

# PROJECT MANUAL

*for*

MINNEHAHA TOWNHOMES  
5348, 5364 & 5368 RIVER VIEW ROAD  
MINNEAPOLIS, MN 55417

*100% CONSTRUCTION DEVELOPMENT ISSUE*

Issue Date: 21 JUNE 2017  
MS&R Project No. 2016015

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**DOCUMENT 00 00 03 - CERTIFICATION**

**ARCHITECT**

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Architect under the laws of the state of Minnesota.

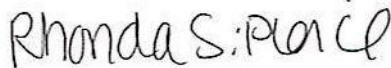


Paul C N Mellblom  
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Date: 21 June 2017

**CIVIL ENGINEER**

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Civil Engineer under the laws of the state of Minnesota.



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**ELECTRICAL ENGINEER**

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Electrical Engineer under the laws of the state of Minnesota.



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Date: 21 June 2017

END OF DOCUMENT



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MATERIALS LIST

Date: 21 June 2017  
 Project Name: Minnehaha Townhomes – 100% CD Issue  
 Project No: 2016015

Division 3 – Concrete

Section	Designator	Material Description / Information
030130	CONC-1	New Concrete Slab on grade
033000	USVR-1	Underslab Vapor Barrier Mfr: Reef Industries Product: Griffolyn Type 105

Division 4 – Masonry

Section	Designator	Material Description / Information
042000	CMU-1	Concrete Masrony Units Location: Foundation walls
044300	BRICK-1	Brick Mfr: Enduramax Location: Building exterior skin
044300	GROUT-1	Grout at BRICK-1 Color: Match architect's sample

Division 6 – Wood, Plastics and Composites

Section	Designator	Material Description / Information
061600	SHTG-1	Floor Sheathing Product: ¾" Plywood
061600	SHTG-2	Plywood Subflooring Product: 23/32" plywood
061600	SHTG-3	Underlayment for Resilient Flooring Product: ¼" Plywood
061600	SHTG-4	Wall Sheathing Product: ¾" AC Finish Plywood
061600	SHTG-5	Roof Sheathing Plywood: ¾" Plywood
064023	PLAM-1	Plastic Laminate Mfr: Formica Color: Graphite Finish: Matte Edge Detail @ Countertop: ¾" Double Waterfall Edge with ¼" Radius Location: Dwelling Unit Kitchen Countertops
064023	SSF-1	Cultured Marble Material Mfr: Leslie Marble Bowl Style: Location: Dwelling Unit Bathroom Lav with integral sink
064023	WD-1	Wood Species: Plain Sawn White Oak Finish: Smooth, STAIN-1 Location: all interior wood stairs, handrails and guardrails

Division 6 – Wood, Plastics and Composites

Section	Designator	Material Description / Information
064023	WD-2	Wood trim Species: Paint grade birch or poplar Finish: Paint Location: door casing, window casing, trim and floor base

Division 7 – Thermal and Moisture Protection

Section	Designator	Material Description / Information
071113	WP-1	Bituminous Waterproofing
072100	INSUL-1	Acoustical Batt Insulation Location: Interior demising walls
072100	INSUL-2	Glass Fiber Batt Insulation Location: Exterior walls See Division 01 Alternates
072100	INSUL-3	Extruded Polystyrene Insulation Location: under slabs and at exterior walls
072100	INSUL-4	One Component Window and Door Spray Foam Insulation Location: Exterior envelope gaps, such as at windows and doors
072100	INSUL-5	Mineral Fiber Batt Insulation Location: Exterior walls See Division 01 Alternates
072100	INSUL-6	Cellulosic-Fiber Loose-Fill Insulation
----	INSUL-7	TPO Roof Insulation See Division 7 "Thermoplastic Polyolefin Roofing"
072500	WRB-1	Weather Resistive Barrier Mfr: DuPont Product: Tyvek CommercialWrap See Division 01 Alternates
072726	AIRB-1	Fluid Applied Air Barrier Mfr: 3M Product: 2085 (Basis of Design) See Division 01 Alternates
073113	SHING-1	Asphalt Shingles Mfr: GAF Product: Timberline Location: sloped roofs except for low slope roofs at screened porches
074600	SIDE-1	Fiber Cement Siding Mfr: James Hardi Color: TBD Location: Exterior walls
074601	TRIM-1	Fiber Cement Soffit and Fascia Panels Mfr: Hardi Location: Roof soffits and Fascia See Alternates 01 23 00
075423	ROOF-1	Thermoplastic Polyolefin Roofing Location: low slop roofs at screened porches
075423	INSUL-7	Polyisocyanurate Board Insulation Location: low slop roofs at screened porches
077100	MTL-1	Gutters and Downspouts
077100	TRIM-2	Aluminium Soffit and Fascia

Division 7 – Thermal and Moisture Protection

Section	Designator	Material Description / Information
		Location: Roof soffits and Fascia See Alternates 01 23 00
079200	SLNT-1 thru SLNT-9	Joint Sealants Locations: See specs for types and uses

Division 8 – Openings (Doors and Windows)

Section	Designator	Material Description / Information
081163	STORM-1	Aluminium Storm Doors Location: Front Entry Door and Screened Porch Door
081416	DR-1	Flush Wood Exterior Solid Core Doors with full light glass panel Species: Paint Grade Finish: Paint Location: Front and Rear Entry Doors
081416	DR-2	Flush Wood Interior Solid Core Doors Species: Paint Grade Finish: Paint Location: All interior doors
083113	ACCESS-1	Flush Wall Access Doors Size: See drawings
083113	ACCESS-2	Flush Ceiling Access Doors Size: See drawings
085313	VWIN-1	Vinyl Windows: Fixed, Awning and Casement Mfr: Pella Product: Series 250 Windows Operation: Fixed, Casement and Awning See Alternates 01 23 00
085414	FGWIN-1	Fiberglass Windows: Fixed, Awning and Casement Mfr: Pella Product: Imperva Windows Operation: Fixed, Casement and Awning See Alternates 01 23 00
088000	GL-1	Low-e, Argon Filled, Insulating Glass Thickness: 1" (nominal) Location: New exterior windows
088000	GL-2	Low-e, Argon Filled, Insulating Tempered Glass Thickness: 1" (nominal) Location: New exterior doors, sidelights, and windows requiring safety glazing

Division 9 – Finishes

Section	Designator	Material Description / Information
092900	GYP-1	Gypsum Board at typical walls Thickness: 5/8 inch Type: non-rated Location: non-rated walls
092900	GYP-2	Gypsum Board at fire rated walls Thickness: 5/8 inch Type: Type X fire-rated Location: fire-rated walls

Division 9 – Finishes

Section	Designator	Material Description / Information
092900	GYP-3	Gypsum Board - Damp Locations Thickness: 5/8 inch Type: moisture and mold resistant Location: non-rated walls
092900	GYP-4	Gypsum Board – Ceilings Thickness: 5/8 inch Type: non-sag, specially manufactured for use at ceilings Location: ceilings
092900	GYP-5	Gypsum Board at fire rated ceilings Thickness: 5/8 inch Type: Type C, non-sag, specially manufactured for use at ceilings Location: fire-rated ceilings
0965 13	RB-1	Resilient Base Location: Bathrooms
0965 16	RSV-1	Resilient Sheet Flooring Location: Bathroom floors
0965 19	RT-1	Resilient Tile Flooring Location All dwelling unit floors except bathroom
0991 13	PT-1	Exterior Paint; Semi-Gloss Finish Location: Siding, soffits and trim
0991 23	PT-2	Interior Paint; Eggshell Finish Location: Interior walls
0991 23	PT-3	Interior Paint; Semi-Gloss Finish Location: Interior wood trim
0991 23	PT-4	Interior Paint; Flat Finish Location: Interior ceilings
	PT Colors:	
	A	Paint Color Mfr: Sherwin Williams Color name/Number: TBD
	B	Paint Color Mfr: Sherwin Williams Color name/Number: TBD
	C	Paint Color Mfr: Sherwin Williams Color name/Number: TBD
099300	STN-1	Interior Wood Stain Mfr: Sherwin Williams Location: Interior wood stair, handrail and guardrail

Division 10 – Specialties

Section	Designator	Material Description / Information
101400	SIGN-1	Dimensional Lettering Copy: street address number Location: On front of each dwelling unit facing the public street and adjacent to the screened porch entry door at the rear of each dwelling unit
102800	TA-02	Toilet Tissue (Roll) Dispenser



Division 10 – Specialties  
 Section Designator

		Material Description / Information
		Location: bathrooms
108000	TA-03	Mirror Location: bathrooms
102800	TA-20	Shower Curtain Rod Dwelling bathrooms
102800	TA-24	Medicine Cabinet Location: bathrooms
102800	TA-26	Towel Bars Location: bathrooms
102800	TA-12	Grab Bar Location: bathrooms at accessible dwelling unit
102800	TA-19	Hook Location: bathrooms
102800	SHELF-1	Wire Coated Metal Closet Shelving Location: bedroom, linen and front entry closets
105500	POST-1	Mailbox Location: Adjacent to each front entry door

Division 11 – Equipment  
 Section Designator

		Material Description / Information
113100	RES-1	Refrigerator with freezer above Location: Kitchen
113100	RES-2	Stacking washer and dryer Location: All dwelling units except accessible dwelling unit
113100	RES-2A	Side by side washer and dryer Location: Accessible dwelling unit
113100	RES-3	Range Location: Kitchen
113100	RES-4	Dishwasher Location: Kitchen
113100	RES-5	Exhaust hood Location: All Kitchens except accessible dwelling unit
113100	RES-7	Exhaust hood Location: Accessible dwelling unit Kitchen
116800	PLAY-1	Playground structure MFR: Rainbow Play Systems

Division 12 – Furnishings  
 Section Designator

		Material Description / Information
122413	BLIND-1	Roller Window Shades Location: At all windows in Dwelling units
123530	CAB-1	Pre-manufactured Cabinets Mfr: Rosebud Location: Kitchen cabinets and Bathroom vanities
123530	PULL-1	Drawer and door pulls
129300	BRACK-1	Bicycle Rack

Division 12 – Furnishings

Section	Designator	Material Description / Information
129300	BRACK-2	Bicycle Lockers

Division 32 – Landscaping

Section	Designator	Material Description / Information
323119	FENCE-1	Playground fence
329300	WEED-1	Weed control barrier Location: under rock splash area
329300	EDGE-1	Weed control barrier edging Location: at rock splash area
329300	ROCK-1	Medium sized gravel fill Location: at rock splash area

**SECTION 00 03 00 – INFORMATION TO BIDDERS**

I.1 GENERAL

I.2 INFORMATION

- A. The following bidding information incorporated in the Project Manual and Drawings is information supplied by the Owner.
- B. Owner has engaged the services of an independent Geotechnical Engineer to report on subsurface conditions to provide design information. This information is included in their report included as an attachment within Division 00.
  - I. Borings: Soil data and logs, which are attached, are for information only.
- C. Owner has engaged the services of an independent hazardous materials investigation agency to perform a Phase I Environmental Site Assessment. This information is included in their report included as an attachment within Division 00.
- D. Data Use Limitations: Because the sub-surface conditions indicated by the borings are a sampling in relation to the entire construction area, and for other reasons, Owner, Architect or firm reporting the sub-surface conditions based on borings, do not warrant the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site.
  - I. Any party using soil information described in this Section shall accept full responsibility for its use and obtaining additional soil information that may be required.
    - a. Extra Payment Limitations: No consideration for extra payment will be given for conditions occurring that could have been anticipated from the soil information. If conditions occur resulting in extra work that could not have been anticipated or reasonably inferred from the soil information, the Conditions of the Contract for changes in the Work shall apply.

**END OF SECTION 00 03 00**

**PHASE I ENVIRONMENTAL  
SITE ASSESSMENT**

**REPORT**



**PROPOSED MINNEHAHA TOWNHOMES  
5348, 5364, 5368 RIVERVIEW ROAD  
& 5118 E. 54TH STREET  
MINNEAPOLIS, MN**

**PROJECT NUMBER: 2016-P0302-0169**

**MARCH 14, 2017**

**THE  
JAVELIN  
GROUP**  
REAL ESTATE DUE DILIGENCE  
CONSULTANTS

**PHASE I  
ENVIRONMENTAL SITE ASSESSMENT  
REPORT**

**SUBJECT PROPERTY**

PROPOSED MINNEHAHA TOWNHOMES  
5348, 5364, 5368 RIVERVIEW ROAD  
& 5118 EAST 54<sup>TH</sup> STREET  
MINNEAPOLIS, MINNESOTA 55415  
JAVELIN PROJECT No. 2016-P0302-0169

**PREPARED FOR**

HENNEPIN COUNTY PUBLIC WORKS  
ENVIRONMENT AND ENERGY DEPARTMENT  
LAND AND WATER, CONTAMINATED LANDS UNIT  
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MINNEAPOLIS, MINNESOTA 55415  
&  
MINNEAPOLIS PUBLIC HOUSING AUTHORITY  
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**PREPARED BY**

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**APRIL 14, 2017**



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## EXECUTIVE SUMMARY



The Javelin Group, Inc. (JAVELIN) was authorized by Hennepin County Public Works to perform a Phase I Environmental Site Assessment (ESA) of the subject property, known as the proposed Minnehaha Townhomes site, located at 5348, 5364, 5368 Riverview Road & 5118 East 54<sup>th</sup> Street in the City of Minneapolis, Hennepin County, Minnesota.

This Phase I Environmental Site Assessment was conducted in general accordance with the requirements of ASTM E 1527-13 “STANDARD PRACTICE FOR ENVIRONMENTAL SITE ASSESSMENTS: PHASE I ENVIRONMENTAL SITE ASSESSMENT PROCESS”. The purpose of this ESA was to qualify for LANDOWNER LIABILITY PROTECTIONS (LLPs) to Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, i.e. Superfund) liability, and to identify any RECOGNIZED ENVIRONMENTAL CONDITIONS (RECs) associated with the subject property. The Phase I ESA is intended to permit a *User* to satisfy one of the requirements to qualify for the innocent landowner, contiguous property owner, or bona fide prospective purchaser limitations on CERCLA liability (hereinafter, the “landowner liability protections” or “LLPs”): that is, the practice that constitutes “all appropriate inquiry into the previous ownership and uses of the property consistent with good commercial or customary practice” as defined at 40 CFR Part 312.

### SUBJECT PROPERTY DESCRIPTION

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The subject property is comprised of the following four (4) vacant parcels:

- ❑ 5348 Riverview Road (PID # 17-028-23-34-0058) 0.54 acres
- ❑ 5364 Riverview Road – (PID # 17-028-23-34-0028) 0.13 acres
- ❑ 5368 Riverview Road – (PID # 17-028-23-34-0056) 0.24 acres
- ❑ 5118 E. 54<sup>th</sup> Street – (PID# 17-028-23-34-0034) 0.13 acres

The four parcels total approximately 1.04 acres. The subject property currently consists of undeveloped relatively level, grass-covered vacant lots. The subject property is currently separated by an asphalt-paved entrance drive and a separate alley that extends from Riverview Road to the southwest-adjacent Riverview Senior Apartments. Other improvements on the subject property include landscaped buffers.

### SUBJECT PROPERTY HISTORY

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Review of historical records identified that since at least 1937 the subject property was developed as single-family homes for Fort Snelling military officers. The homes were subsequently purchased and razed by the MN Department of Transportation (MNDOT) and used as a staging and storage area during the reconstruction and expansion of adjacent Highway 55. Recently over the last decade, the City of Minneapolis has acquired and assembled the development site with property purchased from MNDOT and private property owners. The remaining two (2) residences were demolished in 2015. The proposed Minnehaha Townhomes development will consist of four (4) separate townhome buildings each containing four (4) townhome units.

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## FINDINGS, OPINIONS & CONCLUSIONS

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Javelin has performed a Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM Practice E 1527-13 of the subject property, known as the proposed Minnehaha Townhomes site, located at 5348, 5364, 5368 Riverview Road & 5118 East 54<sup>th</sup> Street in the City of Minneapolis, Hennepin County, Minnesota. Any exceptions to, or deletions from, this practice are described in Section 1.4 of this report.

### **HISTORICAL RECOGNIZED ENVIRONMENTAL CONDITIONS**

The ASTM E1527-13 standard defines the term "Historical Recognized Environmental Conditions (HRECs)" as "a past release of any hazardous substances or petroleum products that has occurred in connection with the property and has been addressed to the satisfaction of the applicable regulatory authority or meeting unrestricted use criteria established by a regulatory authority, without subjecting the property to any required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls)."

- This assessment has revealed no HRECs in connection with the subject property.

### **RECOGNIZED ENVIRONMENTAL CONDITIONS**

The ASTM E1527-13 standard defines the term Recognized Environmental Conditions (RECs) as "the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment."

- This assessment has revealed no evidence of RECs in connection with the subject property.

### **CONTROLLED RECOGNIZED ENVIRONMENTAL CONDITIONS (CRECs)**

The ASTM E1527-13 standard defines the term Controlled Recognized Environmental Conditions (CRECs) as "a recognized environmental condition resulting from a past release of hazardous substances or petroleum products that has been addressed to the satisfaction of the applicable regulatory authority (for example, as evidenced by the issuance of a no further action letter or equivalent, or meeting risk-based criteria established by regulatory authority), with hazardous substances or petroleum products allowed to remain in place subject to the implementation of required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls)." This assessment has identified the following CRECs in connection with the subject property.

- This assessment has revealed no CRECs in connection with the subject property.

### **DE MINIMIS CONDITIONS**

The ASTM E1527-13 standard defines the term *de minimis conditions* as "a condition that generally does not present a threat to human health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies."

- This assessment identified no *de minimis conditions* in connection with the subject property.

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## **ITEMS OF BUSINESS ENVIRONMENTAL RISK**

The ASTM E1527-13 standard defines the term business environmental risk as potential environmental concerns that are not classified as recognized environmental conditions, but may have a material environmental impact on the business associated with the current or planned use of the subject property.

- The following business environmental risk was identified in connection with the subject property:

**Undocumented Fill Soil** – Review of the geotechnical report prepared for the proposed Minnehaha Townhomes redevelopment identified 4.5 to 9.5 feet of undocumented fill in several borings throughout the site. The geotechnical report stated that the undocumented fill is not considered suitable for direct support of the building foundations. The geotechnical report cautions that due to the presence of the undocumented fill soil there is the potential that zones of debris-laded soils may be encountered during redevelopment activities. Review of the boring logs identified no references to encountering buried debris at the soil boring locations. The presence of undocumented fill soil represents the potential for encountering debris and/or contaminated soil during redevelopment activities that may require special handling and disposal.

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## **RECOMMENDATIONS**

Based on the conclusions of this Phase I Environmental Site Assessment, JAVELIN recommends the following:

- Prepare a Construction Contingency Plan that outlines the procedures for the management of impacted soil if encountered during redevelopment activities. Soil testing may be required if export of soil for offsite reuse is planned.

