO NOT EAT, DRINK OR SMOKE WHEN HANDLING. DO NOT  
REMOVE DUST BY BLOWING OR SHAKING. DISPOSE OF LEAD CONTAMINATED  
WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, OR FEDERAL  
REGULATIONS.**

- 3.3.4. Signs, as such, shall be posted at all entrances to the work area including all sealed and/or locked entrance ways.
- 3.3.5. The floor immediately outside the clean room shall be protected by 6 mil plastic sheeting. The Contractor shall also cover all areas of the unit's floor outside the work area where equipment shall be placed and/or personnel shall travel with 6 mil plastic. This area includes any areas between the entrance to the unit and the work area over which personnel will walk.

#### 3.4 EQUIPMENT DECONTAMINATION SYSTEM

- 3.4.1. The Contractor shall provide or construct a separate Equipment Decontamination System, consisting of two (2) totally enclosed chambers as follows:
  - 3.4.1.1. Washroom: The washroom shall be outfitted with two (2) airlocks, one to the work area, and the other to the holding area.
    - 3.4.1.1.1. Water is to be available in the washroom to wet clean the outside of containers.

- 3.4.1.1.2. The waste water must be filtered through a 5.0 micron filter to an available and suitable drain or be discarded into barrels as lead-contaminated material and disposed of as stated herein.
- 3.4.1.2. Holding room: The holding room consists of a room for storage of clean waste containers. An airlock, to the washroom, must be constructed or provided.
- 3.4.1.3. The entrance to the holding room from the clean side (outside) must be able to be locked and have a sign, as stated in Section 3.3.2, posted at the entrance clearly visible to any approaching person.

### 3.5 INSPECTION OF WORK AREA AND DECONTAMINATION ENCLOSURES

- 3.5.1. Prior to any LBP-containing material being encased, enclosed or removed, the Contractor shall notify the Construction Manager that the decontamination system is completed so that it may be inspected.
- 3.5.2. All plasticizing and sealing of work area, building of worker and equipment decontamination enclosure systems, preparation of the negative air system, and all preparation of equipment required for the project shall be completed prior to notification of the Construction Manager.

### 3.6 MAINTENANCE OF THE WORK AREA AND THE DECONTAMINATION ENCLOSURES

- 3.6.1. The Contractor shall stop and repair any tear or leak discovered, to the satisfaction of the Construction Manager.
- 3.6.2. The Contractor shall visually inspect all enclosures and plastic barriers at the beginning and end of each work period.
- 3.6.3. The Contractor shall provide confirmation as to the security and integrity of the work areas and the uninterrupted operation of the air purifying filtration units during the hours between the lead work shifts.
- 3.6.4. The Contractor shall provide at least one (1) ten (10) lb., ABC Multipurpose fire extinguisher per work area to be present and in operational condition.
- 3.6.5. The Contractor shall ensure that all other preparatory steps have been taken and applicable notices and signs have been posted and all applicable permits obtained prior to the commencement of any lead renovation procedures.

### 3.7 NEGATIVE AIR SYSTEMS

- 3.7.1. The negative air systems for containment areas will be exhausted outside the building, unless otherwise approved by the Construction Manager.

### 3.8 WORKER DECONTAMINATION

- 3.8.1. The Contractor shall supply written decontamination and work procedures, posted in the Clean Room.
- 3.8.2. The Contractor shall supply lockers or other clothing storage equipment for the workers and sufficient space for two (2) authorized visitors.
- 3.8.3. Entering the Work Area

- 3.8.3.1. Personnel shall remove all clothes and put on protective disposable coveralls.
- 3.8.3.2. Personnel shall put on clean respirators.
- 3.8.3.3. Personnel shall now enter the work area.
- 3.8.3.4. No clothing, other than disposable coveralls, shall be worn into the work area and subsequently be removed from the work area (i.e., all clothing worn into the work area shall be treated as lead waste).
- 3.8.4. Decontamination Procedures
  - 3.8.4.1. Each worker or visitor shall, each time he/she leaves the work area:
    - 3.8.4.1.1. Remove gross contamination from clothing before leaving the work area.
    - 3.8.4.1.2. Proceed to the Equipment Room and remove all protective clothing EXCEPT RESPIRATORS.
    - 3.8.4.1.3. While still wearing the respirator, proceed naked to the shower room.
    - 3.8.4.1.4. Clean the outside of the respirator with soap and water while showering.
    - 3.8.4.1.5. Finally, after thorough cleaning, remove the respirator.
    - 3.8.4.1.6. Thoroughly shampoo and wash themselves.
    - 3.8.4.1.7. If applicable, remove the filters from the respirators, wet them and dispose of the filters in the container provided by the Contractor for that purpose.
    - 3.8.4.1.8. Wash and rinse the inside of the respirator.
    - 3.8.4.1.9. Following showering and drying off, each worker or visitor shall proceed directly to the clean change room and dress.
- 3.8.5. Workers shall not eat, drink, smoke, or chew gum or tobacco in the work area.
- 3.8.6. Workers shall be fully protected with respirators and protective clothing immediately prior to the first disturbance of lead-containing or contaminated materials and until final clean-up is completed.
- 3.9. REMOVAL / RENOVATION METHODS
  - 3.9.1. Paint removal by power sanding of surfaces, abrasive blasting, or open flame will not be permitted on this Project. Remove the entire painted building component or remove paint within areas designated by the (OWNER) and their representatives in order to completely expose the substrate. Take whatever precautions are necessary to minimize damage to the underlying substrate.
    - 3.9.1.1. The Contractor shall protect adjacent areas and surfaces from damage during the course of Work. Damages to non-protected adjacent areas from the work shall be repaired at the Contractor's expense.
    - 3.9.1.2. The Contractor shall coordinate all demolition and renovation work with the General Construction, Plumbing Construction and Electrical Construction Prime Contractors.

- 3.9.1.3. The Contractor shall be responsible for review and understanding of all project contract drawings
- 3.9.2. Encapsulation or Paint Stabilization
  - 3.9.2.1. For designated components (walls and remaining ceilings) to receive encapsulation or paint stabilization treatments prior to repainting prepare the surface in accordance with the following procedures.
  - 3.9.2.2. Remove loose, flaking, peeling, and deteriorated paint by wet scraping or wet sanding. Continually mist surface with water during scraping. Feather edges lightly. Keep surface wet while sanding. Do not remove paint by burning or torching, power sanding without HEPA attachments, or abrasive blasting, or hydroblasting or high-pressure wash that is not contained, or use of heat guns above 1,100 °F.
  - 3.9.2.3. Remove loose, unsound, or deteriorated substrates. Place in 6 mil polyethylene disposal bag and dispose of in accordance with Section 3.4, Cleanup and Disposal.
  - 3.9.2.4. HEPA vacuum and wet wipe to remove all paint chips, debris, and dust generated during the work. Do not allow dust or debris to accumulate.
  - 3.9.2.5. Clean surfaces prior to encapsulating or repainting. Remove all dust and chips by HEPA vacuuming surface after drying.
  - 3.9.2.6. Chemically treat surface if necessary for good encapsulant/paint adhesion. Follow manufacturer's printed instructions for system used. Surface gloss should be eliminated by chemical etching or HEPA vacuum-assisted sanding.
  - 3.9.2.7. Test surface for pH. Place LITMUS paper on wet surface. Surface pH should be between 6-8. Re-rinse surfaces that do not meet pH requirements with clear water or weak acid solution.
  - 3.9.2.8. Remove oils, waxes, and mold. Remove mold with a 1% to 10% bleach solution. Provide appropriate eye, skin, and respiratory protection during mold decontamination procedures. Remove waxes with ammonia and water. Degrease surfaces with suitable cleaner. Rinse thoroughly following cleaner.
- 3.9.3. Building Component Demolition and Removal
  - 3.9.3.1. For designated components follow the following building component demolition procedures. Building component demolition is defined as the removal of staircase, holding cell, remaining cell components on the second floor (including cell structural members, cell ceilings and cell floor runners), metal ceiling on the second floor, all visible piping and electrical conduit, and other building items that contain lead-based paint. (See Attachment 1 – Known Lead Based Paint)
    - 3.9.3.1.1. The Contractor (RRP Firm) shall engage a Pennsylvania registered Professional Engineer to prepare a demolition plan for the removal of the metal ceiling on the second floor. The plan shall include the detail shop drawings indicating the required temporary support system and the metal ceiling demolition/removal sequence. The shop drawings and any other data shall be signed and sealed by the Pennsylvania registered structural engineer and submitted to the Building Owner.
    - 3.9.3.2. Doors will be installed by others. As directed by the Owner or Owner's representative, secure entry door openings with plywood and poly to create a weather-tight seal.