## 1.0 INTRODUCTION



The Javelin Group, Inc. (Javelin) was authorized by Hennepin County Public Works to perform a Phase I Environmental Site Assessment (ESA) of the subject property, known as the proposed Minnehaha Townhomes site, located at 5348, 5364, 5368 Riverview Road & 5118 East 54<sup>th</sup> Street in the City of Minneapolis, Hennepin County, Minnesota. The subject property location is depicted on Figure 1 - Site Location Map in Appendix A of this report.

### 1.1 PURPOSE

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The purpose of this Phase I Environmental Site Assessment (Phase I ESA) is to identify, to the extent feasible, recognized environmental conditions associated with the subject property as defined by the American Society for Testing and Materials (ASTM) Standard Practice E1527-13. The term *recognized environmental conditions* is defined by ASTM “the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment”. *De minimis* conditions are not *recognized environmental conditions*.

ASTM E1527-13 also defines the term *controlled recognized environmental conditions* as “a recognized environmental condition resulting from a past release of hazardous substances or petroleum products that has been addressed to the satisfaction of the applicable regulatory authority (for example, as evidenced by the issuance of a no further action letter or equivalent, or meeting risk-based criteria established by regulatory authority), with hazardous substances or petroleum products allowed to remain in place subject to the implementation of required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls).”

The Phase I ESA is intended to permit a *User* to satisfy one of the requirements to qualify for the innocent landowner, contiguous property owner, or bona fide prospective purchaser limitations on CERCLA liability (hereinafter, the “landowner liability protections” or “LLPs”): that is, the practice that constitutes “all appropriate inquiry into the previous ownership and uses of the property consistent with good commercial or customary practice” as defined at 40 CFR Part 312.

### 1.2 SCOPE OF SERVICES

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This Phase I Environmental Site Assessment was conducted in general accordance with the requirements of ASTM E 1527-13 “STANDARD PRACTICE FOR ENVIRONMENTAL SITE ASSESSMENTS: PHASE I ENVIRONMENTAL SITE ASSESSMENT PROCESS”. The Phase I Environmental Site Assessment for the subject property included the following tasks:

- ❑ Review of federal, state and local regulatory databases to help identify *recognized environmental conditions* associated with the subject property.
- ❑ Review of historic documents including historic aerial photographs, city directories and historic maps, as readily available.
- ❑ Review of municipal records including building permits, fire department records, and other historical records readily available.

- ❑ Site reconnaissance to visually and physically observe the subject property and associated improvements for indications of *recognized environmental conditions*.
- ❑ Interviews with owners and local government officials regarding current and historic uses of the subject property and indications of *recognized environmental conditions*.
- ❑ Preparation of a Phase I Environmental Site Assessment report documenting the findings and presenting opinions and conclusions regarding known or suspect environmental conditions.

### 1.3 LIMITATIONS & ASSUMPTIONS

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The following significant assumptions were relied on for this Phase I Environmental Site Assessment:

- ❑ Groundwater Flow Direction – The direction of groundwater flow in the area of the subject property was inferred based on observations of surface topography, proximity of nearby surface water bodies, and review of geological references. However, site-specific groundwater flow conditions may be impacted by geologic anomalies, utility trenches, nearby wells or sumps, local drainage patterns or other factors.
- ❑ Unidentifiable Conditions – This assessment follows the methodologies set forth in the ASTM Standard E 1527-13 protocol. Information obtained from records reviews, interviews and visual observations is assumed reliable. There is a possibility that even with adherence to these methodologies, unidentifiable conditions may exist on the subject property that could not be identified within the scope of the assessment or that were not reasonably identifiable from readily available information.

### 1.4 DATA GAPS

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ASTM E1527-13 defines a data gap as the “lack of or inability to obtain information required by this practice despite good faith efforts by the environmental professional to gather such information. The following summarizes data gaps, if any, identified during the site assessment:

- ❑ Access Limitations – None
- ❑ Physical Obstructions to Visual Observations – None
- ❑ Limiting Weather Conditions – None
- ❑ Standard Historical Source Data Failure – None
- ❑ Outstanding FOIA Requests – The City of Minneapolis Fire Department has not responded to our FOIA request.

### 1.5 SPECIAL TERMS AND CONDITIONS

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- ❑ Authorization – JAVELIN was authorized by Hennepin County Public Works on January 23, 2017 to perform this Phase I Environmental Site Assessment. This ESA

is being performed as part of the due diligence requirements for the financing of the subject property.

- Right of Entry – Location and site map, right of entry and description of the subject property was provided by Hennepin County Public Works - Brianna Boos.

## 1.6 USER RELIANCE

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This Phase I Environmental Site Assessment was prepared exclusively for the use or benefit of those listed on the Title page of this report. Reliance or use by any other third party without explicit written authorization from JAVELIN will be at the third party's own risk. No warranties or representations, expressed or implied, are made to any such third party.

## 1.7 USER PROVIDED INFORMATION

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As defined by ASTM, the *User* is the party seeking to use ASTM Standard Practice E 1527-13 to complete an environmental site assessment and may include, without limitations, a potential purchaser, tenant, owner, lender, or a property manager. In order to qualify for *landowner liability protections* to CERCLA liability, the "All Appropriate Inquiries" Final Rule (40 CFR Part 312) requires certain tasks outlined below be completed by the *User*. Pursuant to ASTM 1527-13, JAVELIN provided a *User Questionnaire* to assist the *User* in providing information that may be material to identifying *recognized environmental conditions*.

For the purposes of this Phase I Environmental Site Assessment report, the *User* is identified as follows:

- Minneapolis Public Housing Authority – Developer Rights

### 1.7.1 REVIEW TITLE AND JUDICIAL RECORDS FOR ENVIRONMENTAL LIENS AND ACTIVITY AND USE LIMITATIONS (AULS)

In accordance with ASTM E1527-13, JAVELIN requested from the User the results of the review of title and/or judicial records for environmental liens or activity and use restrictions filed or recorded against the subject property.

- At the direction of the client, a title search was not included as part of the scope of services. Unless notified otherwise, we assume that the client is evaluating this information outside the context of this report.

### 1.7.2 ENVIRONMENTAL LIENS AND ACTIVITY AND USE LIMITATIONS (AULS)

In accordance with ASTM E1527-13, JAVELIN requested from the User any knowledge of activity and use limitations that are in place or filed or recorded against the subject property.

- The User was not aware of any environmental liens or activity and use limitations affecting the subject property.

### 1.7.3 SPECIALIZED KNOWLEDGE OR EXPERIENCE OF THE USER

In accordance with ASTM E1527-13, JAVELIN requested from the User any specialized knowledge or experience of the User that is material to RECs associated with the subject property.

- ❑ The User indicated no specialized knowledge or experience regarding environmental conditions with regard to the subject property.

#### **1.7.4 VALUATION REDUCTION FOR ENVIRONMENTAL ISSUES**

In accordance with ASTM E1527-13, JAVELIN requested from the User any knowledge or awareness of information that would indicate any reduction in purchase price or fair market value of the subject property due to environmental contamination.

- ❑ The User indicated they are not aware of property values being reduced due to the presence of environmental contamination.

#### **1.7.5 COMMONLY KNOWN OR REASONABLY ASCERTAINABLE INFORMATION**

In accordance with ASTM E1527-13, JAVELIN requested from the User any commonly known or reasonably ascertainable information within the local community that is material to recognized environmental conditions associated with the subject property.

- ❑ The User was not aware of commonly known or reasonable ascertainable information material to recognized environmental conditions associated with the subject property or nearby properties.

#### **1.7.6 OBVIOUS INDICATORS OF CONTAMINATION**

In accordance with ASTM E1527-13, JAVELIN requested from the User any knowledge or experience related to the subject property that there are obvious indicators that point to the presence of a release.

- ❑ The User is not aware of any obvious indicators that point to the presence of a release.

#### **1.7.7 OWNER, PROPERTY MANAGER, AND OCCUPANT INFORMATION**

The following information was provided to JAVELIN:

- ❑ PROPERTY OWNER: City of Minneapolis
- ❑ KEY SITE MANAGER: City of Minneapolis
- ❑ BUILDING OCCUPANT: Undeveloped



## 2.0 SITE DESCRIPTION



### 2.1 SUBJECT PROPERTY LOCATION AND LEGAL DESCRIPTION

The subject property is located at 5348, 5364, 5368 Riverview Road & 5118 East 54<sup>th</sup> Street in the City of Minneapolis, Hennepin County, Minnesota. The Property Identification Number and legal description for the subject property parcels are as follows:

PROPERTY INFORMATION	
STREET ADDRESS:	5348 Riverview Road, Minneapolis MN
PARCEL IDENTIFICATION NUMBER (PID):	1702823340058
LAND ACREAGE:	0.54 Acres
CURRENT OWNERSHIP:	City of Minneapolis
PARTIAL LEGAL DESCRIPTION:	RASA ADDITION LOT 001, BLOCK 001
STREET ADDRESS:	5364 Riverview Road, Minneapolis MN
PARCEL IDENTIFICATION NUMBER (PID):	1702823340028
LAND ACREAGE:	0.13 Acres
CURRENT OWNERSHIP:	City of Minneapolis
PARTIAL LEGAL DESCRIPTION:	THORPE BROS MINNEHAHA GROVE ADDN LOT 010, BLOCK 002
STREET ADDRESS:	5368 Riverview Road, Minneapolis MN
PARCEL IDENTIFICATION NUMBER (PID):	1702823340056
LAND ACREAGE:	0.24 Acres
CURRENT OWNERSHIP:	City of Minneapolis
PARTIAL LEGAL DESCRIPTION:	THORPE BROS MINNEHAHA ADDN BLOCK 002
STREET ADDRESS:	5118 East 54 <sup>th</sup> Street, Minneapolis MN
PARCEL IDENTIFICATION NUMBER (PID):	1702823340034
LAND ACREAGE:	0.13 Acres
CURRENT OWNERSHIP:	City of Minneapolis
PARTIAL LEGAL DESCRIPTION:	THORPE BROS MINNEHAHA ADDN LOT 016, BLOCK 002

The subject property is located in the SW  $\frac{1}{4}$  of the SE  $\frac{1}{4}$  of the SW  $\frac{1}{4}$  of Section 17 Township 28 North, Range 23 West as depicted on the St. Paul West, MN USGS (1993) 7.5-minute series topographic map provided as Figure 1 - Site Location Map in Appendix A.

### 2.2 SUBJECT PROPERTY AND GENERAL VICINITY CHARACTERISTICS

The subject property is located in an area occupied by residential properties. Local street access to the subject property is provided by Riverview Road adjacent to the northeast. Regional access to the subject property is provided by Highway 55 (Hiawatha Avenue), located 140 feet to the east.

### 2.3 CURRENT USE OF SUBJECT PROPERTY

The subject property is currently vacant.



## 2.4 EXISTING SITE IMPROVEMENTS

The subject property consists of vacant lots with an asphalt-paved alley that extends from Riverview Road to the southwest-adjacent Riverview Senior Apartments. A general site plan of the subject property is provided as Figure 2 in Appendix A of this report.

<b>EXISTING SITE IMPROVEMENTS</b>	
<b>DEVELOPMENT TYPE:</b>	Vacant Lots
<b>NUMBER OF BUILDINGS:</b>	0
<b>NUMBER OF FLOORS</b>	N/A
<b>DATE OF CONSTRUCTION:</b>	N/A
<b>OTHER IMPROVEMENTS:</b>	Paved alley
<b>CURRENT TENANTS:</b>	NA
<b>DOMESTIC WATER SOURCE:</b>	City of Minneapolis
<b>SANITARY SEWER SERVICE:</b>	City of Minneapolis
<b>ELECTRIC SERVICE:</b>	Xcel Energy
<b>NATURAL GAS SERVICE:</b>	CenterPoint Energy

## 2.5 CURRENT USE OF ADJOINING PROPERTIES

Adjoining properties were observed to determine the current land use and assess the potential for RECs that may impact the subject property. Visual reconnaissance of adjoining properties was limited to areas readily observable from the subject property or from public right-of-ways. Properties adjoining the subject property are described below:

<b>CURRENT USE OF ADJOINING PROPERTIES</b>	
<b>NORTH:</b>	Riverview Road followed by Highway 55, followed by a park alongside the Mississippi River
<b>SOUTH:</b>	Apartment Building and East 54 <sup>th</sup> Street followed by Veterans Community Housing
<b>EAST:</b>	Riverview Road followed by Highway 55, followed by a Dog park alongside the Mississippi River
<b>WEST:</b>	Residential

No current activities were observed on adjoining properties that represent a REC to the subject property.

## 3.0 PHYSICAL DESCRIPTION & SETTING



### 3.1 TOPOGRAPHY

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Review of the UNITED STATES GEOLOGICAL SURVEY 7.5-MINUTE TOPOGRAPHIC MAP, ST. PAUL WEST, MN QUADRANGLE, dated 1993, indicated the following:

- ❑ The subject property is located in the SW ¼ of the SE ¼ of the SW ¼ of Section 17 Township 28 North, Range 23 West.
- ❑ Observation of contour lines on the topographic map indicates the subject property is located at an approximate ranging from 810 to 816 feet above Mean Sea Level.
- ❑ The subject property topography slopes gently down to the east.

### 3.2 SURFICIAL SOILS

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Review of the MINNESOTA GEOLOGICAL SURVEY, GEOLOGIC ATLAS OF HENNEPIN COUNTY, MINNESOTA - COUNTY ATLAS SERIES (ATLAS C-4), PLATES 1-9 dated 1989 indicated the following:

- ❑ The subject property is underlain Middle Terrace deposits characterized as sand, gravelly sand, and loamy sand.

### 3.3 GEOLOGY/HYDROLOGY

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Review of the MINNESOTA GEOLOGICAL SURVEY, GEOLOGIC ATLAS OF HENNEPIN COUNTY, MINNESOTA - COUNTY ATLAS SERIES (ATLAS C-4), PLATES 1-9 dated 1989 indicated the following:

- ❑ The uppermost bedrock underlying the subject property is the Platteville and Glenwood Formations characterized as fine-grained limestone containing thin shale partings near the top and base, underlain by green, sandy shale of the Glenwood.
- ❑ The depth to bedrock is expected to be less than 50-feet below the ground surface.
- ❑ The depth to shallow groundwater in unconsolidated sediments beneath the subject property is expected to be approximately 10-20 feet below the ground surface.
- ❑ The general shallow ground water flow direction near the subject property is expected to be east toward the Mississippi River.

### 3.4 WETLANDS

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Review of the U.S. Department of the Interior National Wetlands Inventory Geotract Mapping System Map, indicated the following:

- ❑ No wetlands were depicted on the subject property. Confirmation of wetlands on the subject property would require additional research and/or field delineation, which is outside the scope of this assessment.

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### 3.5 FLOOD ZONE

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The Hennepin County FEMA Flood Insurance Rate Map, Community Panel Number 27053C0387F covering the subject property and dated November 04, 2016, was reviewed.

- The subject property is located within Zone X, which is defined as being outside the 500-year floodplain. Confirmation of floodplain status would require additional research and/or field survey, which is outside the scope of this assessment.

### 3.6 RADON

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Review of the EPA and Minnesota Department of Health Radon Web pages indicated the following:

- The subject property is located within EPA Radon Zone 1. The expected average indoor radon concentration of Radon Zone 1 is greater than 4 pCi/L, which exceeds the EPA Guidance Level of 4 pCi/L. Radon testing would be required to verify actual radon concentrations.

## 4.0 HISTORICAL LAND USE RECORDS/INTERVIEWS

### 4.1 HISTORICAL SUMMARY

Review of historical records identified that since at least 1937 the subject property was developed as single-family homes for Fort Snelling military officers. Several of the lots were subsequently purchased and razed by the MN Department of Transportation (MNDOT) and used as a staging and storage area during the reconstruction and expansion of adjacent Highway 55. Recently over the last decade, the City of Minneapolis has acquired and assembled the development site with property purchased from MNDOT and private property owners. The remaining two (2) residences were demolished in 2015. The proposed Minnehaha Townhomes development will consist of four (4) separate townhome buildings each containing four (4) townhome units.

### 4.2 HISTORICAL FIRE INSURANCE MAPS/PLAT MAPS

The Sanborn fire insurance and plat map collection were made available through the Environmental Database Report (EDR). Sanborn map coverage for the subject property was available for the years 1941, 1951, 1952, and 1966. Sanborn Maps are provided in Appendix B.

SANBORN MAPS	
YEAR(S)	DESCRIPTION/USE
1941	The subject property is shown as encompassing portions of several residential lots that include 3 residential structures. Snelling Avenue (now called Riverview Road) borders the eastern side of the subject property. Surrounding properties to the north, east and west are residential.
1951, 1952, 1966	The subject property is now shown developed with eleven residential structures. The road adjoining to the east is now labeled Riverview Road. Surrounding properties to the north, east and west are all residential. Historical addresses for Riverview Road are 5344-5380.

### 4.3 HISTORICAL TOPOGRAPHIC MAPS

The topographic collection were made available through the Environmental Database Report (EDR). Topographic map coverage for the subject property was available for the years 1896-2013.

HISTORIC TOPOGRAPHIC MAPS	
YEAR(S)	DESCRIPTION/USE
1896	No structures appear on the subject property. East of the subject property appears to be railroad spur followed by the Mississippi River. West of the subject property appears to be a road in the current location of Minnehaha Avenue.
1951-1958	The subject property appears shaded red depicting that it is located in a residential area. Riverview Road is now apparent adjoining to the east. Adjoining to the north, east, and west appears to be residential. Adjoining to the south appears undeveloped. The VA Hospital is now apparent to the Southwest.
1967-2013	The subject property and surrounding areas appears unchanged with the exception of Highway 55 is now visible in its current location.

#### 4.4 AERIAL PHOTOGRAPHS

Aerial photographs covering the area of the subject property were obtained for the years 1937, 1940, 1947, 1953, 1957, 1966, 1969, 1972, 1984, 1987, 1991, 1997, 2002, 2005, 2008, 2009, 2010 and 2016 through the EDR, U of M MHAPO and Google Earth web pages. Representative aerial photographs are provided in Appendix C.

<b>AERIAL PHOTOGRAPHS</b>	
<b>YEAR(S)</b>	
<b>1937-1947</b>	The subject property appears to be developed for residential use. Multiple residences appear on the subject property. Riverview Road is apparent adjoining to the east and East 54 <sup>th</sup> Street is apparent adjoining to the south. Adjoining to the north, east and west of the subject property appears to be residential, adjoining to the south appears to undeveloped land followed by veterans housing which is a part of the VA hospital located to the southwest of the subject property.
<b>1953-1966</b>	The subject property and surrounding areas appear unchanged with the exception of the expansion of the Veterans hospital.
<b>1969-1974</b>	The subject property and surrounding areas appear unchanged with the exception that approximately seven houses adjoining to the east of the subject property have been razed.
<b>1984-1997</b>	The subject property and surrounding properties appear unchanged with the exception that a new parking lot associated with the VA hospital appears to the southeast of the subject property off East 54 <sup>th</sup> Street.
<b>2002-2005</b>	The subject property and surrounding areas appear unchanged with the exception that a few houses on the subject property have been razed leaving only 5 residences. Highway 55 has been developed in its current location.
<b>2008-2010</b>	The subject property is now occupied by three residences. The surrounding properties appear unchanged with the exception of the addition of two VA buildings adjoining to the south of the subject property.
<b>2016</b>	The subject property appears undeveloped. All remaining residences have been razed. All surrounding properties appear unchanged.