- 3.9.3.3. Prepare the worksite in accordance with these specifications.
- 3.9.3.4. Using a garden sprayer or atomizer, lightly mist the component to be removed with water to help minimize dust generation during the removal process. Before applying the water, be sure there are no electrical circuits inside the component. Disconnect any electrical circuits prior to removal. Do not mist electrical components.
- 3.9.3.5. Carefully score all affected painted seams with a utility knife or other sharp instrument. This will minimize paint chipping and dust generation during removal.
- 3.9.3.6. Remove any screws or other fasteners. Carefully pry the affected building component away from the surface to which it is attached. Use a pry point pad to minimize damage to adjoining surfaces.
- 3.9.3.7. Remove ceramic wall tiles in an intact state. Mist with water during removal. Pry or remove tiles from the wall in such a way to minimize breaking the tiles.
- 3.9.3.8. Use HEPA vacuum to immediately begin dust removal underneath or behind the component being removed.
- 3.9.3.9. Carefully remove or bend back all nails and wrap the component in 6-mil poly and seal with duct tape and dispose of in accordance with waste disposal section of this specification.
- 3.9.3.10. Any deviation from the above procedures shall be outlined in the Contractor's lead-containing paint removal plan and approved by the Engineer.
- 3.10 WASTE REMOVAL THROUGH THE EQUIPMENT DECONTAMINATION ENCLOSURE SYSTEM
  - 3.10.1. The plastic bags shall be sealed by the Contractor in the work area. Ridged containers can be used for disposal.
  - 3.10.2. The Contractor shall place caution labels on the containers in accordance with Regulations. These labels shall be clearly visible.
  - 3.10.3. The external surfaces of the containers shall be thoroughly cleaned of gross contamination in the work area before they are placed into the equipment decontamination enclosure system.
  - 3.10.4. The containers shall then be moved to the washroom. The Contractor shall wet clean each container thoroughly.
  - 3.10.5. Upon completion of the wet cleaning process, each container shall be moved to the holding area pending removal to uncontaminated areas. At this point the Contractors shall be placed in another clean container or disposal bag with proper labels.
  - 3.10.6. The Contractor shall ensure that the containers are removed from the holding area by workers who have entered from the uncontaminated side of the equipment decontamination enclosure system.
  - 3.10.7. These workers shall be protected as described in Section 2.3.
  - 3.10.8. The Contractor shall ensure that workers do not enter the uncontaminated areas through the washroom or the holding area.
  - 3.10.9. The Contractor shall ensure that workers do not exit from the work area through the equipment

decontamination enclosure system.

- 3.10.10. Workers who only move drums from the holding area to uncontaminated areas (trailers, trucks, etc.) may utilize half-face, dual-cartridge type respirators and must be outfitted with proper protection clothing.

3.11 CLEAN UP SEQUENCE

3.11.1. Gross Clean Up

- 3.11.1.1. The Contractor shall remove any remaining accumulation of visible LBP-containing material, including debris and dust, from all surfaces and plastic sheeting.

- 3.11.1.2. The removal of containers, materials, and equipment no longer needed is required. This shall take place via the equipment decontamination enclosure systems and performed as described herein.

- 3.11.1.3. The Contractor shall HEPA vacuum and wet mopping the area with high phosphate (5-10% trisodium phosphate) wash all surfaces in the work area and in contaminated areas.

- 3.11.1.4. After thorough cleaning, Contractor shall then remove first layer of plastic sheeting from walls and floors by folding it inward trapping any debris.

- 3.11.1.5. The decontamination chamber shall remain in place during the gross clean-up sequence.

- 3.11.1.6. Gross clean-up shall be performed using proper respiratory protection as described herein, disposable coveralls, and decontamination procedures.

- 3.11.1.7. The Contractor, upon completion of the gross cleaning process, shall notify the Construction Manager for inspection.

- 3.11.1.8. The Contractor shall provide, if necessary, rolling scaffolding and/or other access equipment for the complete inspection of the work site.

- 3.11.1.9. The Contractor shall provide temporary lighting to properly illuminate the surfaces for inspection.

- 3.11.1.10. The Contractor shall be put on notice that the Construction Manger inspection(s) does not relieve the Contractor of his responsibility to remove the LBP-containing material from all surfaces, and to provide surfaces free of dust, dirt, and debris.

3.11.2. Final Cleaning

- 3.11.2.1. Final wet cleaning and HEPA vacuuming of surfaces should be performed by Contractor.

- 3.11.2.2. Final clean-up should be performed using proper respiratory protection as described herein, disposable coveralls, and decontamination procedures.

- 3.11.2.3. Only after the work area has passed the visual inspection, shall the final clearance air sampling be performed.

3.11.3. Final Inspection of Cleaning

- 3.11.3.1. The Construction Manager will conduct the final inspection of the job site after the last cleaning sequence. All surfaces, pipes, ducts, etc. should be free of any dust, debris, or material



residue.

- 3.11.3.2. The Contractor will be put on notice in the event that LBP-containing materials such as residue, or debris, were not removed during previous work activity. These and all other similar materials shall be removed from the work area using previously specified procedures of plasticizing, decontamination of personnel using showers, respirators, cleaning, encapsulation, and an additional final clearance testing shall be required.
- 3.11.3.3. Should this occur, all extra costs must be paid by the Contractor. The Construction Manager and Owner shall incur no additional costs.
- 3.11.3.4. The extra work required by the Contracting Officer shall be deducted from the Contractor's Contract Sum.

### 3.12 AIR MONITORING

- 3.12.1. The Construction Manager may during construction relative to this contract collect the following samples and minimum volumes each day until completion of scheduled work.

Area Sample Inside Clean Room .....	480 Liters
Area Samples Outside Containment Area .....	480 Liters
Area Sample by Negative Air Exhaust .....	480 Liters
Area Samples Inside the Work Area .....	480 Liters

- 3.12.2. These in-progress air samples will be analyzed using NIOSH Method 7300 or 7082.
- 3.12.3. The final clearance wipe samples shall be analyzed through either SW846-7420 or SW846-6010B at the discretion of the Contracting Officer.
- 3.12.4. Final clearance sampling shall be conducted in each area until the level of final clearance is achieved. The standard for final clearance shall be The EPA/HUD clearance levels for floors, window sills, and exterior rough surfaces are 40, 250, and 400 micrograms per square foot, respectively.
- 3.12.5. Should the Contractor fail the initial final clearance sampling, the area shall be re-cleaned and re-sampled at the expense of the Contractor including time incurred by the Construction Manager and with no increase in the contract time, until the standard of cleaning is achieved.
- 3.12.6. After achieving the Standard of Final Clearance and the work area is free of dust, dirt, and debris, the Contractor shall remove the plastic and tape seals from doors, windows, vents, etc., and all other openings from the work area.
- 3.12.7. The Contractor, at this time, shall remove the decontamination enclosure system.
- 3.12.8. The Contractor shall wet clean and/or HEPA vacuum all surfaces exposed by the removal of the seals and the decontamination Enclosure System.
- 3.12.9. The Contractor shall re-secure all mounted objects previously removed; establish plumbing and electrical systems to their previous working order.
- 3.12.10. Any damage caused by the Contractor shall be repaired to its previous state.

### 3.13 TESTING OF LEAD-CONTAINING PAINT RESIDUE

- 3.13.1. All waste generated by lead paint removal operations is considered hazardous waste and

shall be stored, transported, and disposed of as such. The Contractor shall have the option of testing lead-containing paint residue, at his own expense, in accordance with 40 CFR 261 for hazardous waste and establish disposal requirements for the waste materials.

- 3.13.2. Testing of lead-based paint renovation waste materials shall be by the use of EP Toxicity test or the Toxicity Characteristic Leachate Procedure (TCLP) in accordance with 40 CFR 261. All samples must be collected in the presence of and approved by the Construction Manager prior to submission to the testing laboratory. The limit of lead is 5 parts per million (ppm) in the TCLP extract. All samples must be representative of the waste stream and shall include such items as: paint chips, waste water, and dust from HEPA filters, components removed from building, plastic sheeting, solvents and caustics used for stripping, liquid waste, rags, sponges, mops, filters, cartridges and disposable Work clothes.

### 3.14 DISPOSAL OF LEAD WASTE

- 3.14.1. Collect lead-contaminated waste, scrap, debris, bags containers, equipment, and lead-contaminated clothing which may produce airborne concentrations of lead particles. Label the containers in accordance with 29 CFR 1926.62. Dispose of lead-contaminated waste material at an EPA approved hazardous waste treatment, storage, or disposal facility off Government property.
- 3.14.2. Store waste materials in U.S. Department of Transportation (49 CFR 187) approved 55-gallon drums. Properly label each drum to identify the type of waste (49 CFR 172) and the date the drum was filled. The Construction Manager or an authorized representative will assign an area for interim storage of waste-containing drums. Do not store hazardous waste drums in interim storage longer than 90 calendar days from the date affixed to each drum.
- 3.14.3. Handle, store, transport, and dispose lead or lead-contaminated waste in accordance with 40 CFR 260, 20 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, and 40 CFR 265. Comply with land disposal restriction notification requirements as required by 40 CFR 268.
- 3.14.4. Store and transport all regular construction waste in 40 cubic yard dumpster(s). The dumpster shall be covered at the end of each Work shift to prevent debris from blowing from the dumpster. Space for this dumpster shall be provided by the Owner.
- 3.14.5. Submit written evidence that the hazardous waste treatment, storage, or disposal facility (TSD) is approved for lead disposal by the EPA and state or local regulatory agencies. Submit one copy of the completed manifest, signed and dated by the initial transporter in accordance with 40 CFR 262.

### 3.15 TEMPORARY STORAGE

- 3.15.1. If temporary storage at the job site is to occur, the area must be secured from entrance by unprotected persons.
- 3.15.2. Temporary storage off the job site is not permissible.
- 3.15.3. Ownership of lead waste shall pass from the Owner to the Contractor once waste is placed in proper bags and/or containers. Contractor shall assume all responsibilities relating thereto.

### 3.16 FINAL CLOSING PAPERS (Coordinate with Section pertaining to Notices and Submittals)

- 3.16.1. The Contractor shall submit notarized certification listing additional employees who were not employed when the first certifications were submitted regarding instructions, hazards, respirators, etc.