#### 4.5 CITY DIRECTORIES

City Directories were made available through the Environmental Database Report (EDR). Directories were available for the area covering the subject property for the years 1930, 1935, 1940, 1946, 1950, 1955, 1957, 1960, 1962, 1966, 1970-71, 1975-76, 1979, 1985, 1988-89, 1993, 1999, and 2005. Historic addresses associated with the subject property include 5344, 5348, 5352, 5356, 5360, 5364, 5368, 5372, 5376, & 5380 Riverview Road and 5118 E. 54<sup>th</sup> Street. Copies of the city directory information for the subject property is provided in Appendix D and summarized below.

<b>CITY DIRECTORIES SEARCH (SUBJECT PROPERTY)</b>		
<b>STREET ADDRESS</b>	<b>YEAR(S)</b>	<b>OCCUPANT LISTED</b>
<b>5344, 5348, 5352, 5356, 5360, 5364, 5368, 5372, 5376, 5380 RIVERVIEW ROAD</b>	1950-2005	Residential
<b>5118 EAST 54<sup>TH</sup> STREET</b>	1946-2005	Residential

CITY DIRECTORIES SEARCH (SUBJECT PROPERTY)		
STREET ADDRESS	YEAR(S)	OCCUPANT LISTED
	1930-1940	Not Listed

#### 4.6 LOCAL AGENCY RECORDS REVIEW

A review of local municipal records for the subject property included zoning, building inspection, and fire department files.

##### 4.6.1 ZONING DEPARTMENT

Review of the municipal zoning map identified the following zoning information:

- The subject property is located in a R-3 and R-4 Residential district of the City of Minneapolis.

##### 4.6.2 BUILDING INSPECTION DEPARTMENT

Building permit records for the subject property were reviewed at the City of Minneapolis Building Department. Historic addresses associated with the subject property include 5344, 5348, 5352, 5356, 5360, 5364, 5368, 5372, 5376, & 5380 Riverview Road and 5118 E. 54<sup>th</sup> Street. Relevant building permit records are provided in Appendix E and summarized below:

BUILDING PERMIT RECORDS		
STREET ADDRESS	PERMIT DATE	DESCRIPTION USE
5344 RIVERVIEW RD	9/1/1923	Permit to construct frame dwelling
	5/20/1954	Permit for frame addition to rear of dwelling
	7/23/1993	Permit to Wreck dwelling issued to MNDOT
5348 RIVERVIEW RD	8/26/1940	Permit to construct a 34x28 single dwelling
	11/22/1940	Permit for a gas burner
	5/7/1996	Permit to wreck residential dwelling
5352 RIVERVIEW RD	4/11/49	Permit to construct 1-story frame dwelling
5356 RIVERVIEW RD	9/22/1952	Permit to construct frame dwelling
	11/24/1952	Permit to install gas burner
5360 RIVERVIEW RD	5/27/1941	Permit to construct dwelling and garage
	10/3/1941	Permit to install gas burner
5364 RIVERVIEW RD	9/5/1923	Permit to construct a 18x22 dwelling, garage
	3/28/1949	Permit to construct gas range
	12/15/2015	Permit to wreck the building
5368 RIVERVIEW RD	6/15/1925	Permit to construct a 22x28 structure dwelling
	1/30/1945	Permit for plumbing and gas
	2/20/1945	Permit to transfer for gas furnace
	1/2/1975	Permit to move 29x30x19 dwelling to 4227 29 <sup>th</sup> Ave. S.
5118 54 <sup>TH</sup> STREET E.	11/20/1940	Permit to construct a 30x26 dwelling
	1/31/1945	Permit for plumbing and gas
	3/5/1945	Permit to transfer for gas furnace
	3/6/2002	Permit to tear off and reroof house

BUILDING PERMIT RECORDS		
STREET ADDRESS	PERMIT DATE	DESCRIPTION USE
	12/15/2015	Permit to wreck house

#### 4.6.3 FIRE DEPARTMENT

JAVELIN contacted the Thomas Frame, representing the Minneapolis Fire Department (MFD) on February 1, 2017 for information pertaining to reported underground/aboveground storage tanks, chemical storage, and/or HAZMAT spills/releases at the subject property.

- Mr. Frame did not respond to JAVELIN’s inquiry by the time of report completion.

#### 4.6.4 COUNTY PROPERTY RECORD

JAVELIN reviewed the online County Property Information parcel database for information regarding the subject property. The following relevant information was obtained:

COUNTY PROPERTY INFORMATION	
PROPERTY ID:	1702823340058
PROPERTY TYPE:	Vacant Land-residential
HOMESTEAD STATUS:	Non-Homestead
CONSTRUCTION YEAR:	NA
OWNER NAME:	City of Minneapolis
PROPERTY ID:	1702823340028
PROPERTY TYPE:	Residential
HOMESTEAD STATUS:	Non-Homestead
CONSTRUCTION YEAR:	NA
OWNER NAME:	City of Minneapolis
PROPERTY ID:	1702823340056
PROPERTY TYPE:	Vacant Land-residential
HOMESTEAD STATUS:	Non-Homestead
CONSTRUCTION YEAR:	NA
OWNER NAME:	City of Minneapolis
PROPERTY ID:	1702823340034
PROPERTY TYPE:	Vacant Land-residential
HOMESTEAD STATUS:	Non-Homestead
CONSTRUCTION YEAR:	NA
OWNER NAME:	City of Minneapolis

#### 4.6.5 MINNESOTA COUNTY WELL INDEX

The Minnesota Well Index (MWI) was reviewed online via the Minnesota Department of Health website. Review of the MWI database identified the following:

- No water well records for the subject property were identified in the MWI.

#### 4.7 INTERVIEWS

In accordance with ASTM E1527-13, interviews were conducted with property owners, operators, occupants, and regulatory officials, and/or other people knowledgeable about the subject property, as available. The objective of the interviews was to obtain information regarding *recognized environmental conditions* associated with the subject property. Summary information obtained from the interviews is provided below.

#### 4.7.1 INTERVIEW WITH OWNER REPRESENTATIVE

<b>DATE OF INTERVIEW:</b>	February 9, 2017
<b>NAME &amp; TITLE:</b>	Mike Williams – Demolition Engineer
<b>YEARS ASSOCIATED WITH PROPERTY:</b>	Unknown
<b>AFFILIATION:</b>	City of Minneapolis
<b>TELEPHONE NUMBER:</b>	612-673-5167
<b>INTERVIEW SUMMARY:</b>	Mr. Williams stated that oversaw the demolition of the house located on the 5364 parcel and the house located on the 5118 parcel in 2015. He said that no tanks or septic tanks were located on the property to his knowledge. He stated that all of the building foundations were removed from the site and that each basement was filled with compacted clean sand.

#### 4.7.2 INTERVIEW WITH USER

<b>DATE OF INTERVIEW:</b>	March 16, 2017
<b>NAME &amp; TITLE:</b>	Dean Carlson – MPHA Development Manager
<b>YEARS ASSOCIATED WITH PROPERTY:</b>	Unknown
<b>AFFILIATION:</b>	Minneapolis Public Housing Authority
<b>TELEPHONE NUMBER:</b>	612-342-1213
<b>INTERVIEW SUMMARY:</b>	Mr. Carlson stated that he had no knowledge of environmental releases, USTs, ASTs, or other environmental concerns associated with the subject property. He was aware that residences were formerly located on the subject property and have been razed or moved from the site in the past. He provided a geotechnical report for the proposed Minnehaha Townhomes development. He stated the MPHA has development rights for the subject property, but the site is owned by the City of Minneapolis. He noted that the City of Minneapolis has acquired the subject property parcels over the last decade.

### 4.8 PREVIOUS INVESTIGATIONS/ASSESSMENTS

JAVELIN requested copies of previous environmental reports and geotechnical investigations for review. The geotechnical report provided to Javelin is provided in Appendix F and summarized below:

**Geotechnical Exploration & Engineering Review – Minnehaha Townhomes, Riverview Road, Minneapolis, MN – Prepared by Northern Technologies, LLC (NT) – Dated 3/10/2017.**

The purpose of the NT geotechnical report was to provide generalized opinions and recommendations regarding the soil conditions and design parameters for foundations of the proposed Minnehaha Townhome project.

NT advanced 17 borings on the subject property that terminated at depths ranging from 3.3 to 12.5 feet below the existing ground surface. NT encountered 3 to 24 inches of topsoil over 4.5 to 9.5 feet of undocumented fill primarily composed of clayey sand, poorly graded sand with silt, and poorly graded sand. Undocumented fill was not encountered in 6 of the borings. Bedrock was encountered at depths ranging from 3.3 to 12.5 feet bgs.

NT states that the undocumented fill is not considered suitable for direct support of the building foundations. The NT report cautions that due to the presence of the undocumented fill soil there is the potential that zones of debris-laded soils may be encountered during



redevelopment activities. Review of the boring logs identified no references to encountering buried debris at the soil boring locations.

NTI stated that groundwater was not encountered in the site borings. However, NT states the on-site clay and silt-based soils along with the underlying bedrock are conducive to the development of zones of perched water at varying elevations and locations across the site.

#### 4.9 MPCA FILE REVIEW

JAVELIN conducted a review of the MPCA files for the F&D Motorworks (AKA Brooks Superette) petroleum Leak site (Leak Site# 00000389) formerly located approximately 590 feet west of the subject property in a presumed upgradient groundwater flow direction. The purpose of the MPCA file review was to determine whether the petroleum leak site has the potential to impact the subject property. Key facts identified in the file review are summarized below and a copy of the report is provided in Appendix G:

**Remedial Investigation Report – F&D Motorworks aka Brook Superette, 5371 Minnehaha Avenue South, Minneapolis, MN – Prepared by Peer Environmental & Engineering Resources, Inc., (Peer) – Dated April 16, 1997.**

The Peer RI report identified that the F&D Motorworks site was operated as an automobile repair shop since the late 1970s. Prior to that, the site was occupied by an Amoco gasoline station. Four (4) gasoline underground storage tanks (USTs) were removed from the site in 1976. A petroleum release was detected during the USTs excavations. A corrective action plan was submitted to the MPCA in 1986, which proposed to excavate approximately 700 cubic yards of soil from the UST basin. The MPCA approved the plan, but reportedly, the plan was not implemented.

In 1997, Peer conducted a remedial investigation that included the advancement of five (5) soil borings on the site and the installation of five (5) groundwater wells. Petroleum impacts were identified across a majority of the site within a silt and clay layer that generally occurred at a depth of 12 to 18 feet below ground surface (bgs). Peer noted that the horizontal soil impacts below the silt and clay layer appear to be confined to the former UST basin. Peer identified that the vertical extent of soil contamination is confined by bedrock (bedrock occurs at 30 feet) in the vicinity of the former tank basin. Impacts to bedrock appear to be relatively minor.

Peer noted that originally groundwater flow was presumed to flow east towards the Mississippi River. However, site groundwater flow was determined to flow south-southwest. Petroleum contaminants detected in groundwater did not exceed their respective Health Risk Limits (HRLs) in any of the site monitoring wells.

Upon review of the Peer RI, the MPCA issued a petroleum tank release file closure letter, dated July 16, 1997.

## 5.0 REGULATORY DATABASE RECORDS REVIEW



JAVELIN reviewed regulatory agency environmental records compiled by Environmental Data Resources, Inc. (EDR) to help identify recognized environmental conditions in connection with the subject property. The EDR report meets the governmental records search requirements of ASTM E 1527-013. The complete database prepared by EDR and a map depicting the location of listed sites relative to the subject property is provided in Appendix H. Results of the environmental database records review are summarized below.

### 5.1 STANDARD FEDERAL ENVIRONMENTAL RECORDS DATABASE

**NPL: NATIONAL PRIORITY LIST** – The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program.

- ❑ No NPL sites were identified on or within 1.0 mile of the subject property.

**PROPOSED NPL: PROPOSED NATIONAL PRIORITY LIST SITES**

- ❑ No PROPOSED NPL sites were identified on or within 1.0 mile of the subject property.

**NPL LIENS** – List of filed notices of Superfund Liens

- ❑ No NPL LIENS sites were identified for the subject property.

**DELISTED NPL: NATIONAL PRIORITY LIST DELETIONS** – Database of sites that have been deleted from the NPL where no further response is appropriate.

- ❑ No DELISTED NPL sites were identified on the subject property.
- ❑ One (1) DELISTED NPL site was identified within 1.0 mile of the subject property. The US Air Force Reserve site is located at 760 Military Highway approximately 0.98 miles to the southwest of the subject property in a side gradient orientation with respect to the estimated direction of groundwater flow. Based on this information, this site is not expected to impact the subject property.

**FEDERAL FACILITY: FEDERAL CERCLIS LIST** – Database of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the SEMS Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

- ❑ No FEDERAL FACILITY sites were identified on or within 0.5 miles of the subject property.

**SEMS: SUPERFUND ENTERPRISE MANAGEMENT SYSTEM** – SEMS tracks hazardous waste sites, potentially hazardous waste sites, and remedial activities performed in support of EPA's Superfund Program. The list, formerly known as CERCLIS, contains data on potential hazardous waste sites that have been reported to the USEPA pursuant to Section 103 of CERCLA.

- ❑ No SEMS sites were identified on the subject property.
- ❑ One (1) SEMS site was identified within 0.5 miles of the subject property. The VA Medical Center site is located at 1 Veterans Drive approximately 0.3 miles to the south-southwest of the subject property. This site is located in a side gradient orientation to the subject property with respect to the estimated direction of

groundwater flow. Based on this information, this site is not expected to impact the subject property.

**SEMS-ARCHIVE: FEDERAL CERCLIS NO FURTHER REMEDIAL ACTION PLANNED (NFRAP) SITES**

– Sites listed on this database have been removed from SEMs. NFRAP sites may be sites where, following an initial investigation, no contamination was found, contamination was removed quickly without the need for the site to be placed on the NPL, or the contamination was not serious enough to require Federal Superfund action or NPL consideration.

- ❑ No SEMs-ARCHIVE sites were identified on the subject property.
- ❑ One (1) SEMs-ARCHIVE site was identified within 0.5 miles of the subject property. The Ford Motor Co Twin Cities Assembly Plant is located at 966 South Mississippi River Boulevard approximately 0.4 miles to the northeast and across the Mississippi River. Based on this information, this site is not expected to impact the subject property.

**CORRACTS: CORRECTIVE ACTION REPORT** – Identifies hazardous waste handlers with RCRA corrective action activity.

- ❑ No CORRACTS sites were identified on or within 1.0 mile of the subject property.

**RCRA-TSDF: RESOURCE CONSERVATION AND RECOVERY ACT - TREATMENT, STORAGE, AND DISPOSAL FACILITIES** – Database on facilities that treat, store, and/or dispose of hazardous wastes.

- ❑ No RCRA-TSD sites were identified on or within 0.5 miles of the subject property.

**RCRA-LQG: LARGE QUANTITY GENERATORS** – Facilities that generate more than 1,000 Kg of hazardous waste per month, or meet other applicable requirements of RCRA.

- ❑ No RCRA-LQG sites were identified on or adjoining the subject property.

**RCRA-SQG: SMALL QUANTITY GENERATORS** – Facilities that generate from 100 Kg to 1,000 Kg of hazardous waste per month, or meet other applicable requirements of RCRA.

- ❑ No RCRA-SQG sites were identified on or adjoining the subject property.

**RCRA-CESQG: CONDITIONALLY EXEMPT SMALL QUANTITY GENERATORS** – Facilities that generate less than 100 Kg of hazardous waste per month, or less than 1 kg of acutely hazardous waste per month, or meet other applicable requirements of RCRA.

- ❑ No RCRA-CESQG sites were identified on or adjoining to the subject property.

**RCRA-NONGEN: FACILITIES THAT PREVIOUSLY GENERATED HAZARDOUS WASTE**–

- ❑ No RCRA-NonGen sites were identified on or adjoining to the subject property.

**US ENG CONTROLS: ENGINEERING CONTROLS SITES LIST** – A listing of sites with engineering controls in place to mitigate identified site impacts that typically exceed unrestricted land use criteria.

- ❑ No US ENG CONTROLS sites were identified on or within 0.5 mile of the subject property.

**US INST CONTROLS: SITES WITH INSTITUTIONAL CONTROLS** – A listing of sites with institutional controls in place to mitigate identified site impacts that typically exceed unrestricted land use criteria.

- ❑ No US INST CONTROLS sites were identified on or within 0.5 mile of the subject property.

**ERNS: EMERGENCY RESPONSE NOTIFICATION SYSTEM** – Database that records and stores information on reported releases of oil and hazardous substances.

- ❑ No ERNS sites were identified on the subject property.

## 5.2 STANDARD STATE ENVIRONMENTAL RECORDS DATABASE

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**MN PLP** – Permanent List of Priorities – This list identifies priority state hazardous substance release sites where investigation and cleanup are needed, cleanup is underway, or cleanup has been completed and long-term monitoring or maintenance continues.

- ❑ No MN PLP sites were identified on or within 1.0 mile of the subject property.

**SHWS: STATE HAZARDOUS WASTE SITES** – State hazardous substance release site records that are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list.

- ❑ No SHWS sites were identified on the subject property.
- ❑ Two (2) SHWS sites were identified within 1.0 mile of the subject property. The Twin Cities AFRB site is located at the Minneapolis International Airport approximately 0.89 miles to the southwest and the Magnum Truck site is located at 966 S Mississippi River Boulevard approximately 0.4 miles to the northeast across the Mississippi River. Both sites are located in down or side gradient orientations to the subject property with respect to the estimated direction of groundwater flow. Based on this information, these sites are not expected to impact the subject property.

**SWF/LF: SOLID WASTE FACILITY INVENTORY/TRANSFER STATIONS** – Inventory of solid waste disposal facilities or landfills.

- ❑ No SWF/LF sites were identified on the subject property.
- ❑ One (1) SWF/LF site was identified within 0.5 miles of the subject property. The Veterans Agency Medical Center is located at 1 Veterans Drive approximately 0.30 miles to the south-southwest of the subject property. This site is located in a side gradient orientation to the subject property with respect to the estimated direction of groundwater flow. Based on this information, this site is not expected to impact the subject property.

**UNPERM LF: UNPERMITTED LANDFILL** – These are reported facilities that have solid waste disposal, yet are not permitted.

- ❑ No UNPERM LF sites were identified on or within 0.5 miles of the subject property.

**LCP: CLOSED LANDFILL PRIORITY LIST** – The Minnesota Legislature enacted a law to manage and clean up the State's closed Mixed Municipal Solid Waste Landfills. Under the law, the MPCA is required to create and periodically review a priority list of qualified landfills, based on the relative health and environmental risks they present.

- No LCP sites were identified on or within 0.5 miles of the subject property.