- 3.16.2. The Contractor shall provide the Construction Manager with a Certificate of Employees' Release for the additional employees who have not provided specified certificate.
- 3.16.3. The Contractor shall provide the Construction Manager receipts from the landfill operator which acknowledges the Contractor's delivery(s) of lead waste material.
- 3.16.4. The Contractor, at this time, shall submit the Final Application for Payment, Contractor's Affidavit of Payments of Debts and Claims (AIA Form G706) and Contractor's Affidavit of Release of Liens (AIA Form G706A).

End of Section 3:  
Execution of the Technical Specifications for Lead Renovation

ATTACHMENT 1  
KNOWN LEAD-BASED PAINT

Reading No	Component	Substrate	Side	Condition	Color	Floor	Room	Unit #	Results	Depth Index	Action Level	PbC	Units
2	Wall	Plaster	B	Intact	Beige	2nd	Kitchen	1201K	Positive	10	1	1.40	mg/cm <sup>2</sup>
4	Wall	Plaster	D	Intact	Beige	2nd	Kitchen	1201K	Positive	10	1	1.30	mg/cm <sup>2</sup>
5	Window Sill	Metal	A	Intact	Beige	2nd	Kitchen	1201K	Positive	10	1	1.30	mg/cm <sup>2</sup>
6	Door	Metal	A	Intact	Beige	2nd	Kitchen	1201K	Positive	1	1	1.20	mg/cm <sup>2</sup>
10	Baseboard	Metal	A	Intact	Beige	2nd	Kitchen	1201K	Positive	10	1	5.30	mg/cm <sup>2</sup>
26	Wall	Plaster	A	Intact	Beige	2nd	Bathroom	1201K	Positive	9.97	1	1.10	mg/cm <sup>2</sup>
27	Wall	Plaster	B	Intact	Beige	2nd	Bathroom	1201K	Positive	10	1	1.00	mg/cm <sup>2</sup>
28	Wall	Plaster	C	Intact	Beige	2nd	Bathroom	1201K	Positive	10	1	1.00	mg/cm <sup>2</sup>
36	Wall	Plaster	A	Intact	Beige	2nd	Bedroom 1	1201K	Positive	3.95	1	1.40	mg/cm <sup>2</sup>
41	Window Sill	Metal	B	Intact	Beige	2nd	Bedroom 1	1201K	Positive	10	1	1.20	mg/cm <sup>2</sup>
46	Wall	Plaster	A	Intact	Beige	2nd	Bedroom 2	1201K	Positive	9.6	1	1.00	mg/cm <sup>2</sup>
66	Ceiling	Concrete	B	Intact	Beige	1st	Kitchen	1207L	Positive	6.13	1	1.30	mg/cm <sup>2</sup>
73	Window Sill	Metal	B	Intact	Beige	1st	Living Room	1207L	Positive	10	1	1.90	mg/cm <sup>2</sup>
79	Baseboard	Metal	A	Intact	Beige	1st	Living Room	1207L	Positive	10	1	4.30	mg/cm <sup>2</sup>
88	Window Sill	Metal	B	Intact	Beige	2nd	Bedroom 1	1207L	Positive	5.78	1	1.50	mg/cm <sup>2</sup>
98	Window Sill	Metal	B	Intact	Beige	2nd	Bedroom 2	1207L	Positive	10	1	1.70	mg/cm <sup>2</sup>
117	Ceiling	Concrete	B	Intact	Beige	1st	Kitchen	1205L	Positive	5.17	1	1.30	mg/cm <sup>2</sup>
118	Wall	Plaster	A	Intact	Beige	1st	Living Room	1205L	Positive	10	1	1.30	mg/cm <sup>2</sup>
119	Wall	Plaster	B	Intact	Beige	1st	Living Room	1205L	Positive	10	1	1.30	mg/cm <sup>2</sup>
120	Wall	Plaster	C	Intact	Beige	1st	Living Room	1205L	Positive	9.43	1	1.30	mg/cm <sup>2</sup>
121	Wall	Plaster	D	Intact	Beige	1st	Living Room	1205L	Positive	6.85	1	1.30	mg/cm <sup>2</sup>
129	Baseboard	Metal	C	Intact	Beige	1st	Living Room	1205L	Positive	10	1	4.60	mg/cm <sup>2</sup>
133	Wall	Plaster	B	Intact	Beige	2nd	Bedroom 1	1205L	Positive	9.06	1	1.20	mg/cm <sup>2</sup>
134	Wall	Plaster	C	Intact	Beige	2nd	Bedroom 1	1205L	Positive	8.75	1	1.00	mg/cm <sup>2</sup>
148	Ceiling	Concrete	A	Intact	Beige	2nd	Bedroom 2	1205L	Positive	6	1	1.30	mg/cm <sup>2</sup>
156	Window Sill	Metal	C	Intact	Beige	2nd	Bathroom	1205L	Positive	10	1	1.70	mg/cm <sup>2</sup>

Reading No	Component	Substrate	Side	Condition	Color	Floor	Room	Unit #	Results	Depth Index	Action Level	PbC	Units
161	Wall	Plaster	A	Intact	Beige	1st	Kitchen	1205L	Positive	6.82	1	1.30	mg/cm <sup>2</sup>
162	Wall	Plaster	B	Intact	Beige	1st	Kitchen	1203L	Positive	10	1	1.10	mg/cm <sup>2</sup>
163	Wall	Plaster	C	Intact	Beige	1st	Kitchen	1203L	Positive	10	1	1.30	mg/cm <sup>2</sup>
164	Wall	Plaster	D	Intact	Beige	1st	Kitchen	1203L	Positive	10	1	1.50	mg/cm <sup>2</sup>
168	Window Sill	Metal	C	Intact	Beige	1st	Kitchen	1203L	Positive	10	1	3.20	mg/cm <sup>2</sup>
169	Ceiling	Concrete	B	Intact	Beige	1st	Kitchen	1203L	Positive	10	1	1.20	mg/cm <sup>2</sup>
170	Wall	Plaster	A	Intact	Beige	1st	Living Room	1203L	Positive	10	1	1.00	mg/cm <sup>2</sup>
172	Wall	Plaster	C	Intact	Beige	1st	Living Room	1203L	Positive	8.87	1	1.30	mg/cm <sup>2</sup>
178	Wall	Plaster	B	Intact	Beige	1st	Bedroom 1	1203L	Positive	5.36	1	1.20	mg/cm <sup>2</sup>
179	Wall	Plaster	C	Intact	Beige	1st	Bedroom 1	1203L	Positive	8.89	1	1.30	mg/cm <sup>2</sup>
182	Door Casing	Metal	B	Intact	Beige	1st	Bedroom 1	1203L	Negative	5.62	1	1.30	mg/cm <sup>2</sup>
184	Wall	Plaster	A	Intact	Beige	1st	Bedroom 2	1203L	Positive	10	1	1.30	mg/cm <sup>2</sup>
187	Wall	Plaster	D	Intact	Beige	1st	Bedroom 2	1203L	Positive	10	1	1.10	mg/cm <sup>2</sup>
192	Wall	Plaster	B	Intact	Beige	1st	Bathroom	1203L	Positive	10	1	1.50	mg/cm <sup>2</sup>
193	Wall	Plaster	C	Intact	Beige	1st	Bathroom	1203L	Positive	10	1	1.70	mg/cm <sup>2</sup>
194	Wall	Plaster	D	Intact	Beige	1st	Bathroom	1203L	Positive	10	1	1.40	mg/cm <sup>2</sup>
200	Ceiling	Concrete	B	Intact	Beige	1st	Bathroom	1203L	Positive	10	1	1.70	mg/cm <sup>2</sup>
201	Wall	Plaster	A	Intact	Beige	1st	Kitchen	1209L	Positive	10	1	1.10	mg/cm <sup>2</sup>
202	Wall	Plaster	B	Intact	Beige	1st	Kitchen	1209L	Positive	9.86	1	1.10	mg/cm <sup>2</sup>
208	Window Sill	Metal	C	Intact	Beige	1st	Kitchen	1209L	Positive	3.89	1	3.50	mg/cm <sup>2</sup>
218	Window Sill	Metal	B	Intact	Beige	1st	Living Room	1209L	Positive	2.44	1	2.50	mg/cm <sup>2</sup>
221	Baseboard	Metal	C	Intact	Beige	1st	Living Room	1209L	Positive	10	1	4.00	mg/cm <sup>2</sup>
230	Window Sill	Metal	B	Intact	Beige	2nd	Bedroom 1	1209L	Positive	10	1	2.00	mg/cm <sup>2</sup>
236	Window Sill	Metal	C	Intact	Beige	2nd	Bedroom 2	1209L	Negative	7.65	1	4.20	mg/cm <sup>2</sup>
244	Wall	Plaster	A	Intact	Beige	2nd	Bathroom	1209L	Positive	6.37	1	1.30	mg/cm <sup>2</sup>
245	Wall	Plaster	B	Intact	Beige	2nd	Bathroom	1209L	Positive	10	1	1.10	mg/cm <sup>2</sup>

Reading No	Component	Substrate	Side	Condition	Color	Floor	Room	Unit #	Results	Depth Index	Action Level	PbC	Units
257	Wall	Plaster	B	Intact	Beige	1st	Kitchen	1215L	Positive	10	1	1.10	mg/cm <sup>2</sup>
258	Wall	Plaster	C	Intact	Beige	1st	Kitchen	1215L	Positive	10	1	1.20	mg/cm <sup>2</sup>
259	Wall	Plaster	D	Intact	Beige	1st	Kitchen	1215L	Positive	10	1	1.10	mg/cm <sup>2</sup>
263	Window Sill	Metal	D	Intact	Beige	1st	Kitchen	1215L	Positive	10	1	2.30	mg/cm <sup>2</sup>
265	Wall	Plaster	A	Intact	Beige	1st	Living Room	1215L	Positive	10	1	1.20	mg/cm <sup>2</sup>
266	Wall	Plaster	B	Intact	Beige	1st	Living Room	1215L	Positive	10	1	1.00	mg/cm <sup>2</sup>
267	Wall	Plaster	C	Intact	Beige	1st	Living Room	1215L	Positive	10	1	1.10	mg/cm <sup>2</sup>
273	Window Sill	Metal	B	Intact	Beige	1st	Living Room	1215L	Positive	10	1	2.20	mg/cm <sup>2</sup>
276	Baseboard	Metal	A	Intact	Beige	1st	Living Room	1215L	Positive	10	1	4.80	mg/cm <sup>2</sup>
278	Ceiling	Concrete	A	Intact	Beige	1st	Living Room	1215L	Positive	8.13	1	1.30	mg/cm <sup>2</sup>
297	Wall	Plaster	B	Intact	Beige	2nd	Bathroom	1215L	Positive	10	1	1.40	mg/cm <sup>2</sup>
299	Wall	Plaster	D	Intact	Beige	2nd	Bathroom	1215L	Positive	10	1	1.40	mg/cm <sup>2</sup>
304	Radiator	Metal	C	Intact	Beige	2nd	Bathroom	1215L	Positive	10	1	1.00	mg/cm <sup>2</sup>
306	Ceiling	Concrete	C	Intact	Beige	2nd	Bathroom	1215L	Positive	10	1	1.30	mg/cm <sup>2</sup>
307	Wall	Plaster	A	Intact	Beige	1st	Kitchen	1221L	Positive	10	1	1.10	mg/cm <sup>2</sup>
308	Wall	Plaster	B	Intact	Beige	1st	Kitchen	1221L	Positive	10	1	1.20	mg/cm <sup>2</sup>
309	Wall	Plaster	C	Intact	Beige	1st	Kitchen	1221L	Positive	10	1	1.10	mg/cm <sup>2</sup>
310	Wall	Plaster	D	Intact	Beige	1st	Kitchen	1221L	Positive	10	1	1.20	mg/cm <sup>2</sup>
314	Window Sill	Metal	D	Intact	Beige	1st	Kitchen	1221L	Positive	6.08	1	3.20	mg/cm <sup>2</sup>
316	Wall	Plaster	A	Intact	Beige	1st	Living Room	1221L	Positive	10	1	1.20	mg/cm <sup>2</sup>
317	Wall	Plaster	B	Intact	Beige	1st	Living Room	1221L	Positive	9.24	1	1.10	mg/cm <sup>2</sup>
318	Wall	Plaster	C	Intact	Beige	1st	Living Room	1221L	Positive	10	1	1.10	mg/cm <sup>2</sup>
319	Wall	Plaster	D	Intact	Beige	1st	Living Room	1221L	Positive	10	1	1.70	mg/cm <sup>2</sup>
322	Window Sill	Metal	D	Intact	Beige	1st	Living Room	1221L	Positive	10	1	2.40	mg/cm <sup>2</sup>
323	Ceiling	Concrete	B	Intact	Beige	1st	Living Room	1221L	Positive	8.11	1	1.70	mg/cm <sup>2</sup>
325	Wall	Plaster	B	Intact	Beige	1st	Bedroom 1	1221L	Positive	6.14	1	1.50	mg/cm <sup>2</sup>

Reading No	Component	Substrate	Side	Condition	Color	Floor	Room	Unit #	Results	Depth Index	Action Level	PbC	Units
326	Wall	Plaster	C	Intact	Beige	1st	Bedroom 1	1221L	Positive	9.53	1	1.00	mg/cm <sup>2</sup>
330	Window Sill	Metal	D	Intact	Beige	1st	Bedroom 1	1221L	Positive	6.39	1	3.20	mg/cm <sup>2</sup>
334	Wall	Plaster	C	Intact	Beige	1st	Bedroom 2	1221L	Positive	8.77	1	1.20	mg/cm <sup>2</sup>
338	Window Sill	Metal	D	Intact	Beige	1st	Bedroom 2	1221L	Positive	10	1	2.30	mg/cm <sup>2</sup>
341	Wall	Plaster	B	Intact	Beige	1st	Bathroom	1221L	Positive	10	1	1.30	mg/cm <sup>2</sup>
343	Wall	Plaster	D	Intact	Beige	1st	Bathroom	1221L	Positive	10	1	1.50	mg/cm <sup>2</sup>
359	Wall	Plaster	B	Intact	Beige	1st	Kitchen	1219L	Positive	9.49	1	1.20	mg/cm <sup>2</sup>
361	Wall	Plaster	D	Intact	Yellow	1st	Kitchen	1219L	Positive	10	1	1.10	mg/cm <sup>2</sup>
365	Window Sill	Metal	D	Intact	Yellow	1st	Kitchen	1219L	Positive	4.1	1	3.10	mg/cm <sup>2</sup>
375	Window Sill	Metal	B	Intact	Beige	1st	Living Room	1219L	Positive	2.09	1	2.30	mg/cm <sup>2</sup>
378	Baseboard	Metal	A	Intact	Beige	1st	Living Room	1219L	Positive	10	1	3.70	mg/cm <sup>2</sup>
383	Wall	Plaster	D	Intact	Beige	1st	Bedroom 1	1219L	Positive	6.44	1	1.00	mg/cm <sup>2</sup>
386	Window Sill	Metal	B	Intact	Beige	1st	Bedroom 1	1219L	Positive	10	1	1.90	mg/cm <sup>2</sup>
395	Window Sill	Metal	D	Intact	Beige	1st	Bedroom 2	1219L	Positive	7.45	1	3.40	mg/cm <sup>2</sup>
396	Ceiling	Concrete	B	Intact	Beige	1st	Bedroom 2	1219L	Positive	5.15	1	1.10	mg/cm <sup>2</sup>
397	Wall	Plaster	A	Intact	Beige	1st	Bathroom	1219L	Positive	5.52	1	1.40	mg/cm <sup>2</sup>
398	Wall	Plaster	B	Intact	Beige	1st	Bathroom	1219L	Positive	9.65	1	1.30	mg/cm <sup>2</sup>
399	Wall	Plaster	C	Intact	Beige	1st	Bathroom	1219L	Positive	9.26	1	1.40	mg/cm <sup>2</sup>
405	Ceiling	Metal	B	Intact	Beige	1st	Bathroom	1219L	Positive	6.83	1	1.40	mg/cm <sup>2</sup>
409	Wall	Plaster	B	Intact	Beige	1st	Kitchen	1211L	Positive	10	1	2.10	mg/cm <sup>2</sup>
411	Wall	Plaster	D	Intact	Beige	1st	Kitchen	1211L	Positive	9.52	1	1.50	mg/cm <sup>2</sup>
415	Window Sill	Metal	C	Intact	Beige	1st	Kitchen	1211L	Positive	10	1	4.30	mg/cm <sup>2</sup>
416	Ceiling	Concrete	B	Intact	Beige	1st	Kitchen	1211L	Positive	10	1	1.60	mg/cm <sup>2</sup>
417	Wall	Plaster	A	Intact	Beige	1st	Living Room	1211L	Positive	10	1	1.10	mg/cm <sup>2</sup>
425	Window Sill	Metal	B	Intact	Beige	1st	Living Room	1211L	Positive	10	1	1.50	mg/cm <sup>2</sup>
428	Baseboard	Metal	A	Intact	Beige	1st	Living Room	1211L	Positive	10	1	4.00	mg/cm <sup>2</sup>