**LUST: LEAKING UNDERGROUND STORAGE TANK INCIDENT REPORTS** – Inventory of reported leaking underground storage tank releases.

- No LUST sites were identified on the subject property.
- Nine (9) LUST sites were identified within 0.5 miles of the subject property. All nine sites have been issued petroleum file closure letters by the MPCA. A closure status indicates that the releases at these sites has been investigated, and if necessary remediated to the satisfaction of the MPCA. Seven (7) of these sites are located in side or downgradient orientations with respect to the estimated direction of groundwater flow. Based on this information, these seven (7) sites are not expected to impact the subject property.

Two (2) of the LUST sites (both sites are on the same property) are located within 600 feet of the subject property and are discussed below:

**The Former F&D Motor Works site (a former gas station)** is located at 5371 Minnehaha Avenue approximately 590 feet west of the subject property. The release product is registered as hydraulic fluid. No groundwater contamination was reported. This site had one registered 200 gallon UST that was removed in 1998. The site is currently undeveloped.

**The Brooks Superette site (former gas station)** is located at 54<sup>th</sup> Street East & Minnehaha Avenue approximately 615 feet west of the subject property. The file closure letter for this site is addressed 5371 Minnehaha Avenue (same as the Former F&D Motor Works site). This site reported a gasoline leak. This site received a file closure on 7/16/1997 (see Appendix I) and was razed in approximately 2005.

**Javelin Comment:** Javelin conducted a MPCA file review of the F&D Motor Works and Brooks Superette LUST sites to determine the potential risk to the subject property. Review of the MPCA LUST file identified that the petroleum release to soil was confined primarily to the UST basin and shallow soil across the site. Groundwater impacts were low with no contaminants detected above the MDH HRLs. Groundwater flow was determined to flow south/southwest instead of the presumed easterly flow. Based on this information, the two LUST sites represent a low risk to the subject property. The MPCA file review is discussed more fully in Section 4.9 of this report.

**LAST: LEAKING ABOVEGROUND STORAGE TANKS** - A listing of leaking aboveground storage tanks.

- No LAST sites were identified on the subject property.
- Two (2) LAST sites were identified within 0.5 miles of the subject property. The Magnum Truck site is located at 966 South Mississippi River Boulevard approximately 0.4 miles northeast of the subject property. The Minnesota Veterans Home site is located at 5101 Minnehaha Avenue approximately 0.48 miles to the north. Both sites are located in a side or down gradient orientations to the subject property with respect to the estimated direction of groundwater flow. Based on this information, these LAST sites are not expected to impact the subject property.

**UST: LISTING OF REGULATED UNDERGROUND STORAGE TANKS** – Inventory of registered underground storage tanks.

- 
- ❑ No UST sites were identified on or adjoining to the subject property.

**AST: LISTING OF REGULATED ABOVEGROUND STORAGE TANKS** – Inventory of registered aboveground storage tanks.

- ❑ No AST sites were identified on or adjoining to the subject property.

**MN INST CONTROL: LIST OF INSTITUTIONAL CONTROL SITES** – Sites that have an institutional control event.

- ❑ No MN INST CONTROL sites were identified on or within 0.5 miles of the subject property.

**VIC: VOLUNTARY INVESTIGATION AND CLEANUP PROGRAM** – Voluntary Investigation and Cleanup Program list.

- ❑ No VIC sites were identified on the subject property.
- ❑ Five (5) VIC sites were identified within 0.5 miles of the subject property. All five (5) VIC sites are located in a side or downgradient orientation to the subject property with respect to the estimated direction of groundwater flow. Based on this information, these VIC sites are not expected to impact the subject property.

**BROWNFIELDS: PETROLEUM BROWNFIELDS PROGRAM SITES**

- ❑ No BROWNFIELDS sites were identified on the subject property.
- ❑ Two (2) BROWNFIELDS sites were identified within 0.5 miles of the subject property. Both sites are located in side or downgradient orientations to the subject property with respect to the estimated direction of groundwater flow. Based on this information, these BROWNFIELD sites are not expected to impact the subject property.

### 5.3 ADDITIONAL ENVIRONMENTAL RECORD SOURCES

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EDR provides information from approximately 50 additional environmental record sources that are not required by ASTM E 1527-13, and information on standard environmental record sources in which information was provided for distances beyond that required by ASTM E 1527-13. Detailed description of these databases and sites identified are included in the EDR report included in Appendix C. Review of these environmental records identified the following:

- ❑ EDR HISTORICAL AUTOS – One (1) Historical auto station was identified within 0.125 miles of the subject property. The address 5371 Minnehaha Avenue was a gas station and service station from 1955 to 2009 and had multiple names, but most recently the F & D Motor Works. This site is discussed in the LUST database above and in Section 4.9 of this report.

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## 5.4 UNMAPPABLE SITES

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Unmappable sites are facilities listed on environmental databases that cannot be plotted with confidence, but can be located by ZIP code or city name. Review of the unmappable sites in the EDR report, cross-referencing addresses and site names, reveals the following:

- No unmappable sites were determined to be located on the subject property or adjoining properties, nor within an ASTM E 1527-13 search radius for a specific database that would be expected to impact the subject property.



## **6.0 SUBJECT PROPERTY RECONNAISSANCE**



### **6.1 SITE ACCESS**

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JAVELIN environmental professional, Mr. Brady MacLean conducted a reconnaissance of the subject property on February 7, 2017. The reconnaissance consisted of observing the subject property from accessible adjacent public thoroughfares. Photographs were taken of significant features observed and any environmental concerns documented, where possible. Representative photographs are provided in Appendix J.

### **6.2 CURRENT FACILITY OPERATIONS/NOTEWORTHY TENANTS**

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The subject property is comprised of four (4) undeveloped parcels previously occupied by residential dwellings.

### **6.3 SURFACE AREAS**

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The subject property is comprised of four (4) vacant grass-covered lots that are generally level sloping gently to the east. An asphalt-paved entrance drive and a separate alley extend from Riverview Road to the southwest-adjacent Riverview Senior Apartments.

- ❑ No surface migration of petroleum releases or hazardous materials onto or off the subject property or adjoining properties was observed during the site reconnaissance.

### **6.4 HAZARDOUS SUBSTANCES AND PETROLEUM PRODUCTS CONTAINERS**

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The use, treatment, storage, disposal or generation of hazardous substances and/or petroleum products identified in connection with the use of the subject property, to the extent visually or physically observed or identified from interviews, is described below:

- ❑ No hazardous substance or petroleum products containers were observed on the subject property during the site reconnaissance.

### **6.5 UNIDENTIFIED SUBSTANCE CONTAINERS**

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The presence of open or damaged containers containing unidentified substances suspected of being hazardous substances or petroleum products visually or physically observed or identified from interviews, is described below:

- ❑ No unidentified substance containers were observed on the subject property at the time of the site reconnaissance.

### **6.6 STORAGE TANKS**

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The presence of aboveground storage tanks (ASTs) or underground storage tanks (USTs) or vent pipes, fill pipes or access ways indicating underground storage tanks identified on the



subject property, to the extent visually or physically observed or identified from interviews, is described below:

- ❑ No ASTs or UST vent or fill pipes were observed on the subject property at the time of the site reconnaissance.

## **6.7 ODORS**

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The presence of strong, pungent or noxious odors identified on the subject property, to the extent visually or physically observed or identified from interviews, is described below:

- ❑ No strong, pungent or noxious odors indicative of a release of hazardous materials or petroleum products were observed on the subject property at the time of the site reconnaissance.

## **6.8 POOLS OF LIQUID**

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The presence of standing pools of non-aqueous liquid identified on the subject property, to the extent visually or physically observed or identified from interviews, is described below:

- ❑ No standing pools of liquid indicative of a release of hazardous materials or petroleum products were observed on the subject property at the time of the site reconnaissance.

## **6.9 DRUMS**

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The presence of drums with capacities of 55-gallons or greater containing hazardous substances or petroleum products identified on the subject property, to the extent visually or physically observed or identified from interviews, is described below:

- ❑ No 55-gallon drums were observed on the subject property during the site reconnaissance.

## **6.10 POLYCHLORINATED BIPHENYLS (PCBS)**

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The presence of electrical or hydraulic equipment known or likely to contain PCBs identified on the subject property, to the extent visually or physically observed or identified from interviews, is described below:

- ❑ One pole-mounted transformer was identified at the southeast corner of the subject property. The transformer appeared in good condition. No leaks or spills were observed.

## **6.11 ASBESTOS-CONTAINING BUILDING MATERIALS (ACBM)s**

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The presence of asbestos-containing building materials, to the extent visually or physically observed or identified from interviews, is described below:

- ❑ No suspect asbestos containing building materials were identified during the site reconnaissance.

## **6.12 PITS, PONDS OR LAGOONS**

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The presence of pits, ponds or lagoons, particularly if associated with waste disposal or waste treatment processes, identified on the subject property or adjoining property, to the extent visually or physically observed or identified from interviews, is described below:

- ❑ No pits, ponds or lagoons were identified on the subject property during the site reconnaissance.

## **6.13 STAINED SOIL, PAVEMENT OR FLOORS**

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The presence of stained areas identified on the subject property, to the extent visually observed, is described below:

- ❑ No stained soil, pavement, or floors were observed during the site reconnaissance.

## **6.14 STRESSED VEGETATION**

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The presence of areas of stressed vegetation identified on the subject property, to the extent visually or physically observed or identified from interviews, is described below:

- ❑ No chemically stressed vegetation was observed on the subject property at the time of the site reconnaissance.

## **6.15 SOLID WASTE DUMPING OR SUSPECT FILL MATERIAL**

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The presence of areas of solid waste dumping or suspect fill material identified on the subject property, to the extent visually or physically observed or identified from interviews, is described below:

- ❑ No solid waste dumping or suspect fill material was observed on the subject property at the time of the site reconnaissance.

## **6.16 DRAINS, SUMPS AND WASTEWATER DISCHARGE**

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The presence of drains, sumps and wastewater discharges into a drain, ditch, or stream identified on or adjacent to the subject property, to the extent visually or physically observed or identified from interviews, is described below:

- ❑ No drains, sumps or wastewater discharge were observed during the site reconnaissance.

## **6.17 WELLS**

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The presence of wells (including dry wells, irrigation wells, injection wells or abandoned wells) identified on the subject property, to the extent visually or physically observed or identified from interviews, is described below:

- ❑ No wells were observed on the subject property at the time of the site reconnaissance.

## 6.18 SEPTIC SYSTEMS

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The presence of on-site septic systems or cesspools identified on the subject property, to the extent visually or physically observed or identified from interviews, is described below:

- No septic systems were observed on the subject property at the time of the site reconnaissance.

## 7.0 CONCLUSIONS AND RECOMMENDATIONS



### 7.1 FINDINGS, OPINIONS & CONCLUSIONS

Javelin has performed a Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM Practice E 1527-13 of the subject property, known as the proposed Minnehaha Townhomes site, located at 5348, 5364, 5368 Riverview Road & 5118 East 54<sup>th</sup> Street in the City of Minneapolis, Hennepin County, Minnesota. Any exceptions to, or deletions from, this practice are described in Section 1.4 of this report.

#### **HISTORIC RECOGNIZED ENVIRONMENTAL CONDITIONS (HRECs)**

The ASTM E1527-13 standard defines the term “Historical Recognized Environmental Conditions (HRECs)” as “a past release of any hazardous substances or petroleum products that has occurred in connection with the property and has been addressed to the satisfaction of the applicable regulatory authority or meeting unrestricted use criteria established by a regulatory authority, without subjecting the property to any required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls).

- This assessment has revealed no evidence of HRECs in connection with the subject property.

#### **RECOGNIZED ENVIRONMENTAL CONDITIONS (RECs)**

The ASTM E1527-13 standard defines the term Recognized Environmental Conditions (RECs) as “the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment.” This assessment has revealed no evidence of RECs in connection with the subject property, with the exception of the following:

- This assessment has revealed no evidence of RECs in connection with the subject property.

#### **CONTROLLED RECOGNIZED ENVIRONMENTAL CONDITIONS (CRECs)**

The ASTM E1527-13 standard defines the term Controlled Recognized Environmental Conditions (CRECs) as “a recognized environmental condition resulting from a past release of hazardous substances or petroleum products that has been addressed to the satisfaction of the applicable regulatory authority (for example, as evidenced by the issuance of a no further action letter or equivalent, or meeting risk-based criteria established by regulatory authority), with hazardous substances or petroleum products allowed to remain in place subject to the implementation of required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls).” This assessment has identified the following CRECs in connection with the subject property.

- This assessment has revealed no evidence of CRECs in connection with the subject property.

#### **DE MINIMIS CONDITIONS**

The ASTM E1527-13 standard defines the term *de minimis conditions* as “a condition that generally does not present a threat to human health or the environment and that generally

would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.”

- ❑ This assessment identified no *de minimis conditions* in connection with the subject property.

### **ITEMS OF BUSINESS ENVIRONMENTAL RISK**

The ASTM E1527-13 standard defines the term business environmental risk as potential environmental concerns that are not classified as recognized environmental conditions, but may have a material environmental impact on the business associated with the current or planned use of the subject property.

- ❑ The following business environmental risk was identified in connection with the subject property:

**Undocumented Fill Soil** – Review of the geotechnical report prepared for the subject property identified 4.5 to 9.5 feet of undocumented fill in several borings throughout the site. The geotechnical report stated that the undocumented fill is not considered suitable for direct support of the building foundations. The geotechnical report cautions that due to the presence of the undocumented fill soil there is the potential that zones of debris-laded soils may be encountered during redevelopment activities. Review of the boring logs identified no references to encountering buried debris at the soil boring locations. The presence of undocumented fill soil represents the potential for encountering debris and/or contaminated soil during redevelopment activities that may require special handling and disposal.

## **7.2 RECOMMENDATIONS**

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Based on the conclusions of this Phase I Environmental Site Assessment, JAVELIN recommends the following:

- ❑ Prepare a Construction Contingency Plan that outlines the procedures for the management of impacted soil if encountered during redevelopment activities. Soil testing may be required if export of soil for offsite reuse is planned.

## 8.0 ENVIRONMENTAL PROFESSIONAL SIGNATURES



An environmental professional conducted this Phase I Environmental Site Assessment in accordance with ASTM E 1527-13. We declare that, to the best of our professional knowledge and belief, we meet the definition of environmental professional as defined in § 312.10 of 40 CFR 312; and, we have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property (Appendix K). We have developed and performed the all-appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.

The services performed by JAVELIN on this project have been conducted with that level of care and skill ordinarily exercised by reputable members of the profession, practicing in the same locality, under similar budget and time constraints. No other warranty is expressed or intended.

**PREPARED BY:**

**THE JAVELIN GROUP, INC.**

A handwritten signature in black ink that reads "Brady MacLean".

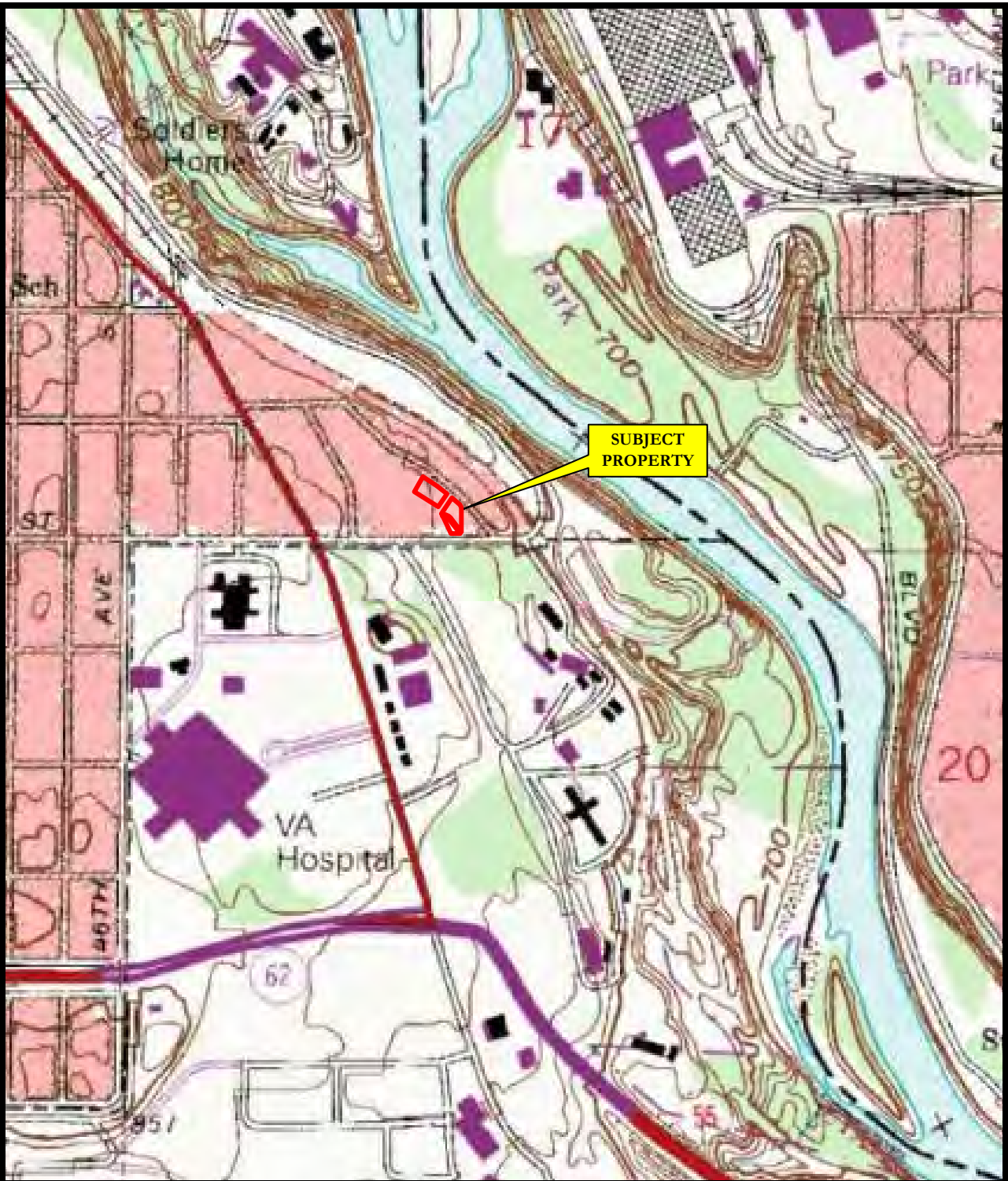
**BRADY MACLEAN**  
**ENVIRONMENTAL SPECIALIST**

A handwritten signature in black ink that reads "John E. Findley".

**JOHN E. FINDLEY, M.S.**  
**PRINCIPAL ENVIRONMENTAL PROFESSIONAL**

# APPENDIX A

## FIGURES



**PROJECT NAME:**

PROPOSED MINNEHAHA  
TOWNHOMES  
5348, 5364, 5368 RIVERVIEW RD.  
& 5118 EAST 54<sup>TH</sup> STREET  
MINNEAPOLIS, MN 55415



FIGURE 1: SITE LOCATION  
MAP

PROJECT #  
2016-P0302-0169







**PROJECT NAME:**

PROPOSED MINNEHAHA  
TOWNHOMES  
5348, 5364, 5368 RIVERVIEW RD.  
& 5118 EAST 54<sup>TH</sup> STREET  
MINNEAPOLIS, MN 55415

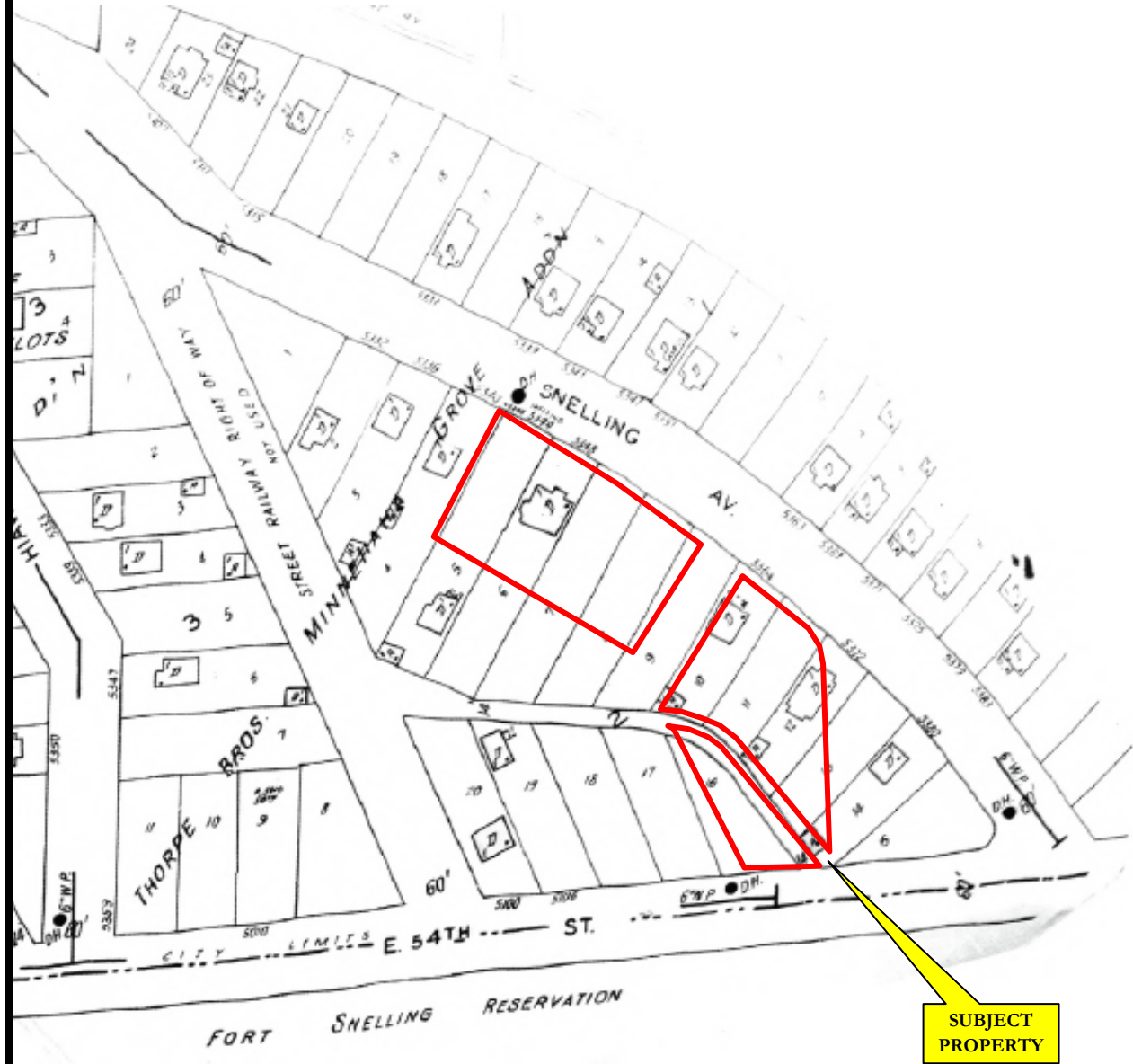


FIGURE 2: SITE PLAN

PROJECT #  
2016-P0302-0169



**APPENDIX B**  
**SANBORN MAPS**



**PROJECT NAME:**

**PROPOSED MINNEHAHA  
TOWNHOMES  
5348, 5364, 5368 RIVERVIEW RD.  
& 5118 EAST 54<sup>TH</sup> STREET  
MINNEAPOLIS, MN 55415**

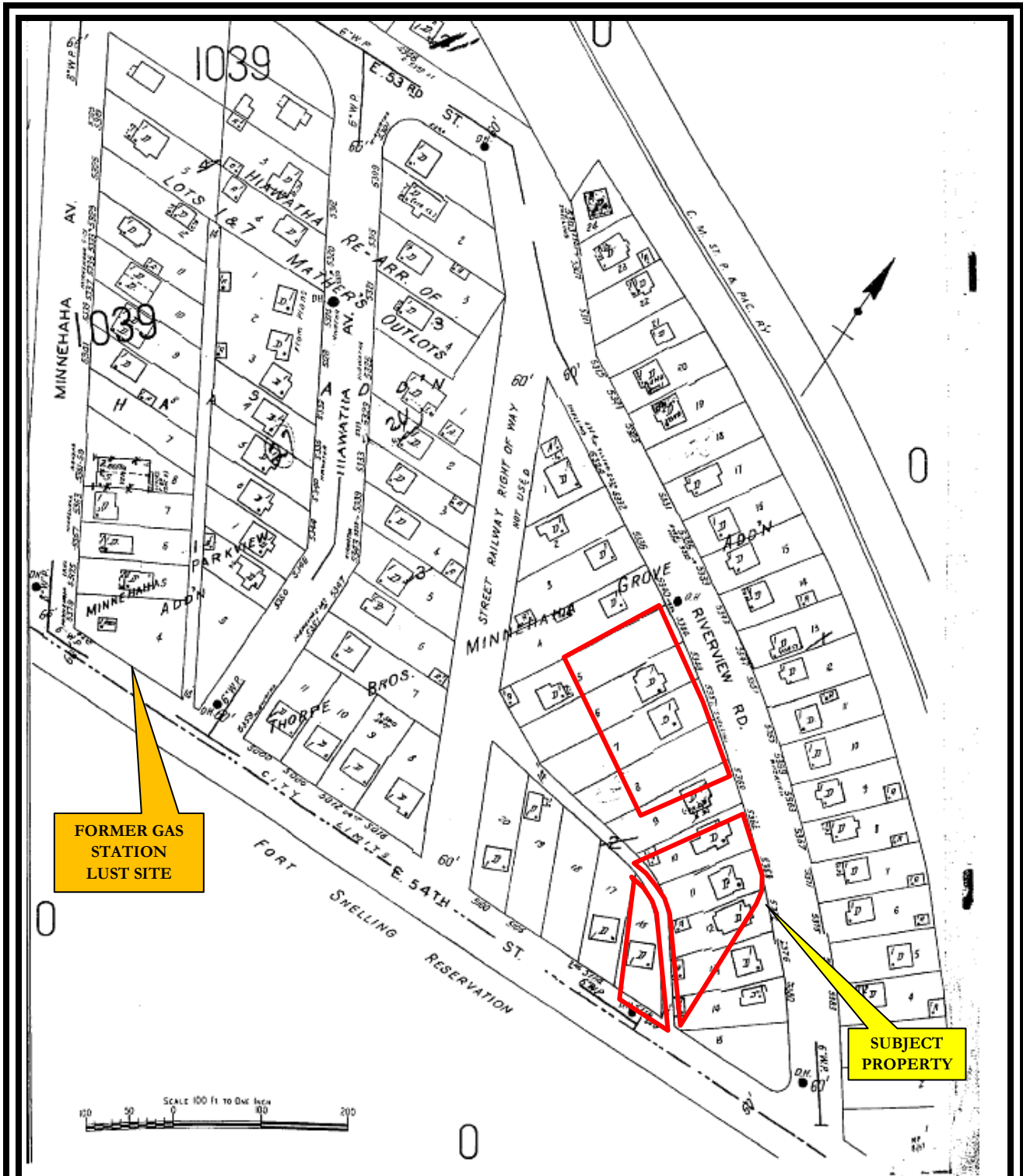


**SANBORN MAP: 1941**

**PROJECT #  
2016-P0302-0169**







**PROJECT NAME:**

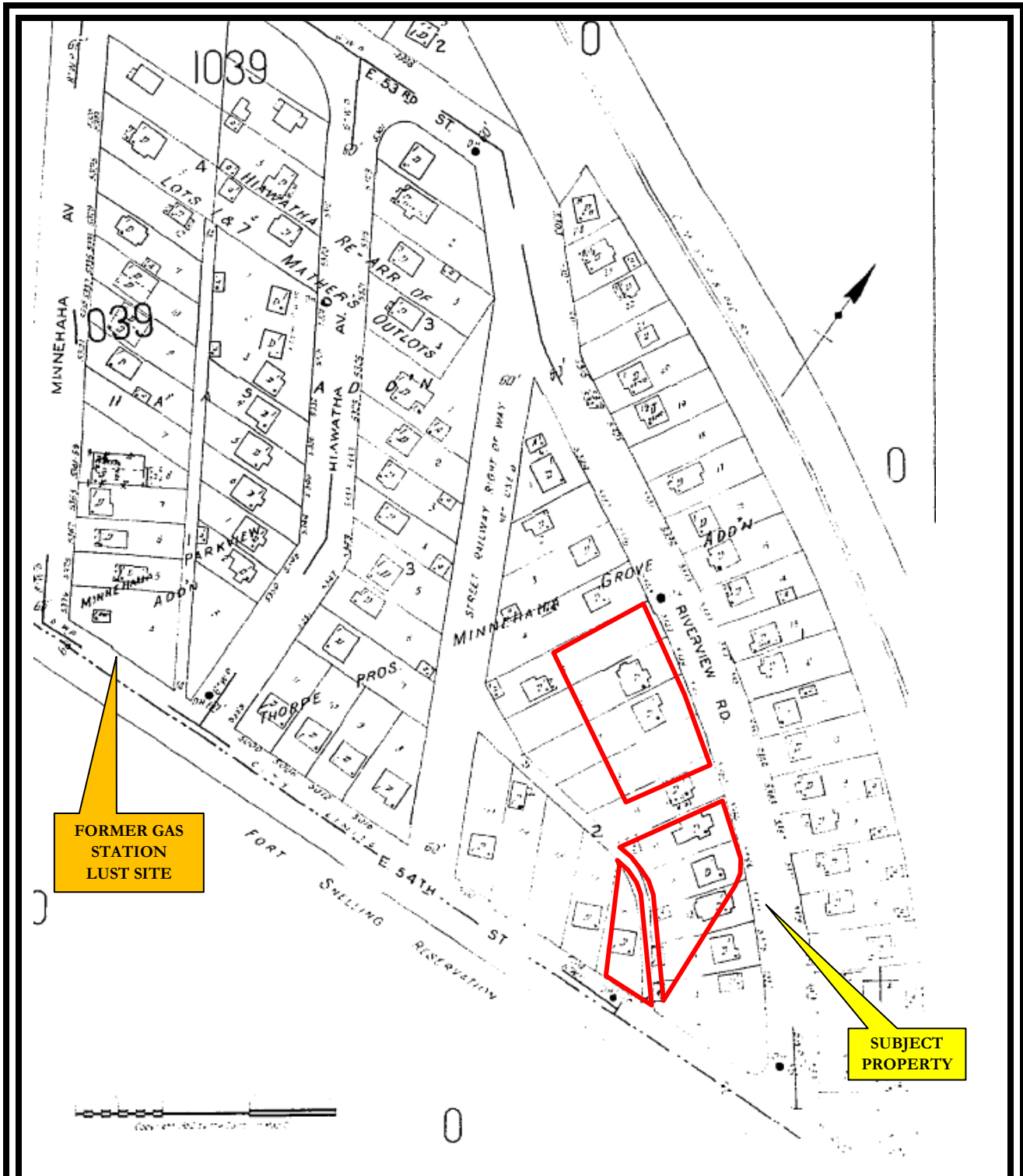
PROPOSED MINNEHAHA  
TOWNHOMES  
5348, 5364, 5368 RIVERVIEW RD.  
& 5118 EAST 54<sup>TH</sup> STREET  
MINNEAPOLIS, MN 55415



SANBORN MAP: 1951

PROJECT #  
2016-P0302-0169





**PROJECT NAME:**

PROPOSED MINNEHAHA  
 TOWNHOMES  
 5348, 5364, 5368 RIVERVIEW RD.  
 & 5118 EAST 54<sup>TH</sup> STREET  
 MINNEAPOLIS, MN 55415



SANBORN MAP: 1952

PROJECT #  
 2016-P0302-0169





SUBJECT  
PROPERTY

**PROJECT NAME:**

PROPOSED MINNEHAHA  
TOWNHOMES  
5348, 5364, 5368 RIVERVIEW RD.  
& 5118 EAST 54<sup>TH</sup> STREET  
MINNEAPOLIS, MN 55415



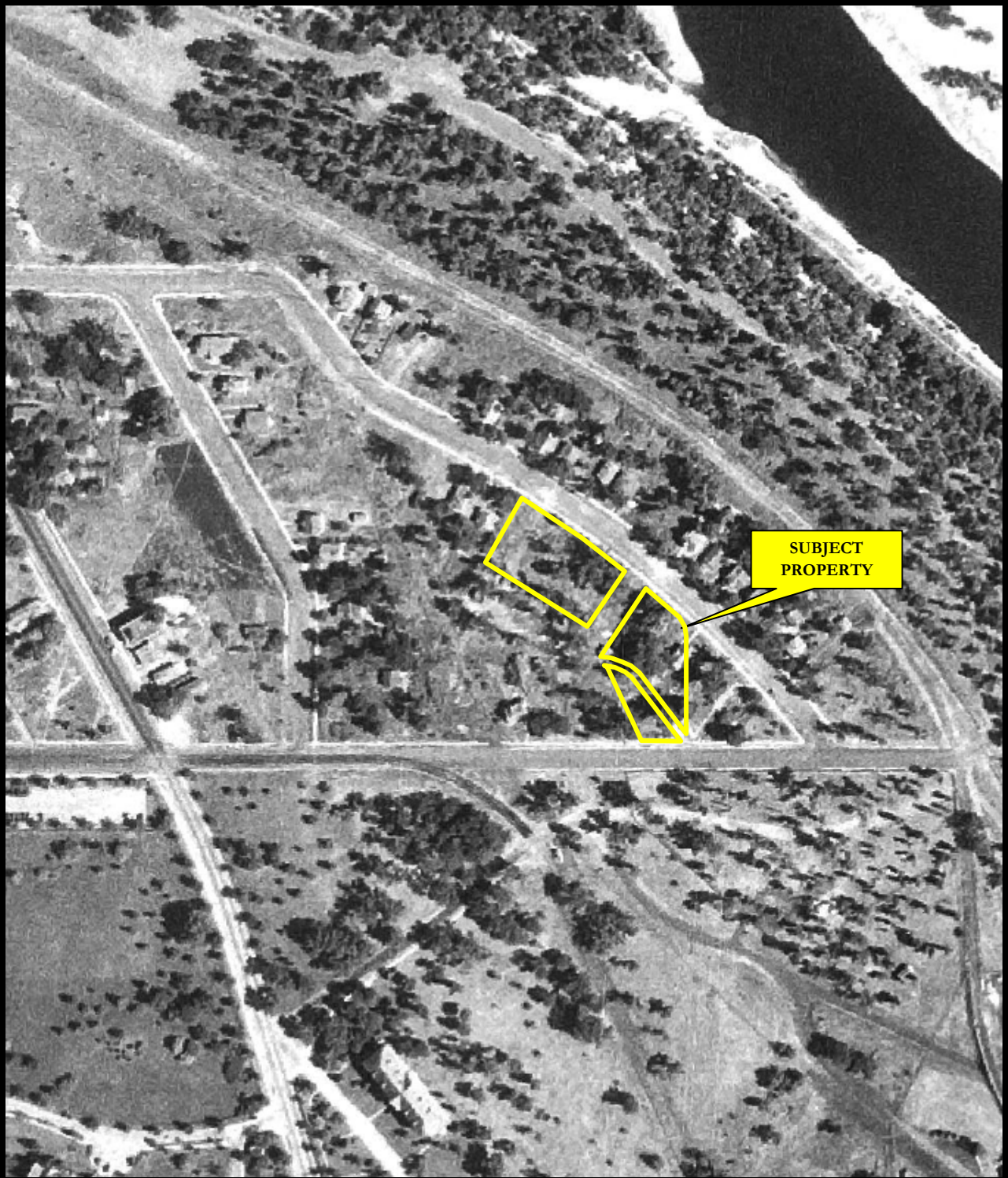
SANBORN MAP: 1966

PROJECT #  
2016-P0302-0169



**APPENDIX C**  
**HISTORIC AERIAL**  
**PHOTOGRAPHS**





**PROJECT NAME:**

PROPOSED MINNEHAHA  
TOWNHOMES  
5348, 5364, 5368 RIVERVIEW RD.  
& 5118 EAST 54<sup>TH</sup> STREET  
MINNEAPOLIS, MN 55415



AERIAL PHOTOGRAPH  
1937

PROJECT #  
2016-P0302-0169







**PROJECT NAME:**

**PROPOSED MINNEHAHA  
TOWNHOMES  
5348, 5364, 5368 RIVERVIEW RD.  
& 5118 EAST 54<sup>TH</sup> STREET  
MINNEAPOLIS, MN 55415**



**AERIAL PHOTOGRAPH  
1953**

**PROJECT #  
2016-P0302-0169**





SUBJECT  
PROPERTY

**PROJECT NAME:**

PROPOSED MINNEHAHA  
TOWNHOMES  
5348, 5364, 5368 RIVERVIEW RD.  
& 5118 EAST 54<sup>TH</sup> STREET  
MINNEAPOLIS, MN 55415