Reading No	Component	Substrate	Side	Condition	Color	Floor	Room	Unit #	Results	Depth Index	Action Level	PbC	Units
431	Wall	Plaster	A	Intact	Beige	1st	Bedroom 1	1211L	Positive	10	1	1.10	mg/cm <sup>2</sup>
437	Window Sill	Metal	B	Intact	Beige	2nd	Bedroom 1	1211L	Positive	6.28	1	2.40	mg/cm <sup>2</sup>
443	Wall	Plaster	C	Intact	Beige	2nd	Bedroom 2	1211L	Positive	10	1	1.20	mg/cm <sup>2</sup>
447	Window Sill	Metal	D	Intact	Beige	2nd	Bedroom 2	1211L	Positive	10	1	2.70	mg/cm <sup>2</sup>
450	Wall	Plaster	B	Intact	Beige	2nd	Bathroom	1211L	Positive	10	1	1.00	mg/cm <sup>2</sup>
452	Wall	Plaster	D	Intact	Beige	2nd	Bathroom	1211L	Positive	10	1	1.10	mg/cm <sup>2</sup>
456	Window Sill	Metal	D	Intact	Beige	2nd	Bathroom	1211L	Positive	10	1	1.60	mg/cm <sup>2</sup>
457	Ceiling	Concrete	C	Intact	Beige	2nd	Bathroom	1211L	Positive	6.19	1	1.40	mg/cm <sup>2</sup>
465	Window Sill	Metal	D	Intact	Beige	1st	Kitchen	1217L	Positive	6.88	1	2.80	mg/cm <sup>2</sup>
475	Window Sill	Metal	B	Intact	Beige	1st	Living Room	1217L	Positive	10	1	2.10	mg/cm <sup>2</sup>
476	Tread	Concrete	C	Intact	Beige	1st	Living Room	1217L	Positive	4.62	1	1.40	mg/cm <sup>2</sup>
478	Baseboard	Metal	C	Intact	Beige	1st	Living Room	1217L	Positive	10	1	2.90	mg/cm <sup>2</sup>
487	Window Sill	Metal	D	Intact	Beige	2nd	Bedroom 1	1217L	Positive	6.81	1	2.30	mg/cm <sup>2</sup>
488	Ceiling	Concrete	B	Intact	Beige	2nd	Bedroom 1	1217L	Positive	7.38	1	1.40	mg/cm <sup>2</sup>
491	Wall	Plaster	C	Intact	Beige	2nd	Bedroom 2	1217L	Positive	1.77	1	1.50	mg/cm <sup>2</sup>
508	Wall	Plaster	A	Intact	Beige	1st	Kitchen	1205K	Positive	10	1	1.60	mg/cm <sup>2</sup>
509	Wall	Plaster	B	Intact	Beige	1st	Kitchen	1205K	Positive	10	1	2.20	mg/cm <sup>2</sup>
510	Wall	Plaster	C	Intact	Beige	1st	Kitchen	1205K	Positive	1	1	1.90	mg/cm <sup>2</sup>
511	Wall	Plaster	D	Intact	Beige	1st	Kitchen	1205K	Positive	1	1	1.50	mg/cm <sup>2</sup>
515	Window Sill	Metal	C	Intact	Beige	1st	Kitchen	1205K	Positive	10	1	2.70	mg/cm <sup>2</sup>
517	Wall	Plaster	A	Intact	Beige	1st	Living Room	1205K	Positive	10	1	1.10	mg/cm <sup>2</sup>
518	Wall	Plaster	B	Intact	Beige	1st	Living Room	1205K	Positive	10	1	1.40	mg/cm <sup>2</sup>
519	Wall	Plaster	C	Intact	Beige	1st	Living Room	1205K	Positive	6.08	1	1.20	mg/cm <sup>2</sup>
520	Wall	Plaster	D	Intact	Beige	1st	Living Room	1205K	Positive	9.84	1	1.40	mg/cm <sup>2</sup>
525	Window Sill	Metal	B	Intact	Beige	1st	Living Room	1205K	Positive	6.19	1	2.10	mg/cm <sup>2</sup>
527	Baseboard	Metal	C	Intact	Beige	1st	Living Room	1205K	Positive	10	1	3.50	mg/cm <sup>2</sup>

Reading No	Component	Substrate	Side	Condition	Color	Floor	Room	Unit #	Results	Depth Index	Action Level	PbC	Units
530	Ceiling	Concrete	C	Intact	Beige	1st	Living Room	1205K	Negative	5.74	1	1.40	mg/cm <sup>2</sup>
539	Window Sill	Metal	B	Intact	Beige	2nd	Bedroom 1	1205K	Positive	10	1	2.10	mg/cm <sup>2</sup>
541	Wall	Plaster	A	Intact	Beige	2nd	Bedroom 2	1205K	Positive	1.77	1	1.30	mg/cm <sup>2</sup>
547	Window Sill	Metal	D	Intact	Beige	2nd	Bedroom 2	1205K	Positive	10	1	1.40	mg/cm <sup>2</sup>
549	Wall	Plaster	A	Intact	Beige	2nd	Bathroom	1205K	Positive	1	1	1.30	mg/cm <sup>2</sup>
550	Wall	Plaster	B	Intact	Beige	2nd	Bathroom	1205K	Positive	7.43	1	1.20	mg/cm <sup>2</sup>
552	Wall	Plaster	D	Intact	Beige	2nd	Bathroom	1205K	Positive	1.75	1	1.30	mg/cm <sup>2</sup>
556	Window Sill	Metal	D	Intact	Beige	2nd	Bathroom	1205K	Positive	10	1	2.20	mg/cm <sup>2</sup>
557	Ceiling	Concrete	B	Intact	Beige	2nd	Bathroom	1205K	Positive	10	1	2.10	mg/cm <sup>2</sup>
568	Window Sill	Metal	D	Intact	Beige	1st	Kitchen	1207K	Positive	10	1	1.70	mg/cm <sup>2</sup>
578	Window Sill	Metal	B	Intact	Beige	1st	Living Room	1207K	Positive	10	1	1.30	mg/cm <sup>2</sup>
581	Baseboard	Metal	A	Intact	Beige	1st	Living Room	1207K	Positive	10	1	3.90	mg/cm <sup>2</sup>
588	Window Sill	Metal	B	Intact	Beige	2nd	Bedroom 1	1207K	Positive	4.3	1	1.20	mg/cm <sup>2</sup>
606	Window Sill	Metal	D	Intact	Beige	2nd	Bathroom	1207K	Positive	10	1	1.20	mg/cm <sup>2</sup>
617	Window Sill	Metal	D	Intact	Beige	1st	Kitchen	1209K	Positive	3.08	1	1.00	mg/cm <sup>2</sup>
625	Window Sill	Metal	B	Intact	Beige	1st	Living Room	1209K	Positive	10	1	1.10	mg/cm <sup>2</sup>
628	Baseboard	Metal	A	Intact	Beige	1st	Living Room	1209K	Positive	1	1	3.60	mg/cm <sup>2</sup>
639	Window Sill	Metal	B	Intact	Beige	2nd	Bedroom 1	1209K	Positive	10	1	1.30	mg/cm <sup>2</sup>
658	Window Sill	Metal	D	Intact	Beige	2nd	Bathroom	1209K	Positive	10	1	1.90	mg/cm <sup>2</sup>
666	Window Sill	Metal	D	Intact	Beige	1st	Kitchen	1215K	Positive	7.05	1	2.20	mg/cm <sup>2</sup>
680	Baseboard	Metal	A	Intact	Beige	1st	Living Room	1215K	Positive	3.22	1	5.70	mg/cm <sup>2</sup>
689	Window Sill	Wood	B	Intact	Beige	2nd	Bedroom 1	1215K	Positive	1	1	1.50	mg/cm <sup>2</sup>
735	Window Sill	Metal	B	Intact	Beige	1st	Living Room	1219K	Positive	10	1	1.90	mg/cm <sup>2</sup>
738	Baseboard	Metal	A	Intact	Beige	1st	Living Room	1219K	Positive	4.38	1	6.50	mg/cm <sup>2</sup>
749	Window Sill	Metal	B	Intact	Beige	2nd	Bedroom 1	1219K	Positive	6.23	1	2.10	mg/cm <sup>2</sup>
752	Wall	Plaster	B	Intact	Beige	2nd	Bedroom 2	1219K	Positive	10	1	1.13	mg/cm <sup>2</sup>

Reading No	Component	Substrate	Side	Condition	Color	Floor	Room	Unit #	Results	Depth Index	Action Level	PbC	Units
757	Window Sill	Metal	D	Intact	Beige	2nd	Bedroom 2	1219K	Positive	1	1	2.70	mg/cm <sup>2</sup>
766	Window Sill	Metal	D	Intact	Beige	2nd	Bathroom	1219K	Positive	7.89	1	2.20	mg/cm <sup>2</sup>
771	Wall	Plaster	B	Intact	Beige	1st	Kitchen	1221K	Positive	10	1	1.90	mg/cm <sup>2</sup>
773	Wall	Plaster	D	Intact	Beige	1st	Kitchen	1221K	Positive	1	1	1.40	mg/cm <sup>2</sup>
782	Wall	Plaster	D	Intact	Beige	1st	Living Room	1221K	Positive	1	1	1.00	mg/cm <sup>2</sup>
789	Wall	Plaster	A	Intact	Beige	1st	Bedroom 1	1221K	Positive	1	1	1.40	mg/cm <sup>2</sup>
796	Wall	Plaster	A	Intact	Beige	1st	Bedroom 1	1221K	Positive	4.75	1	1.50	mg/cm <sup>2</sup>
804	Wall	Plaster	A	Intact	Beige	1st	Bathroom	1221K	Positive	10	1	1.90	mg/cm <sup>2</sup>
805	Wall	Plaster	B	Intact	Beige	1st	Bathroom	1221K	Positive	1	1	1.40	mg/cm <sup>2</sup>
806	Wall	Plaster	C	Intact	Beige	1st	Bathroom	1221K	Positive	3.09	1	1.70	mg/cm <sup>2</sup>
811	Window Sill	Metal	D	Intact	Beige	1st	Bathroom	1221K	Positive	10	1	1.80	mg/cm <sup>2</sup>
813	Wall	Plaster	A	Intact	Beige	2nd	Kitchen	1222K	Positive	1	1	1.30	mg/cm <sup>2</sup>
814	Wall	Plaster	B	Intact	Beige	2nd	Kitchen	1222K	Positive	9.8	1	1.30	mg/cm <sup>2</sup>
816	Wall	Plaster	D	Intact	Beige	2nd	Kitchen	1222K	Positive	1	1	1.30	mg/cm <sup>2</sup>
826	Wall	Plaster	A	Intact	Beige	2nd	Living Room	1222K	Positive	2.44	1	1.40	mg/cm <sup>2</sup>
829	Wall	Plaster	D	Intact	Beige	2nd	Living Room	1222K	Positive	10	1	1.00	mg/cm <sup>2</sup>
837	Wall	Plaster	D	Intact	Beige	2nd	Bedroom 1	1222K	Positive	5.23	1	1.30	mg/cm <sup>2</sup>
850	Wall	Plaster	A	Intact	Beige	2nd	Bathroom	1222K	Positive	1	1	1.50	mg/cm <sup>2</sup>
851	Wall	Plaster	B	Intact	Beige	2nd	Bathroom	1222K	Positive	10	1	1.30	mg/cm <sup>2</sup>
853	Wall	Plaster	D	Intact	Beige	2nd	Bathroom	1222K	Positive	10	1	1.20	mg/cm <sup>2</sup>
860	Ceiling	Concrete	A	Intact	Beige	2nd	Bathroom	1222K	Positive	10	1	1.30	mg/cm <sup>2</sup>
861	Wall	Plaster	A	Intact	Beige	1st	Kitchen	1203K	Positive	10	1	2.60	mg/cm <sup>2</sup>
862	Wall	Plaster	B	Intact	Beige	1st	Kitchen	1203K	Positive	10	1	3.30	mg/cm <sup>2</sup>
863	Wall	Plaster	C	Intact	Beige	1st	Kitchen	1203K	Positive	1	1	1.70	mg/cm <sup>2</sup>
864	Wall	Plaster	D	Intact	Beige	1st	Kitchen	1203K	Positive	1	1	2.90	mg/cm <sup>2</sup>
867	Window Sill	Metal	D	Intact	Beige	1st	Kitchen	1203K	Positive	10	1	2.30	mg/cm <sup>2</sup>