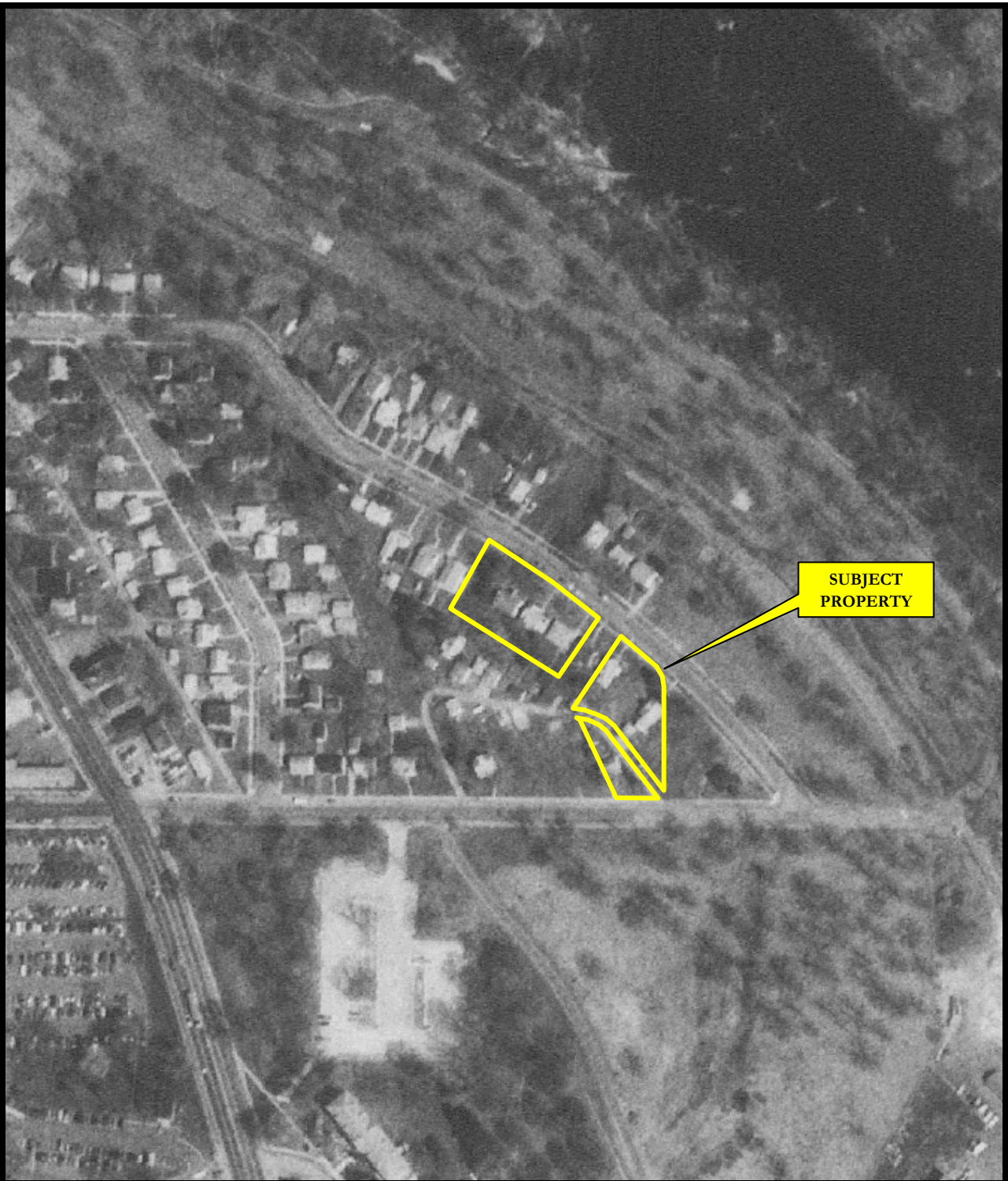


AERIAL PHOTOGRAPH  
1966

PROJECT #  
2016-P0302-0169







SUBJECT  
PROPERTY

**PROJECT NAME:**

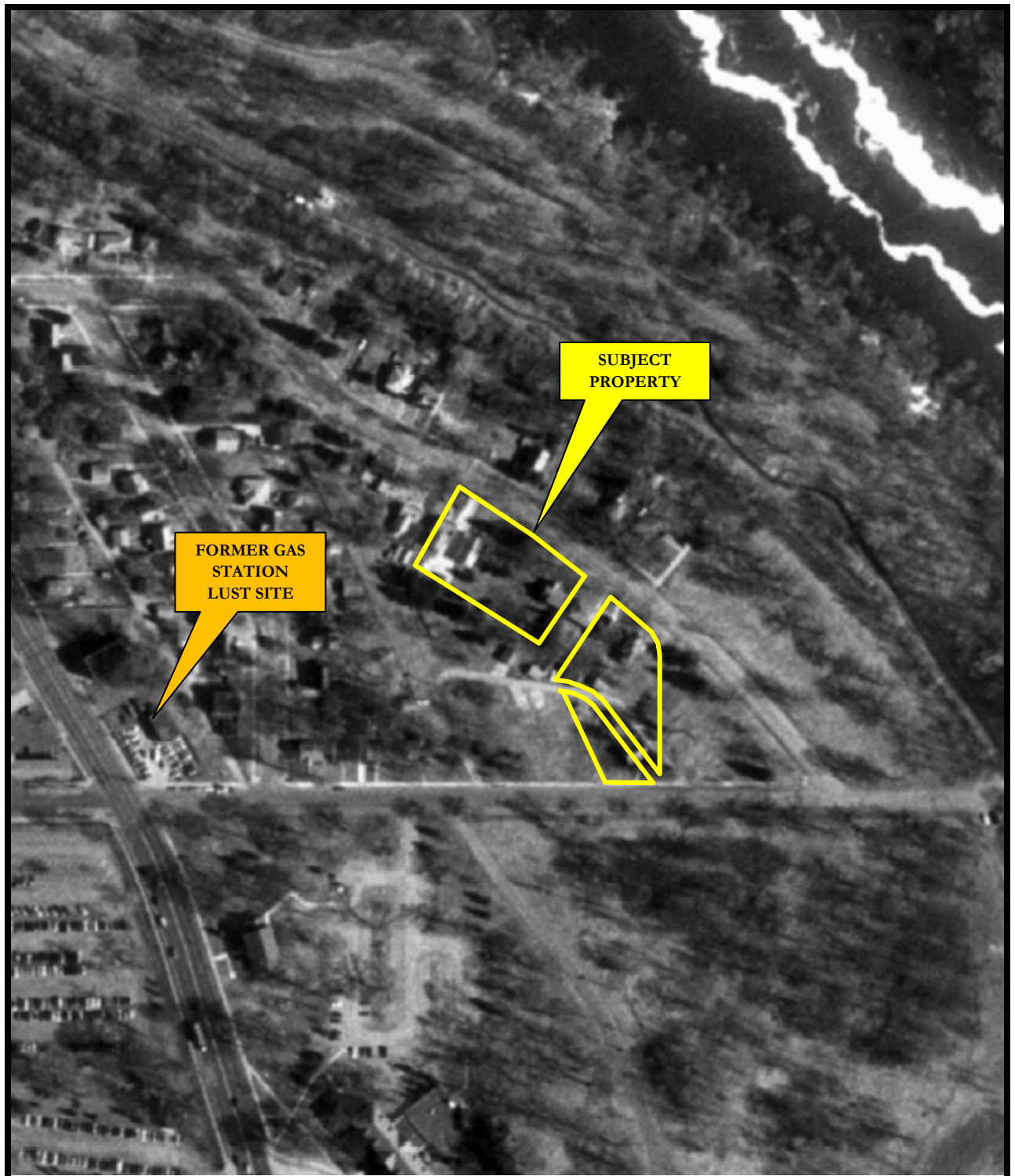
PROPOSED MINNEHAHA  
TOWNHOMES  
5348, 5364, 5368 RIVERVIEW RD.  
& 5118 EAST 54<sup>TH</sup> STREET  
MINNEAPOLIS, MN 55415



AERIAL PHOTOGRAPH  
1984

PROJECT #  
2016-P0302-0169





**PROJECT NAME:**

PROPOSED MINNEHAHA  
TOWNHOMES  
5348, 5364, 5368 RIVERVIEW RD.  
& 5118 EAST 54<sup>TH</sup> STREET  
MINNEAPOLIS, MN 55415

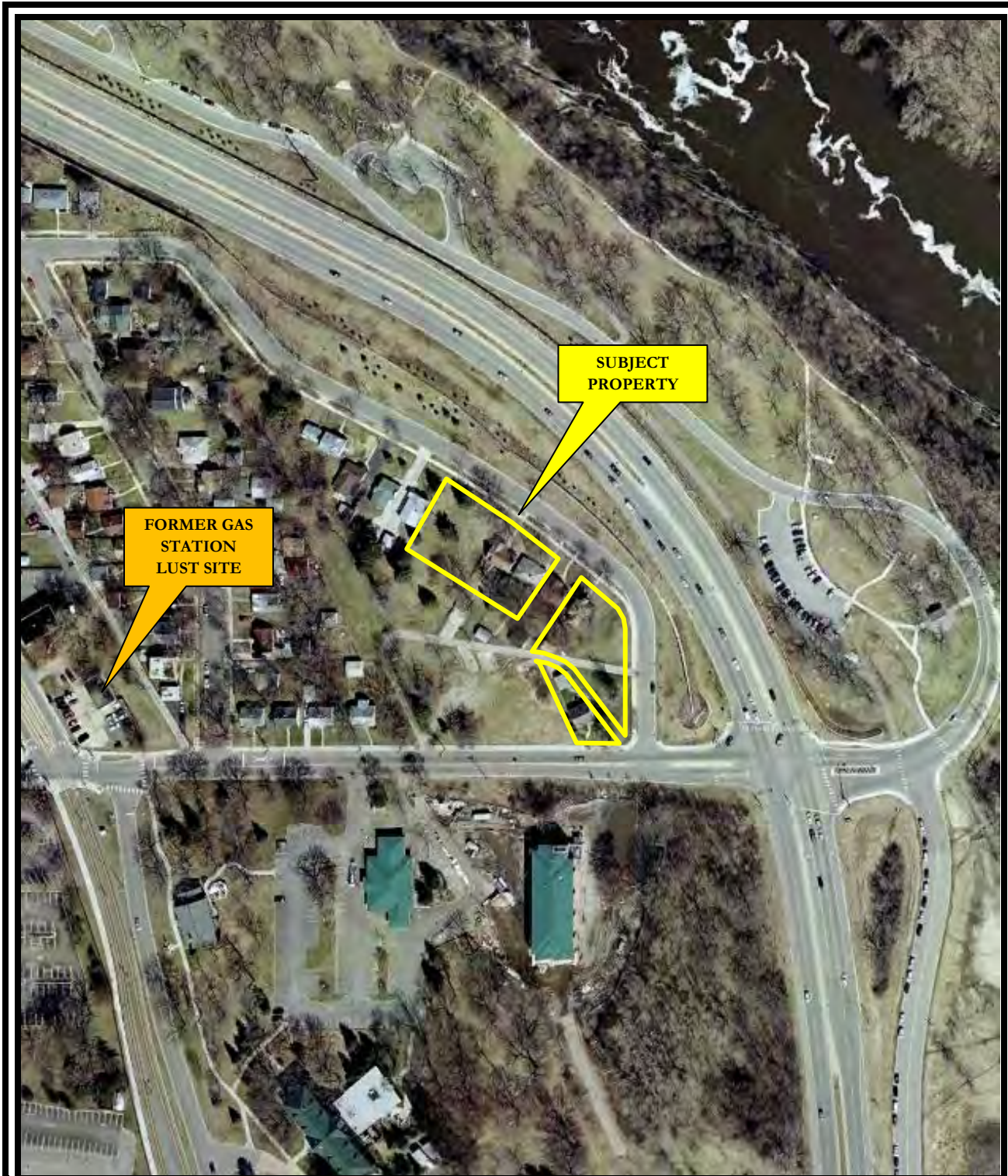


AERIAL PHOTOGRAPH  
1997

PROJECT #  
2016-P0302-0169







**PROJECT NAME:**

**PROPOSED MINNEHAHA  
TOWNHOMES  
5348, 5364, 5368 RIVERVIEW RD.  
& 5118 EAST 54<sup>TH</sup> STREET  
MINNEAPOLIS, MN 55415**



**AERIAL PHOTOGRAPH  
2006**

**PROJECT #  
2016-P0302-0169**







**PROJECT NAME:**

**PROPOSED MINNEHAHA  
TOWNHOMES  
5348, 5364, 5368 RIVERVIEW RD.  
& 5118 EAST 54<sup>TH</sup> STREET  
MINNEAPOLIS, MN 55415**



**AERIAL PHOTOGRAPH  
2016**

**PROJECT #  
2016-P0302-0169**



**APPENDIX D**  
**CITY DIRECTORIES**

**Proposed Minnehaha Townhomes Development**

5348 Riverview Road  
Minneapolis, MN 55417

Inquiry Number: 4841280.6  
January 31, 2017

# The EDR-City Directory Abstract



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### SECTION

Executive Summary

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City Directory Images

*Thank you for your business.*  
Please contact EDR at 1-800-352-0050  
with any questions or comments.

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## EXECUTIVE SUMMARY

### DESCRIPTION

Environmental Data Resources, Inc.'s (EDR) City Directory Abstract is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's City Directory Abstract includes a search and abstract of available city directory data. For each address, the directory lists the name of the corresponding occupant at five year intervals.

Business directories including city, cross reference and telephone directories were reviewed, if available, at approximately five year intervals for the years spanning 1920 through 2013. This report compiles information gathered in this review by geocoding the latitude and longitude of properties identified and gathering information about properties within 660 feet of the target property.

A summary of the information obtained is provided in the text of this report.

### RECORD SOURCES

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Data by

**infoUSA**<sup>®</sup>

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### RESEARCH SUMMARY

The following research sources were consulted in the preparation of this report. An "X" indicates where information was identified in the source and provided in this report.

<u>Year</u>	<u>Source</u>	<u>TP</u>	<u>Adjoining</u>	<u>Text Abstract</u>	<u>Source Image</u>
2013	Cole Information Services	-	X	X	-
2008	Cole Information Services	-	X	X	-
2005	Cole Information Services	-	X	X	X
	Cole Information Services	X	X	X	X
1999	R.L. Polk CO.	-	X	X	X
	R.L. Polk CO.	X	X	X	X
1993	R.L. Polk CO.	X	X	X	X
1989	R. L. Polk Co.	X	X	X	X
1988	R.L. Polk Co. Publishers	-	-	-	-
1985	R. L. Polk Co.	X	X	X	X
1979	R.L. Polk Co. Publishers	X	X	X	X
1976	R.L. Polk Co. Publishers	-	-	-	-
1975	R. L. Polk Co.	X	X	X	X
1971	R.L. Polk Co. Publishers	-	-	-	-
1970	R. L. Polk Co.	X	X	X	X

## EXECUTIVE SUMMARY

<u>Year</u>	<u>Source</u>	<u>TP</u>	<u>Adjoining</u>	<u>Text Abstract</u>	<u>Source Image</u>
1966	R.L. Polk CO.	X	X	X	X
1962	R.L. Polk Co. Publishers	-	-	-	-
1960	R. L. Polk Co.	-	X	X	X
	R. L. Polk Co.	X	X	X	X
1957	R.L. Polk and Co. Publishers	-	X	X	X
1955	Minneapolis Directory Co.	X	X	X	X
1950	Minneapolis Directory Co.	X	X	X	X
1946	Minneapolis Directory Co.	-	X	X	X
	Minneapolis Directory Co.	X	X	X	X
1940	Minneapolis Directory Co.	-	X	X	X
1935	Minneapolis Directory Co.	-	X	X	X
1930	Minneapolis Directory Co.	-	X	X	X
1925	Minneapolis Directory Co.	-	X	X	-
1920	Minneapolis Directory Co.	-	-	-	-

## EXECUTIVE SUMMARY

### SELECTED ADDRESSES

The following addresses were selected by the client, for EDR to research. An "X" indicates where information was identified.

<u>Address</u>	<u>Type</u>	<u>Findings</u>
5364 Riverview Road	Client Entered	X
5368 Riverview Road	Client Entered	X
5118 E. 54th Street	Client Entered	X
5360 Riverview Road	Client Entered	X
5015 E. 54th Street	Client Entered	
5025 E. 54th Street	Client Entered	

# FINDINGS

## TARGET PROPERTY INFORMATION

### ADDRESS

5348 Riverview Road  
Minneapolis, MN 55417

### FINDINGS DETAIL

Target Property research detail.

### 54TH E

#### 5118 54TH E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Larson Louis	R. L. Polk Co.	Image pg. A27
1955	Larson Louis	Minneapolis Directory Co.	Image pg. A31
1950	Larson Louis	Minneapolis Directory Co.	Image pg. A35

### 54TH St E

#### 5118 54TH St E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1946	Larson Louis	Minneapolis Directory Co.	Image pg. A38

### E 54TH ST

#### 5118 E 54TH ST

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1993	Peterson Jon D & Loma J	R.L. Polk CO.	Image pg. A7
1989	Larson Ruth J Mrs	R. L. Polk Co.	Image pg. A10
1985	Larson Ruth J Mrs	R. L. Polk Co.	Image pg. A13
1979	Larson Ruth J Mrs	R.L. Polk Co. Publishers	Image pg. A16
1970	LARSON RUTH J MRS	R. L. Polk Co.	Image pg. A21
1966	Larson Rutn J Mrs	R.L. Polk CO.	Image pg. A24

### E. 54th Street

#### 5118 E. 54th Street

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1993	Peterson Jon D & Loma J	R.L. Polk CO.	Image pg. A7
1989	Larson Ruth J Mrs	R. L. Polk Co.	Image pg. A10
1985	Larson Ruth J Mrs	R. L. Polk Co.	Image pg. A13

## FINDINGS

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1979	Larson Ruth J Mrs	R.L. Polk Co. Publishers	Image pg. A16
1970	LARSON RUTH J MRS	R. L. Polk Co.	Image pg. A21
1966	Larson Rutn J Mrs	R.L. Polk CO.	Image pg. A24
1960	Larson Louis	R. L. Polk Co.	Image pg. A27
1955	Larson Louis	Minneapolis Directory Co.	Image pg. A31
1950	Larson Louis	Minneapolis Directory Co.	Image pg. A35
1946	Larson Louis	Minneapolis Directory Co.	Image pg. A38

### RIVER VIEW RD

#### 5364 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Blille Randell W	R. L. Polk Co.	Image pg. A28

#### 5368 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Benson Geo A	R. L. Polk Co.	Image pg. A28

### RIVERVIEW RD

#### 5348 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1993	Christianson uane L & Linda L IC+	R.L. Polk CO.	Image pg. A8
1989	Christianson Duane L	R. L. Polk Co.	Image pg. A11
1985	Christianson Duane L	R. L. Polk Co.	Image pg. A14
1979	Olson Victor E	R.L. Polk Co. Publishers	Image pg. A17
1975	Olaon Victor E	R. L. Polk Co.	Image pg. A19
1970	OLSON VICTOR E	R. L. Polk Co.	Image pg. A22
1966	Olson Victor E	R.L. Polk CO.	Image pg. A25
1955	Olson Victor E	Minneapolis Directory Co.	Image pg. A32
1950	Olson Victor E	Minneapolis Directory Co.	Image pg. A36

#### 5364 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	RWBililie	Cole Information Services	Image pg. A1
	Theresa WBite	Cole Information Services	Image pg. A1
1999	Blilie R W 2+ A	R.L. Polk CO.	Image pg. A4
1989	Billie Theresa Mrs	R. L. Polk Co.	Image pg. A11
1985	Blilie Theresa Mrs	R. L. Polk Co.	Image pg. A14
1979	Blilie Theresa Mrs	R.L. Polk Co. Publishers	Image pg. A17

## FINDINGS

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1975	Blilie Theresa Mrs	R. L. Polk Co.	Image pg. A19
1970	BLILIE THERESA MRS	R. L. Polk Co.	Image pg. A22
1966	Billie Theresa	R.L. Polk CO.	Image pg. A25
1955	Billie Edw R	Minneapolis Directory Co.	Image pg. A32
1950	Smith Howard H	Minneapolis Directory Co.	Image pg. A36

### 5368 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1975	Last Kirk A	R. L. Polk Co.	Image pg. A19
1970	BENSON GEO A	R. L. Polk Co.	Image pg. A22
1966	Benson Geo A	R.L. Polk CO.	Image pg. A25
1955	Benson Geo A	Minneapolis Directory Co.	Image pg. A32
1950	Benson Geo A	Minneapolis Directory Co.	Image pg. A36

### Riverview Road

#### 5364 Riverview Road

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	RWBlilie	Cole Information Services	Image pg. A1
	Theresa WBite	Cole Information Services	Image pg. A1
1999	Blilie R W 2+ A	R.L. Polk CO.	Image pg. A4
1989	Billie Theresa Mrs	R. L. Polk Co.	Image pg. A11
1985	Blilie Theresa Mrs	R. L. Polk Co.	Image pg. A14
1979	Blilie Theresa Mrs	R.L. Polk Co. Publishers	Image pg. A17
1975	Blilie Theresa Mrs	R. L. Polk Co.	Image pg. A19
1970	BLILIE THERESA MRS	R. L. Polk Co.	Image pg. A22
1966	Billie Theresa	R.L. Polk CO.	Image pg. A25
1955	Billie Edw R	Minneapolis Directory Co.	Image pg. A32
1950	Smith Howard H	Minneapolis Directory Co.	Image pg. A36

#### 5368 Riverview Road

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1975	Last Kirk A	R. L. Polk Co.	Image pg. A19
1970	BENSON GEO A	R. L. Polk Co.	Image pg. A22
1966	Benson Geo A	R.L. Polk CO.	Image pg. A25
1955	Benson Geo A	Minneapolis Directory Co.	Image pg. A32
1950	Benson Geo A	Minneapolis Directory Co.	Image pg. A36

## FINDINGS

### ADJOINING PROPERTY DETAIL

The following Adjoining Property addresses were researched for this report. Detailed findings are provided for each address.