Reading No	Component	Substrate	Side	Condition	Color	Floor	Room	Unit #	Results	Depth Index	Action Level	PbC	Units
869	Ceiling	Concrete	B	Intact	Beige	1st	Kitchen	1203K	Positive	1.64	1	1.30	mg/cm <sup>2</sup>
879	Wall	Plaster	B	Intact	Beige	2nd	Bedroom 1	1203K	Positive	5.48	1	1.00	mg/cm <sup>2</sup>
889	Wall	Plaster	D	Intact	Beige	2nd	Bedroom 2	1203K	Positive	1	1	1.20	mg/cm <sup>2</sup>
890	Door	Plaster	D	Intact	Beige	2nd	Bedroom 2	1203K	Positive	7.91	1	1.10	mg/cm <sup>2</sup>
895	Wall	Plaster	B	Intact	Beige	2nd	Bathroom	1203K	Positive	10	1	1.10	mg/cm <sup>2</sup>
896	Wall	Plaster	C	Intact	Beige	2nd	Bathroom	1203K	Positive	2.23	1	1.30	mg/cm <sup>2</sup>
897	Wall	Plaster	D	Intact	Beige	2nd	Bathroom	1203K	Positive	3.26	1	1.00	mg/cm <sup>2</sup>
919	Window Sill	Metal	D	Intact	Beige	1st	Kitchen	1205M	Positive	10	1	3.15	mg/cm <sup>2</sup>
930	Window Sill	Metal	B	Intact	Beige	1st	Living Room	1205M	Positive	1.45	1	1.40	mg/cm <sup>2</sup>
932	Baseboard	Metal	C	Intact	Beige	1st	Living Room	1205M	Positive	5.19	1	4.10	mg/cm <sup>2</sup>
943	Window Sill	Metal	B	Intact	Beige	2nd	Bedroom 1	1205M	Positive	4.77	1	1.70	mg/cm <sup>2</sup>
946	Wall	Plaster	B	Intact	Beige	2nd	Bedroom 2	1205M	Positive	10	1	1.30	mg/cm <sup>2</sup>
949	Window Sill	Metal	D	Intact	Beige	2nd	Bedroom 2	1205M	Positive	9.22	1	2.80	mg/cm <sup>2</sup>
953	Wall	Plaster	A	Intact	Beige	2nd	Bathroom	1205M	Positive	4.64	1	1.30	mg/cm <sup>2</sup>
955	Wall	Plaster	C	Intact	Beige	2nd	Bathroom	1205M	Positive	10	1	1.20	mg/cm <sup>2</sup>
960	Window Sill	Metal	D	Intact	Beige	2nd	Bathroom	1205M	Positive	7.04	1	3.30	mg/cm <sup>2</sup>
985	Baseboard	Metal	A	Intact	Beige	1st	Living Room	1207M	Positive	7.05	1	3.70	mg/cm <sup>2</sup>
1006	Wall	Plaster	A	Intact	Yellow	2nd	Bathroom	1207M	Positive	10	1	1.30	mg/cm <sup>2</sup>
1007	Wall	Plaster	B	Intact	Yellow	2nd	Bathroom	1207M	Positive	7.63	1	1.40	mg/cm <sup>2</sup>
1013	Window Sill	Metal	D	Intact	Beige	2nd	Bathroom	1207M	Positive	7.87	1	1.60	mg/cm <sup>2</sup>
1016	Ceiling	Concrete	B	Intact	Beige	2nd	Bathroom	1207M	Positive	3.5	1	1.30	mg/cm <sup>2</sup>
1018	Wall	Plaster	B	Intact	Beige	1st	Kitchen	1209M	Positive	5.09	1	1.40	mg/cm <sup>2</sup>
1024	Window Sill	Metal	D	Intact	Beige	1st	Kitchen	1209M	Positive	10	1	1.60	mg/cm <sup>2</sup>
1027	Wall	Plaster	B	Intact	Beige	1st	Living Room	1209M	Negative	7.41	1	1.40	mg/cm <sup>2</sup>
1034	Window Sill	Metal	B	Intact	Beige	1st	Living Room	1209M	Positive	2.39	1	2.10	mg/cm <sup>2</sup>
1035	Tread	Concrete	C	Intact	Beige	1st	Living Room	1209M	Positive	4.62	1	1.70	mg/cm <sup>2</sup>

Reading No	Component	Substrate	Side	Condition	Color	Floor	Room	Unit #	Results	Depth Index	Action Level	PbC	Units
1046	Window Sill	Metal	B	Intact	Beige	2nd	Bedroom 1	1209M	Positive	6.59	1	1.70	mg/cm <sup>2</sup>
1047	Ceiling	Concrete	D	Intact	Beige	2nd	Bedroom 1	1209M	Positive	6.3	1	1.10	mg/cm <sup>2</sup>
1048	Wall	Plaster	A	Intact	Beige	2nd	Bedroom 2	1209M	Positive	2.38	1	1.40	mg/cm <sup>2</sup>
1050	Wall	Plaster	C	Intact	Beige	2nd	Bedroom 2	1209M	Positive	2.56	1	1.30	mg/cm <sup>2</sup>
1052	Window Sill	Metal	D	Intact	Beige	2nd	Bedroom 2	1209M	Positive	6.32	1	1.90	mg/cm <sup>2</sup>
1055	Ceiling	Concrete	C	Intact	Beige	2nd	Bedroom 2	1209M	Positive	7.96	1	1.00	mg/cm <sup>2</sup>
1059	Wall	Plaster	D	Intact	Beige	2nd	Bathroom	1209M	Positive	10	1	1.30	mg/cm <sup>2</sup>
1060	Window Sill	Metal	D	Intact	Beige	2nd	Bathroom	1209M	Positive	10	1	2.10	mg/cm <sup>2</sup>
1069	Wall	Plaster	B	Intact	Beige	1st	Kitchen	1211M	Positive	7.1	1	1.40	mg/cm <sup>2</sup>
1071	Wall	Plaster	D	Intact	Beige	1st	Kitchen	1211M	Positive	1.79	1	1.20	mg/cm <sup>2</sup>
1074	Window Sill	Metal	D	Intact	Beige	1st	Kitchen	1211M	Positive	1	1	2.30	mg/cm <sup>2</sup>
1076	Ceiling	Concrete	B	Intact	Beige	1st	Kitchen	1211M	Positive	10	1	1.10	mg/cm <sup>2</sup>
1077	Wall	Plaster	A	Intact	Beige	1st	Living Room	1211M	Positive	10	1	1.30	mg/cm <sup>2</sup>
1078	Wall	Plaster	B	Intact	Beige	1st	Living Room	1211M	Positive	10	1	1.40	mg/cm <sup>2</sup>
1079	Wall	Plaster	C	Intact	Beige	1st	Living Room	1211M	Positive	10	1	1.30	mg/cm <sup>2</sup>
1080	Wall	Plaster	D	Intact	Beige	1st	Living Room	1211M	Positive	5.52	1	1.40	mg/cm <sup>2</sup>
1083	Window Sill	Metal	B	Intact	Beige	1st	Living Room	1211M	Positive	1	1	3.20	mg/cm <sup>2</sup>
1086	Tread	Concrete	A	Intact	Beige	1st	Living Room	1211M	Positive	10	1	1.40	mg/cm <sup>2</sup>
1088	Baseboard	Metal	A	Intact	Beige	1st	Living Room	1211M	Positive	3.41	1	2.20	mg/cm <sup>2</sup>
1090	Ceiling	Concrete	A	Intact	Beige	1st	Living Room	1211M	Positive	10	1	1.20	mg/cm <sup>2</sup>
1091	Wall	Plaster	A	Intact	Beige	2nd	Bedroom 1	1211M	Positive	4.4	1	1.10	mg/cm <sup>2</sup>
1097	Window Sill	Metal	B	Intact	Beige	2nd	Bedroom 1	1211M	Positive	4.25	1	2.80	mg/cm <sup>2</sup>
1104	Wall	Plaster	D	Intact	Beige	2nd	Bathroom	1211M	Positive	10	1	1.30	mg/cm <sup>2</sup>
1109	Window Sill	Metal	D	Intact	Beige	2nd	Bathroom	1211M	Positive	10	1	1.60	mg/cm <sup>2</sup>
1110	Ceiling	Concrete	D	Intact	Beige	2nd	Bathroom	1211M	Positive	9.62	1	1.20	mg/cm <sup>2</sup>
1111	Wall	Plaster	A	Intact	Beige	2nd	Bedroom 2	1211M	Positive	10	1	1.20	mg/cm <sup>2</sup>

Reading No	Component	Substrate	Side	Condition	Color	Floor	Room	Unit #	Results	Depth Index	Action Level	PbC	Units
1115	Window Sill	Metal	D	Intact	Beige	2nd	Bedroom 2	1211M	Positive	10	1	3.50	mg/cm <sup>2</sup>
1118	Wall	Plaster	A	Intact	Beige	1st	Kitchen	1213M	Positive	7.42	1	1.40	mg/cm <sup>2</sup>
1119	Wall	Plaster	B	Intact	Beige	1st	Kitchen	1213M	Positive	7.7	1	1.30	mg/cm <sup>2</sup>
1120	Wall	Plaster	C	Intact	Beige	1st	Kitchen	1213M	Positive	6.37	1	1.10	mg/cm <sup>2</sup>
1121	Wall	Plaster	D	Intact	Beige	1st	Kitchen	1213M	Positive	8.38	1	1.30	mg/cm <sup>2</sup>
1123	Window Sill	Metal	D	Intact	Beige	1st	Kitchen	1213M	Positive	10	1	2.70	mg/cm <sup>2</sup>
1129	Wall	Plaster	C	Intact	Beige	1st	Living Room	1213M	Positive	8.68	1	1.20	mg/cm <sup>2</sup>
1130	Wall	Plaster	D	Intact	Beige	1st	Living Room	1213M	Positive	9.72	1	1.30	mg/cm <sup>2</sup>
1133	Window Sill	Metal	B	Intact	Beige	1st	Living Room	1213M	Positive	10	1	2.50	mg/cm <sup>2</sup>
1138	Baseboard	Metal	C	Intact	Beige	1st	Living Room	1213M	Positive	10	1	3.70	mg/cm <sup>2</sup>
1145	Window Sill	Metal	D	Intact	Beige	2nd	Bedroom 1	1213M	Positive	10	1	2.50	mg/cm <sup>2</sup>
1150	Wall	Plaster	B	Intact	Beige	2nd	Bedroom 2	1213M	Positive	10	1	1.20	mg/cm <sup>2</sup>
1152	Wall	Plaster	D	Intact	Beige	2nd	Bedroom 2	1213M	Positive	10	1	1.40	mg/cm <sup>2</sup>
1153	Window Sill	Metal	D	Intact	Beige	2nd	Bedroom 2	1213M	Positive	10	1	3.20	mg/cm <sup>2</sup>
1164	Window Sill	Metal	D	Intact	Beige	2nd	Bathroom	1213M	Positive	10	1	2.50	mg/cm <sup>2</sup>
1168	Wall	Plaster	A	Intact	Beige	1st	Kitchen	1203M	Positive	10	1	1.40	mg/cm <sup>2</sup>
1169	Wall	Plaster	B	Intact	Beige	1st	Kitchen	1203M	Positive	10	1	1.20	mg/cm <sup>2</sup>
1171	Wall	Plaster	D	Intact	Beige	1st	Kitchen	1203M	Positive	10	1	1.40	mg/cm <sup>2</sup>
1176	Ceiling	Concrete	B	Intact	Beige	1st	Kitchen	1203M	Positive	10	1	1.10	mg/cm <sup>2</sup>
1179	Wall	Plaster	C	Intact	Beige	1st	Living Room	1203M	Positive	8.66	1	1.20	mg/cm <sup>2</sup>
1181	Window Sill	Metal	B	Intact	Beige	1st	Living Room	1203M	Positive	10	1	2.20	mg/cm <sup>2</sup>
1191	Window Sill	Metal	B	Intact	Beige	2nd	Bedroom 1	1203M	Positive	6.49	1	1.50	mg/cm <sup>2</sup>
1197	Window Sill	Metal	D	Intact	Beige	2nd	Bedroom 2	1203M	Positive	10	1	2.10	mg/cm <sup>2</sup>
1212	Wall	Plaster	C	Intact	Beige	1st	Kitchen	1203M	Positive	10	1	1.10	mg/cm <sup>2</sup>
1215	Window Sill	Metal	D	Intact	Beige	1st	Kitchen	1203M	Positive	10	1	2.20	mg/cm <sup>2</sup>
1225	Window Sill	Metal	B	Intact	Beige	1st	Living Room	1215M	Positive	10	1	2.90	mg/cm <sup>2</sup>

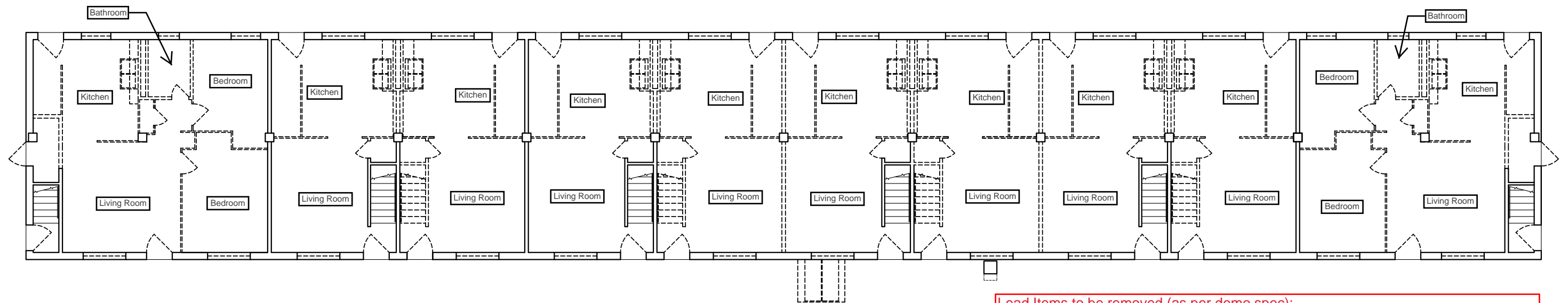
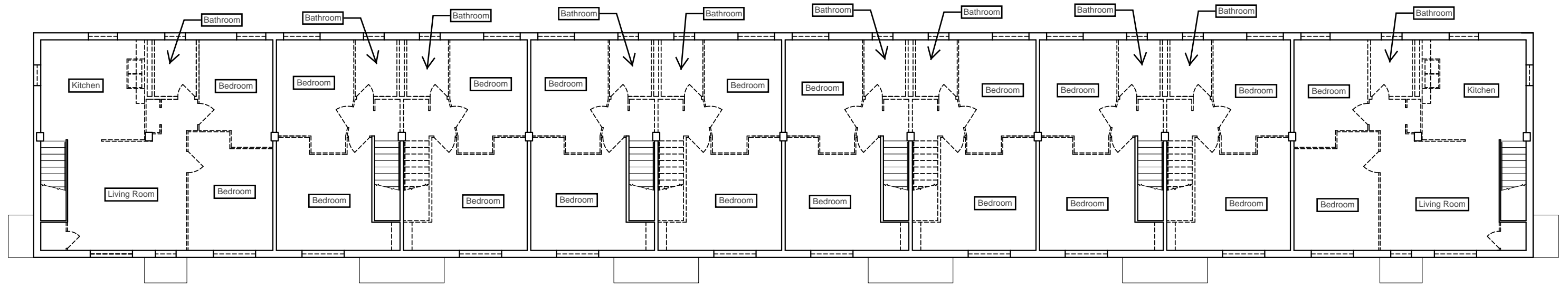
Reading No	Component	Substrate	Side	Condition	Color	Floor	Room	Unit #	Results	Depth Index	Action Level	PbC	Units
1241	Window Sill	Metal	B	Intact	Beige	2nd	Bedroom 1	1215M	Positive	10	1	3.30	mg/cm <sup>2</sup>
1249	Window Sill	Metal	D	Intact	Beige	2nd	Bedroom 2	1215M	Positive	6.52	1	4.90	mg/cm <sup>2</sup>
1252	Wall	Plaster	B	Intact	Beige	2nd	Bathroom	1215M	Positive	1.05	1	1.10	mg/cm <sup>2</sup>
1259	Ceiling	Concrete	C	Intact	Beige	2nd	Bathroom	1215M	Positive	1	1	1.20	mg/cm <sup>2</sup>
1262	Wall	Plaster	A	Intact	Beige	1st	Kitchen	1217M	Positive	7.31	1	1.10	mg/cm <sup>2</sup>
1263	Wall	Plaster	B	Intact	Beige	1st	Kitchen	1217M	Positive	10	1	1.30	mg/cm <sup>2</sup>
1265	Wall	Plaster	D	Intact	Beige	1st	Kitchen	1217M	Positive	10	1	1.50	mg/cm <sup>2</sup>
1266	Cabinet	Wood	B	Intact	Brown	1st	Kitchen	1217M	Positive	9.53	1	1.50	mg/cm <sup>2</sup>
1271	Wall	Plaster	A	Intact	Beige	1st	Living Room	1217M	Positive	10	1	1.20	mg/cm <sup>2</sup>
1277	Window Sill	Metal	B	Intact	Beige	1st	Living Room	1217M	Positive	6.85	1	3.80	mg/cm <sup>2</sup>
1282	Baseboard	Metal	A	Intact	Beige	1st	Living Room	1217M	Positive	4.24	1	3.90	mg/cm <sup>2</sup>
1289	Window Sill	Metal	B	Intact	Beige	2nd	Bedroom 1	1217M	Positive	7.82	1	2.60	mg/cm <sup>2</sup>
1297	Window Sill	Metal	D	Intact	Beige	2nd	Bedroom 2	1217M	Positive	10	1	2.50	mg/cm <sup>2</sup>
1301	Wall	Plaster	A	Intact	Beige	2nd	Bathroom	1217M	Positive	10	1	1.20	mg/cm <sup>2</sup>
1304	Wall	Plaster	D	Intact	Beige	2nd	Bathroom	1217M	Positive	10	1	1.30	mg/cm <sup>2</sup>
1310	Ceiling	Concrete	B	Intact	Beige	2nd	Bathroom	1217M	Positive	7.67	1	1.30	mg/cm <sup>2</sup>
1348	Wall	Plaster	A	Intact	Beige	1st	Bathroom	1221M	Positive	10	1	1.10	mg/cm <sup>2</sup>
1358	Wall	Plaster	B	Intact	Beige	2nd	Kitchen	1222M	Positive	10	1	1.20	mg/cm <sup>2</sup>
1369	Ceiling	Concrete	C	Intact	Beige	2nd	Kitchen	1222M	Positive	10	1	1.10	mg/cm <sup>2</sup>
1378	Wall	Plaster	A	Intact	Beige	2nd	Bedroom 1	1222M	Positive	10	1	1.70	mg/cm <sup>2</sup>
1379	Wall	Plaster	B	Intact	Beige	2nd	Bedroom 1	1222M	Positive	10	1	1.40	mg/cm <sup>2</sup>
1380	Wall	Plaster	C	Intact	Beige	2nd	Bedroom 1	1222M	Positive	9.69	1	1.40	mg/cm <sup>2</sup>
1381	Wall	Plaster	D	Intact	Beige	2nd	Bedroom 1	1222M	Positive	10	1	1.50	mg/cm <sup>2</sup>