#### 54TH E

##### 5000 54TH E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Nelson Edwin G	R. L. Polk Co.	Image pg. A27
1955	US Veterans Admin Regional Office	Minneapolis Directory Co.	Image pg. A31
	US Veterans Admin Hosp	Minneapolis Directory Co.	Image pg. A31
	Nelson Edwin G	Minneapolis Directory Co.	Image pg. A31
1950	Nelson Edwin G	Minneapolis Directory Co.	Image pg. A35

##### 5006 54TH E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Blesener Helen L Mrs	R. L. Polk Co.	Image pg. A27
1955	Blesener Helen L Mrs	Minneapolis Directory Co.	Image pg. A31
1950	Blesener Alf J	Minneapolis Directory Co.	Image pg. A35

##### 5010 54TH E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1935	Tolan Edw C	Minneapolis Directory Co.	Image pg. A42

##### 5012 54TH E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Loza John	R. L. Polk Co.	Image pg. A27
1955	Loza John	Minneapolis Directory Co.	Image pg. A31
1950	Loza John	Minneapolis Directory Co.	Image pg. A35

##### 5016 54TH E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Love Ray E	R. L. Polk Co.	Image pg. A27
1955	Love Ray E	Minneapolis Directory Co.	Image pg. A31
1950	Love Ray E	Minneapolis Directory Co.	Image pg. A35

##### 5100 54TH E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Beaty Warren H	R. L. Polk Co.	Image pg. A27
	Beaty Jas M	R. L. Polk Co.	Image pg. A27



## FINDINGS

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1955	Beaty Warren H	Minneapolis Directory Co.	Image pg. A31
1950	Beaty Warren H	Minneapolis Directory Co.	Image pg. A35
1940	Beaty Warren H	Minneapolis Directory Co.	Image pg. A40
1935	Lawson Hazel O Mrs	Minneapolis Directory Co.	Image pg. A42

### 5106 54TH E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	No return	R. L. Polk Co.	Image pg. A27
1955	Benham Cyrus S	Minneapolis Directory Co.	Image pg. A31
1950	Benham Cyrus S	Minneapolis Directory Co.	Image pg. A35
1940	Bjerke Norman R	Minneapolis Directory Co.	Image pg. A40
1935	Wilsey John G	Minneapolis Directory Co.	Image pg. A42

### 5114 54TH E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Westerheim Stanley D	R. L. Polk Co.	Image pg. A27
1955	Peterson Geo J	Minneapolis Directory Co.	Image pg. A31
1950	Peterson Geo J	Minneapolis Directory Co.	Image pg. A35

### 54TH ST E

#### 0 54TH ST E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1930	No houses to	Minneapolis Directory Co.	Image pg. A44

### 54TH St E

#### 5000 54TH St E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1946	Nelson Edwin G	Minneapolis Directory Co.	Image pg. A38

#### 5006 54TH St E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1946	Blesener Alf J	Minneapolis Directory Co.	Image pg. A38

#### 5012 54TH St E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1946	Schroeder Howard A	Minneapolis Directory Co.	Image pg. A38

## FINDINGS

### 5100 54TH St E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1946	Beaty Warren H	Minneapolis Directory Co.	Image pg. A38

### 54TH ST E

#### 5100 54TH ST E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1930	Butler Andrew	Minneapolis Directory Co.	Image pg. A44

### 54TH St E

#### 5106 54TH St E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1946	Benham Cyrus S	Minneapolis Directory Co.	Image pg. A38

#### 5114 54TH St E

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1946	List Seibert B	Minneapolis Directory Co.	Image pg. A38

### E 54TH ST

#### 5000 E 54TH ST

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Barnaby Nelson Wiesner	Cole Information Services	Image pg. A2
1999	Vaslijevic Elena R WI	R.L. Polk CO.	Image pg. A5
1993	Nelson Edwin G & Belle R C+	R.L. Polk CO.	Image pg. A7
1989	Nelson Edwin G	R. L. Polk Co.	Image pg. A10
1985	Nelson Edwin G	R. L. Polk Co.	Image pg. A13
1979	Nelson Edwin G	R.L. Polk Co. Publishers	Image pg. A16
1970	NELSON EDWIN G	R. L. Polk Co.	Image pg. A21
1966	Nelson Edwin G	R.L. Polk CO.	Image pg. A24

#### 5006 E 54TH ST

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Lance T Mc Cready	Cole Information Services	Image pg. A2
1999	Gera Si Mo jerry y WI	R.L. Polk CO.	Image pg. A5
1993	Gerasimo Pilar	R.L. Polk CO.	Image pg. A7
	Gerasimo Andrea M	R.L. Polk CO.	Image pg. A7
	Gerasimo Andrea ISH	R.L. Polk CO.	Image pg. A7
1989	Gerasimo Jerry	R. L. Polk Co.	Image pg. A10

## FINDINGS

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1985	Gerasimo Jerry	R. L. Polk Co.	Image pg. A13
1979	Baumgaertner James C	R.L. Polk Co. Publishers	Image pg. A16
1970	WILCOX ROBT H	R. L. Polk Co.	Image pg. A21
1966	Wilcox Robt HO	R.L. Polk CO.	Image pg. A24

### 5010 E 54TH ST

<u>Year</u>	<u>Uses</u>	<u>Source</u>
1925	Pleasant WWm J r	Minneapolis Directory Co.
	Osgood Gilbert A printer b	Minneapolis Directory Co.
	Osgood Geo H shipper M L Boucher r	Minneapolis Directory Co.

### 5012 E 54TH ST

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1993	Oberg Tennie E S	R.L. Polk CO.	Image pg. A7
1989	Oberg Tennie E Mrs	R. L. Polk Co.	Image pg. A10
1985	Loza John	R. L. Polk Co.	Image pg. A13
1979	Loza John	R.L. Polk Co. Publishers	Image pg. A16
1970	L 3 ZA JOHN R	R. L. Polk Co.	Image pg. A21
1966	Loza John	R.L. Polk CO.	Image pg. A24

### 5015 E 54TH ST

<u>Year</u>	<u>Uses</u>	<u>Source</u>
2013	VETERANS & COMMUNITY HOUSING	Cole Information Services
	VETERANS & COMMUNITY HOUSING	Cole Information Services

### 5016 E 54TH ST

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Hazel Amanda Love	Cole Information Services	Image pg. A2
	RIVERVIEW RD 11 NTS	Cole Information Services	Image pg. A2
1999	Love Ray EW+ A	R.L. Polk CO.	Image pg. A5
1993	Love Ray E & Hazel A	R.L. Polk CO.	Image pg. A7
1989	Love Ray E	R. L. Polk Co.	Image pg. A10
1985	Love Ray E	R. L. Polk Co.	Image pg. A13
1979	Love Ray E	R.L. Polk Co. Publishers	Image pg. A16
1970	LOVE RAY E	R. L. Polk Co.	Image pg. A21
1966	Love Ray E	R.L. Polk CO.	Image pg. A24

## FINDINGS

### 5025 E 54TH ST

<u>Year</u>	<u>Uses</u>	<u>Source</u>
2008	FORT SNELLING FEDERAL CREDIT UNION	Cole Information Services
	FORT SNELLING FEDERAL CREDIT UNION	Cole Information Services

### 5100 E 54TH ST

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1993	A R C MOVERS	R.L. Polk CO.	Image pg. A7
1989	Carlson Ernest F	R. L. Polk Co.	Image pg. A10
1985	Prigge Linda	R. L. Polk Co.	Image pg. A13
1979	Tuerberg I Richd V	R.L. Polk Co. Publishers	Image pg. A16
1970	MC CARTY ROBT F	R. L. Polk Co.	Image pg. A21
1966	Beaty Warren H O	R.L. Polk CO.	Image pg. A24

### 5106 E 54TH ST

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1970	DONGOSKE LEONARD	R. L. Polk Co.	Image pg. A21
1966	Dongoske Leonard	R.L. Polk CO.	Image pg. A24
1925	Rotegard Olof C millwright r	Minneapolis Directory Co.	

### 5110 E 54TH ST

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1970	BOE ROBT A	R. L. Polk Co.	Image pg. A21
1966	Boe Robt A	R.L. Polk CO.	Image pg. A24

### 5114 E 54TH ST

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1970	WESTERHEIM STANLEY D	R. L. Polk Co.	Image pg. A21
1966	Westerheim Stanley D	R.L. Polk CO.	Image pg. A24

## HIAWATHA AVE

### 5332 HIAWATHA AVE

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1985	Graham James A CD	R. L. Polk Co.	Image pg. A15
1979	Graham J A	R.L. Polk Co. Publishers	Image pg. A18
1975	Grams	R. L. Polk Co.	Image pg. A20
1970	ESTES SHELTON	R. L. Polk Co.	Image pg. A23
1966	Dale Clayton M	R.L. Polk CO.	Image pg. A26
1960	Dale Clayton M	R. L. Polk Co.	Image pg. A29

## FINDINGS

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1955	Dale Clayton M	Minneapolis Directory Co.	Image pg. A33
1950	Dale Marie L Mrs	Minneapolis Directory Co.	Image pg. A37

### 5333 HIAWATHA AVE

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1985	Ingalls Patk E	R. L. Polk Co.	Image pg. A15
1979	Ingalls Patk E	R.L. Polk Co. Publishers	Image pg. A18
1975	Anderson J Alida Mrs	R. L. Polk Co.	Image pg. A20
1970	ANDERSON EDWIN E	R. L. Polk Co.	Image pg. A23
1966	Anderson Edwin E	R.L. Polk CO.	Image pg. A26
1960	Anderson Edwin E	R. L. Polk Co.	Image pg. A29
1955	Lund Herman F	Minneapolis Directory Co.	Image pg. A33
1950	Lund Herman F	Minneapolis Directory Co.	Image pg. A37
1946	Lund Herman F	Minneapolis Directory Co.	Image pg. A39
1940	Lund Herman F	Minneapolis Directory Co.	Image pg. A41
1935	Long Frank L	Minneapolis Directory Co.	Image pg. A43
1930	Reese Mae Mrs	Minneapolis Directory Co.	Image pg. A45

### 5336 HIAWATHA AVE

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1985	Goar Louis E	R. L. Polk Co.	Image pg. A15
1979	Goar Louis E	R.L. Polk Co. Publishers	Image pg. A18
1975	Goar Louis E Jr	R. L. Polk Co.	Image pg. A20
1970	GOAR LOUIS E JR	R. L. Polk Co.	Image pg. A23
1966	Goar Louis E	R.L. Polk CO.	Image pg. A26
1960	Rasmussen Geo A	R. L. Polk Co.	Image pg. A29
1955	Rasmussen Geo A	Minneapolis Directory Co.	Image pg. A33
1950	Balmer Don L	Minneapolis Directory Co.	Image pg. A37

### 5339 HIAWATHA AVE

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1985	Clobes Donald H	R. L. Polk Co.	Image pg. A15
1979	Clobes Donald H	R.L. Polk Co. Publishers	Image pg. A18
1975	Vacant	R. L. Polk Co.	Image pg. A20
1970	BECK MARY A MRS	R. L. Polk Co.	Image pg. A23
1966	Beck Mary A Mrs	R.L. Polk CO.	Image pg. A26
1960	Beck Mary A Mrs	R. L. Polk Co.	Image pg. A29
1955	Beck Walter E	Minneapolis Directory Co.	Image pg. A33
1950	Beck Walter E	Minneapolis Directory Co.	Image pg. A37

## FINDINGS

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1946	Beck Walter E	Minneapolis Directory Co.	Image pg. A39
1940	Beck Walter E	Minneapolis Directory Co.	Image pg. A41
1935	Beck Walter E	Minneapolis Directory Co.	Image pg. A43
1930	Beck Walter E	Minneapolis Directory Co.	Image pg. A45
1925	Neff Jesse A mngr ptg dept Amera Chemical Co Inc b	Minneapolis Directory Co.	
	Neff Laura Mrs r	Minneapolis Directory Co.	

### 5340 HIAWATHA AVE

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1985	Ruotsinoja Steven	R. L. Polk Co.	Image pg. A15
1979	Ruoteinoja Steven	R.L. Polk Co. Publishers	Image pg. A18
1975	Seeger Wm L	R. L. Polk Co.	Image pg. A20
1970	SEEGER WM L	R. L. Polk Co.	Image pg. A23
1966	Ulstrom David R	R.L. Polk CO.	Image pg. A26
1960	Vacant	R. L. Polk Co.	Image pg. A29
1955	Kolesar Wm R	Minneapolis Directory Co.	Image pg. A33
1950	Kolesar Wm R	Minneapolis Directory Co.	Image pg. A37

### 5343 HIAWATHA AVE

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1985	Dupont Carnet	R. L. Polk Co.	Image pg. A15
1979	Dupont Carnet	R.L. Polk Co. Publishers	Image pg. A18
1975	Dupont Carnet	R. L. Polk Co.	Image pg. A20
1970	DUPONT CARNET	R. L. Polk Co.	Image pg. A23
1966	Haiby Arlan P	R.L. Polk CO.	Image pg. A26
1960	Johnson Henry J	R. L. Polk Co.	Image pg. A29
1955	Johnson Henry J	Minneapolis Directory Co.	Image pg. A34

### 5344 HIAWATHA AVE

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1985	Hullerman Cath M	R. L. Polk Co.	Image pg. A15
1979	Hullerman Cath M	R.L. Polk Co. Publishers	Image pg. A18
1975	Hul Jerman Cath M	R. L. Polk Co.	Image pg. A20
1970	HULLERMAN CATH M	R. L. Polk Co.	Image pg. A23
1966	Hullerman Cath M	R.L. Polk CO.	Image pg. A26
1960	Hullerman Cath M	R. L. Polk Co.	Image pg. A29
1955	Doak Robt L	Minneapolis Directory Co.	Image pg. A34
1950	Doak Robt L	Minneapolis Directory Co.	Image pg. A37

## FINDINGS

### 5347 HIAWATHA AVE

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1985	Workman Ruth F Mrs	R. L. Polk Co.	Image pg. A15
1979	Workman Ruth F Mrs	R.L. Polk Co. Publishers	Image pg. A18
1975	Workman Ruth F Mrs	R. L. Polk Co.	Image pg. A20
1970	WORKMAN RUTH F MRS	R. L. Polk Co.	Image pg. A23
1966	Workman Ruth F Mrs	R.L. Polk CO.	Image pg. A26
1960	Workman Laurens M	R. L. Polk Co.	Image pg. A29
1955	Workman Laurens M	Minneapolis Directory Co.	Image pg. A34
1950	Workman Laurens M	Minneapolis Directory Co.	Image pg. A37
1946	Workman Laurenc M	Minneapolis Directory Co.	Image pg. A39
1940	Workman Laurens M	Minneapolis Directory Co.	Image pg. A41
1935	Workman Laurens M	Minneapolis Directory Co.	Image pg. A43
1930	Workman Laurens M	Minneapolis Directory Co.	Image pg. A45
	City Limits	Minneapolis Directory Co.	Image pg. A45
	E 54th Intersects	Minneapolis Directory Co.	Image pg. A45
1925	O Chas L salsn Martin F Falk Paper Co	Minneapolis Directory Co.	
	b	Minneapolis Directory Co.	

### 5348 HIAWATHA AVE

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1985	Drew Diane A	R. L. Polk Co.	Image pg. A15
1979	Drew Ronald J	R.L. Polk Co. Publishers	Image pg. A18
1975	Drew Ronald J t	R. L. Polk Co.	Image pg. A20
1970	DREW RONALD J	R. L. Polk Co.	Image pg. A23
1966	Goodse U Wm Jjr O	R.L. Polk CO.	Image pg. A26
1960	Goodsell Wm J	R. L. Polk Co.	Image pg. A29
1955	Sklenar Robt B	Minneapolis Directory Co.	Image pg. A34
1950	Carlsen Robt A	Minneapolis Directory Co.	Image pg. A37
1946	Carlsen Robt A	Minneapolis Directory Co.	Image pg. A39

### 5350 HIAWATHA AVE

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1985	Miller James K	R. L. Polk Co.	Image pg. A15
1979	Rundgren Richd L	R.L. Polk Co. Publishers	Image pg. A18
1975	Rundgren Richd L I	R. L. Polk Co.	Image pg. A20
1970	RUNDGREN RICHD L	R. L. Polk Co.	Image pg. A23
1966	No Return	R.L. Polk CO.	Image pg. A26
1960	Peterson Donald L	R. L. Polk Co.	Image pg. A29
1955	Butler Louise Mrs	Minneapolis Directory Co.	Image pg. A34

## FINDINGS

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1950	Butler Louise Mrs	Minneapolis Directory Co.	Image pg. A37
1946	Butler Louise Mrs	Minneapolis Directory Co.	Image pg. A39
1940	Butler Andrew	Minneapolis Directory Co.	Image pg. A41
1935	Butler Andrew	Minneapolis Directory Co.	Image pg. A43
1925	Butler Theresa laundress b	Minneapolis Directory Co.	
	Co Emil J lab b	Minneapolis Directory Co.	
	Co Andrew watchman Mpls Gas Lt Co r	Minneapolis Directory Co.	