ATTACHMENT 2

FLOOR PLANS



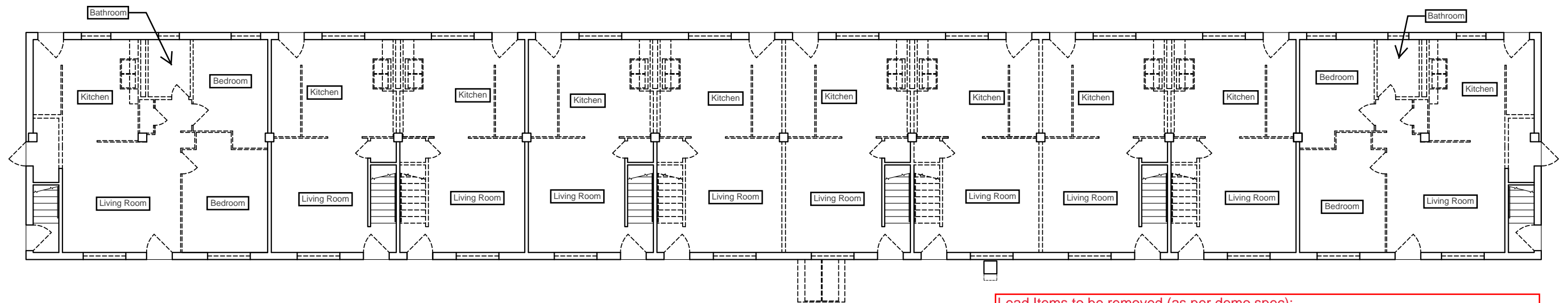
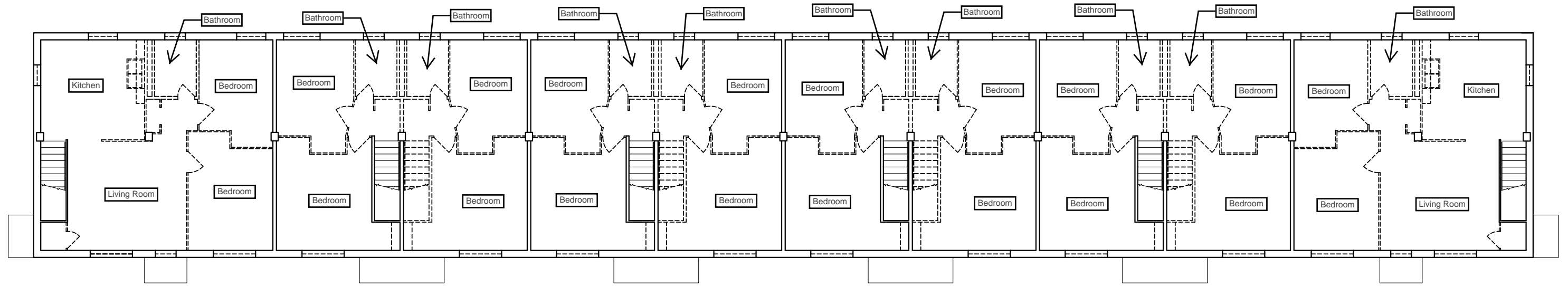
# Building K Lead Demo



**Lead Items to be removed (as per demo spec):**  
**All beige/white painted building components should be considered LBP**

1. Door Components
2. Window Components
3. Closet Components
4. Baseboards
5. Bathroom Chair Rails
6. Walls
7. Ceilings
8. Radiators and Piping

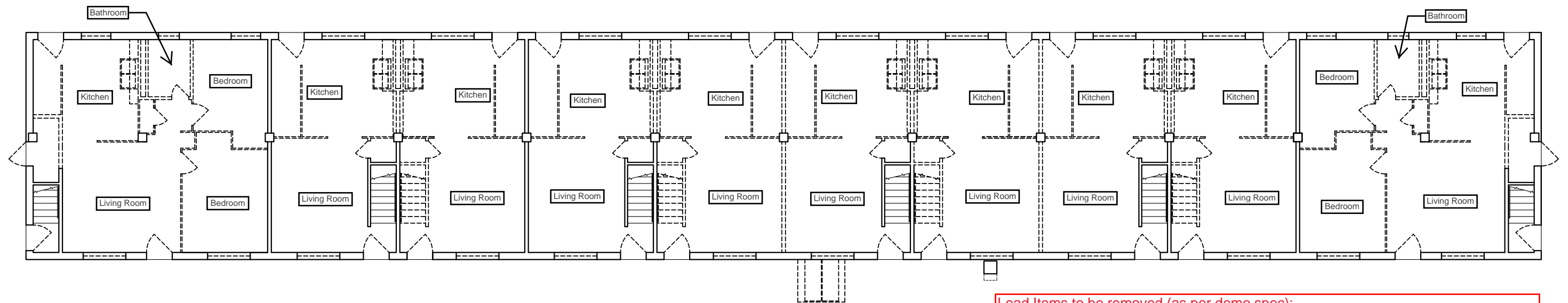
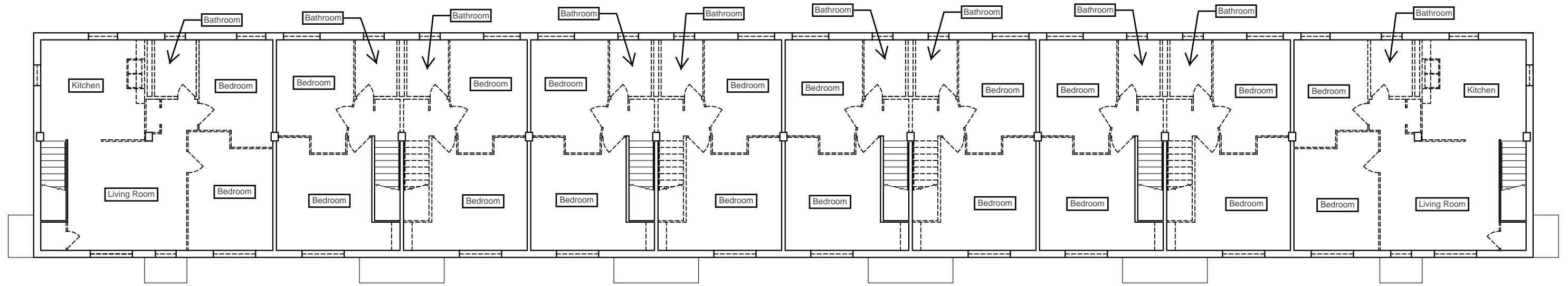
# Building L Lead Demo



**Lead Items to be removed (as per demo spec):**  
**All beige/white painted building components should be considered LBP**

1. Door Components
2. Window Components
3. Closet Components
4. Baseboards
5. Bathroom Chair Rails
6. Walls
7. Ceilings
8. Radiators and Piping

# Building M Lead Demo



**Lead Items to be removed (as per demo spec):**  
**All beige/white painted building components should be considered LBP**

1. Door Components
2. Window Components
3. Closet Components
4. Baseboards
5. Bathroom Chair Rails
6. Walls
7. Ceilings
8. Radiators and Piping