### 5351 HIAWATHA AVE

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1985	Bonin Florence M Mrs	R. L. Polk Co.	Image pg. A15
1979	Bonin Florence M Mrs	R.L. Polk Co. Publishers	Image pg. A18
1975	Bonin Florence M Mrs It	R. L. Polk Co.	Image pg. A20
1970	BONIN FLORENCE M MRS	R. L. Polk Co.	Image pg. A23
1966	Bonin Florence M Mrs	R.L. Polk CO.	Image pg. A26
1960	Bonin Richd V	R. L. Polk Co.	Image pg. A29
1955	Bonin Richd V	Minneapolis Directory Co.	Image pg. A34
1950	Bonin Richd V	Minneapolis Directory Co.	Image pg. A37
1946	Bonin Richd V	Minneapolis Directory Co.	Image pg. A39

### 5358 HIAWATHA AVE

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1979	Aslakson Gary L	R.L. Polk Co. Publishers	Image pg. A18
1975	Custer James	R. L. Polk Co.	Image pg. A20

### 5360 HIAWATHA AVE

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1985	Englin Donald	R. L. Polk Co.	Image pg. A15
1979	Englin Donald C	R.L. Polk Co. Publishers	Image pg. A18
1975	Huss Julia D Mrs	R. L. Polk Co.	Image pg. A20

## HIAWATHA LN

### 5332 HIAWATHA LN

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Kimberly Ann Wegscheid	Cole Information Services	Image pg. A3
1993	Jewson Jeffrey S	R.L. Polk CO.	Image pg. A9
1989	Jewson Clara B	R. L. Polk Co.	Image pg. A12



## FINDINGS

### 5333 HIAWATHA LN

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	NP	Cole Information Services	Image pg. A3
1999	Peabody Eric E & Blan lche E+ A	R.L. Polk CO.	Image pg. A6
1993	Peabody Eric	R.L. Polk CO.	Image pg. A9
1989	Benson Bruce W	R. L. Polk Co.	Image pg. A12

### 5336 HIAWATHA LN

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Shane Kristian Roberts	Cole Information Services	Image pg. A3
	Jennifer K Roberts	Cole Information Services	Image pg. A3
1993	Not Verified	R.L. Polk CO.	Image pg. A9
1989	Tang Trong Nghia	R. L. Polk Co.	Image pg. A12

### 5339 HIAWATHA LN

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Gregory Todd Wilson	Cole Information Services	Image pg. A3
	Ebony Dawnmarie Wilson	Cole Information Services	Image pg. A3
1993	Dupont Darcy L	R.L. Polk CO.	Image pg. A9
	Clobes Donald H & Susan H+	R.L. Polk CO.	Image pg. A9
1989	Clobes Donald H	R. L. Polk Co.	Image pg. A12

### 5340 HIAWATHA LN

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Regina Camille Byrd	Cole Information Services	Image pg. A3
	Lee Wayne Byrd	Cole Information Services	Image pg. A3
1993	Turner Michl	R.L. Polk CO.	Image pg. A9
1989	Byrd Lee W	R. L. Polk Co.	Image pg. A12

### 5343 HIAWATHA LN

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Garnet 0 Dupont	Cole Information Services	Image pg. A3
1999	Almquist Darcy	R.L. Polk CO.	Image pg. A6
	Dupont Darcy L E	R.L. Polk CO.	Image pg. A6
1993	Dupont Joyce M IN	R.L. Polk CO.	Image pg. A9
1989	Dupont Carnet	R. L. Polk Co.	Image pg. A12

### 5344 HIAWATHA LN

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Amy N Buc en	Cole Information Services	Image pg. A3
	Beau Bucklen	Cole Information Services	Image pg. A3

## FINDINGS

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1999	Page Michael R A	R.L. Polk CO.	Image pg. A6
1993	Hullerman Cath M BI+	R.L. Polk CO.	Image pg. A9
1989	Hullerman Cath M	R. L. Polk Co.	Image pg. A12

### 5347 HIAWATHA LN

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Patrick LHovde	Cole Information Services	Image pg. A3
1999	Workmran Laurence T E 1+ A	R.L. Polk CO.	Image pg. A6
1993	Workman Laurens M BH	R.L. Polk CO.	Image pg. A9
1989	Workman Ruth F Mrs	R. L. Polk Co.	Image pg. A12

### 5348 HIAWATHA LN

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Matthew R Drew	Cole Information Services	Image pg. A3
1999	Drew Ronald J Ei+ A	R.L. Polk CO.	Image pg. A6
1993	Drew Ronald BHI	R.L. Polk CO.	Image pg. A9
1989	Drew Ronald J	R. L. Polk Co.	Image pg. A12

### 5350 HIAWATHA LN

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Erik K Pettersen	Cole Information Services	Image pg. A3
1999	Mc Curdy Bobbie B E	R.L. Polk CO.	Image pg. A6
1993	Mc Curdy Bobbie IS	R.L. Polk CO.	Image pg. A9
1989	Mc Curdy Bobbie	R. L. Polk Co.	Image pg. A12

### 5351 HIAWATHA LN

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Richard V Bonin	Cole Information Services	Image pg. A3
	Francis Girard Bonin	Cole Information Services	Image pg. A3
1999	Bonin Francis G + A	R.L. Polk CO.	Image pg. A6
1993	Bonin Francis G	R.L. Polk CO.	Image pg. A9
	Bonin Richd V BJ+	R.L. Polk CO.	Image pg. A9
1989	Bonin Florence M Mrs	R. L. Polk Co.	Image pg. A12

### 5358 HIAWATHA LN

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Kasondra Kapttan	Cole Information Services	Image pg. A3
1993	Stenlund Arvid IS	R.L. Polk CO.	Image pg. A9
1989	Stenlund Arvid	R. L. Polk Co.	Image pg. A12

## FINDINGS

### 5360 HIAWATHA LN

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Michael Stanberry	Cole Information Services	Image pg. A3
	WAtwater	Cole Information Services	Image pg. A3
1999	Garbinsky G	R.L. Polk CO.	Image pg. A6
1993	Englin Carl N & Mae E BH+	R.L. Polk CO.	Image pg. A9
1989	Englin Carl N	R. L. Polk Co.	Image pg. A12

### RIVER VIEW RD

#### 5307 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Hoivik Berent J	R. L. Polk Co.	Image pg. A28

#### 5311 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Kratz Alvin	R. L. Polk Co.	Image pg. A28

#### 5315 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Evans Clifford	R. L. Polk Co.	Image pg. A28

#### 5319 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Skarsten Harry I	R. L. Polk Co.	Image pg. A28

#### 5323 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Nyberg Olga M Mrs	R. L. Polk Co.	Image pg. A28

#### 5324 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Johnson Leigh E	R. L. Polk Co.	Image pg. A28

#### 5327 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Hurley Henry J	R. L. Polk Co.	Image pg. A28

#### 5331 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Dunnell Ronald D	R. L. Polk Co.	Image pg. A28

## FINDINGS

### 5332 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Schubert Lawrence H	R. L. Polk Co.	Image pg. A28

### 5335 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Johnson Albert E	R. L. Polk Co.	Image pg. A28

### 5336 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Wilson Webster C	R. L. Polk Co.	Image pg. A28

### 5339 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Larson Robt P	R. L. Polk Co.	Image pg. A28

### 5340 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Larson Brons	R. L. Polk Co.	Image pg. A28

### 5343 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Carlson Anna K Mrs	R. L. Polk Co.	Image pg. A28

### 5344 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	OBrien Eug C	R. L. Polk Co.	Image pg. A28

### 5347 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Anderson Lloyd C	R. L. Polk Co.	Image pg. A28

### 5348 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Olson Victor E	R. L. Polk Co.	Image pg. A28

### 5351 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Wold Otto L	R. L. Polk Co.	Image pg. A28

### 5352 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Hursh Philip W	R. L. Polk Co.	Image pg. A28

## FINDINGS

### 5355 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Dongoske Leonard	R. L. Polk Co.	Image pg. A28

### 5356 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Craighead Herman W painting contr	R. L. Polk Co.	Image pg. A28

### 5359 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Knudsen Kermit L	R. L. Polk Co.	Image pg. A28

### 5360 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Larson Edwin W	R. L. Polk Co.	Image pg. A28

### 5363 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Stansbury Clarice J Mrs	R. L. Polk Co.	Image pg. A28

### 5367 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Doris Philip	R. L. Polk Co.	Image pg. A28

### 5371 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Kennedy Chas D	R. L. Polk Co.	Image pg. A28

### 5372 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Bjerknes Benj F	R. L. Polk Co.	Image pg. A28

### 5375 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Rich Jas	R. L. Polk Co.	Image pg. A28

### 5376 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Solvie Adolph B	R. L. Polk Co.	Image pg. A28

### 5379 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Vacant	R. L. Polk Co.	Image pg. A28

## FINDINGS

### 5380 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Norskog Gordon H	R. L. Polk Co.	Image pg. A28

### 5383 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Grygelko Anton G	R. L. Polk Co.	Image pg. A28

### 5384 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	McLean J Burnet	R. L. Polk Co.	Image pg. A28

### 5387 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Seefeldt Wilfred Rev	R. L. Polk Co.	Image pg. A28

### 5391 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	Lamberton Donald W	R. L. Polk Co.	Image pg. A28

### 5395 RIVER VIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1960	White Thomas F	R. L. Polk Co.	Image pg. A28

### RIVERVIEW RD

#### 5307 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1975	No Return	R. L. Polk Co.	Image pg. A19
1970	HOIVIK BERENT J	R. L. Polk Co.	Image pg. A22
1966	Hoivik Berent J	R.L. Polk CO.	Image pg. A25
1955	Hoivik Berent J	Minneapolis Directory Co.	Image pg. A32
1950	Holvik Berant	Minneapolis Directory Co.	Image pg. A36

#### 5311 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1993	Kratz Alvin & Carol J 1\$+ a	R.L. Polk CO.	Image pg. A8
1989	Kratz Alvin	R. L. Polk Co.	Image pg. A11
1985	Kratz Alvin	R. L. Polk Co.	Image pg. A14
1979	Kratz Alvin	R.L. Polk Co. Publishers	Image pg. A17
1975	Kratz Alvin	R. L. Polk Co.	Image pg. A19
1970	KRATZ ALVIN	R. L. Polk Co.	Image pg. A22

## FINDINGS

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1966	Kratz Alvin	R.L. Polk CO.	Image pg. A25
1955	Hartke Darwin	Minneapolis Directory Co.	Image pg. A32
	Hartke Studio photog	Minneapolis Directory Co.	Image pg. A32
1950	Vacant	Minneapolis Directory Co.	Image pg. A36

### 5315 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1993	Evans Clifford & Gladys L BJ+	R.L. Polk CO.	Image pg. A8
1989	Evans Clifford	R. L. Polk Co.	Image pg. A11
1985	Evans Clifford e	R. L. Polk Co.	Image pg. A14
1979	Evans Clifford	R.L. Polk Co. Publishers	Image pg. A17
1970	EVANS CLIFFORD	R. L. Polk Co.	Image pg. A22
1966	Evans Clifford	R.L. Polk CO.	Image pg. A25
1955	Evans Clifford N	Minneapolis Directory Co.	Image pg. A32
1950	Evans Clifford	Minneapolis Directory Co.	Image pg. A36

### 5316 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1975	Evans Clifford	R. L. Polk Co.	Image pg. A19

### 5319 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1999	Reynolds Danny	R.L. Polk CO.	Image pg. A4
1993	Not Verified	R.L. Polk CO.	Image pg. A8
1985	Skarsten Harry I	R. L. Polk Co.	Image pg. A14
1979	Skarsten Harry I	R.L. Polk Co. Publishers	Image pg. A17
1975	Skarsten Harry I	R. L. Polk Co.	Image pg. A19
1970	SKARSTEN HARRY H	R. L. Polk Co.	Image pg. A22
1966	Skarsten Harry I	R.L. Polk CO.	Image pg. A25
1955	Skarten Harry E	Minneapolis Directory Co.	Image pg. A32
1950	Schwanz Emil W	Minneapolis Directory Co.	Image pg. A36

### 5323 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1999	Landberg Jon M + A	R.L. Polk CO.	Image pg. A4
1993	Landberg Jon	R.L. Polk CO.	Image pg. A8
1989	Pegler B	R. L. Polk Co.	Image pg. A11
1985	Seefeldt Wilbert T Rev	R. L. Polk Co.	Image pg. A14
1979	Seefeldt Wilbert T Rev	R.L. Polk Co. Publishers	Image pg. A17
1975	Seefeldt Wilbert T Rev	R. L. Polk Co.	Image pg. A19



## FINDINGS

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1970	SEEFELDT WILBERT T REV	R. L. Polk Co.	Image pg. A22
1966	Seefeldt Wilbert T Rev	R.L. Polk CO.	Image pg. A25
1955	Northfelt Richd A	Minneapolis Directory Co.	Image pg. A32
	Nyberg Oscar A	Minneapolis Directory Co.	Image pg. A32
1950	Nyberg Oscar A	Minneapolis Directory Co.	Image pg. A36

### 5324 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	NP	Cole Information Services	Image pg. A1
1993	Fait Troy D	R.L. Polk CO.	Image pg. A8
	Not Verified 2 Haes	R.L. Polk CO.	Image pg. A8
1989	Nelson Irel E	R. L. Polk Co.	Image pg. A11
1985	Nelson Irel E	R. L. Polk Co.	Image pg. A14
1979	Butler General H	R.L. Polk Co. Publishers	Image pg. A17
1975	Johnson Frances M Mrs	R. L. Polk Co.	Image pg. A19
1970	JOHNSON FRANCES M MRS	R. L. Polk Co.	Image pg. A22
1966	Johnson Leigh E	R.L. Polk CO.	Image pg. A25
1955	Mertens Theo J	Minneapolis Directory Co.	Image pg. A32
1950	Bailey John J	Minneapolis Directory Co.	Image pg. A36

### 5327 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1989	Fait P L	R. L. Polk Co.	Image pg. A11
1985	Wood John W	R. L. Polk Co.	Image pg. A14
	Stohlgren Keith	R. L. Polk Co.	Image pg. A14
1979	Schlenk Edw B	R.L. Polk Co. Publishers	Image pg. A17
1975	Shamnron Donald	R. L. Polk Co.	Image pg. A19
1970	EHRHARDT W B	R. L. Polk Co.	Image pg. A22
1966	Hurley Richd J	R.L. Polk CO.	Image pg. A25

### 5331 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1970	HERKAL VIRGINIA M MRS	R. L. Polk Co.	Image pg. A22
1966	Herkal Fred J jr	R.L. Polk CO.	Image pg. A25
1955	Dunnell Ronald D	Minneapolis Directory Co.	Image pg. A32
1950	Hammerlund Alf	Minneapolis Directory Co.	Image pg. A36

### 5332 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Terry Lee Bums	Cole Information Services	Image pg. A1

## FINDINGS

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1999	Bums Terence L	R.L. Polk CO.	Image pg. A4
1993	Papp Geza B	R.L. Polk CO.	Image pg. A8
1989	Papp Katharina C Mrs	R. L. Polk Co.	Image pg. A11
1985	Papp Katharina C Mrs	R. L. Polk Co.	Image pg. A14
1979	Papp Geza	R.L. Polk Co. Publishers	Image pg. A17
1970	PAPA GEZA	R. L. Polk Co.	Image pg. A22
1966	Schubert Lawrence H	R.L. Polk CO.	Image pg. A25
1955	Schubert L H	Minneapolis Directory Co.	Image pg. A32
1950	Schubert Lawrence H	Minneapolis Directory Co.	Image pg. A36

### 5335 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1970	FOS IN RICHD A	R. L. Polk Co.	Image pg. A22
1966	Johnson Rachel P Mrs	R.L. Polk CO.	Image pg. A25
1955	Johnson Albert E	Minneapolis Directory Co.	Image pg. A32

### 5336 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	NP	Cole Information Services	Image pg. A1
1999	Schubert Larry	R.L. Polk CO.	Image pg. A4
1993	Schubert Lawr H I	R.L. Polk CO.	Image pg. A8
1989	Vacant	R. L. Polk Co.	Image pg. A11
1985	Gustafson Greg G	R. L. Polk Co.	Image pg. A14
1979	Knoblauch Thou	R.L. Polk Co. Publishers	Image pg. A17
1975	Pershing W	R. L. Polk Co.	Image pg. A19
1970	VACANT	R. L. Polk Co.	Image pg. A22
1966	Wilson Webster C	R.L. Polk CO.	Image pg. A25
1955	Wilson Webster C	Minneapolis Directory Co.	Image pg. A32
1950	Wilson Webster C	Minneapolis Directory Co.	Image pg. A36

### 5339 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1999	1 Larson Robert P	R.L. Polk CO.	Image pg. A4
1989	Larson Robt P	R. L. Polk Co.	Image pg. A11
1985	Larson Robt P	R. L. Polk Co.	Image pg. A14
1979	Larson Robt P	R.L. Polk Co. Publishers	Image pg. A17
1975	Larson Robt P	R. L. Polk Co.	Image pg. A19
1970	LARSON ROBT P	R. L. Polk Co.	Image pg. A22
1966	Larson Robt P	R.L. Polk CO.	Image pg. A25

## FINDINGS

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1955	Larson Robt P	Minneapolis Directory Co.	Image pg. A32
1950	Schoenike Peter S	Minneapolis Directory Co.	Image pg. A36

### 5340 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Grant David Theng	Cole Information Services	Image pg. A1
1993	Larson Brons & Thelma M Bf+	R.L. Polk CO.	Image pg. A8
1989	Larson Brons	R. L. Polk Co.	Image pg. A11
1985	Larson Brons	R. L. Polk Co.	Image pg. A14
1979	Larson Brone	R.L. Polk Co. Publishers	Image pg. A17
1975	Larson Brons	R. L. Polk Co.	Image pg. A19
1970	LARSON BRONS	R. L. Polk Co.	Image pg. A22
1966	Larson Brons	R.L. Polk CO.	Image pg. A25
1955	Larson Brons	Minneapolis Directory Co.	Image pg. A32
1950	Larson Brons	Minneapolis Directory Co.	Image pg. A36

### 5343 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1975	Vacant	R. L. Polk Co.	Image pg. A19
1970	ELDEN OLE A	R. L. Polk Co.	Image pg. A22
1966	Carlson Anna K Mrs	R.L. Polk CO.	Image pg. A25
1955	Carlson Anna C Mrs	Minneapolis Directory Co.	Image pg. A32
1950	Krantz John A	Minneapolis Directory Co.	Image pg. A36

### 5344 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1993	Not Verified	R.L. Polk CO.	Image pg. A8
1989	Dotson Mary Ann	R. L. Polk Co.	Image pg. A11
1985	Vacant	R. L. Polk Co.	Image pg. A14
1979	Vacant	R.L. Polk Co. Publishers	Image pg. A17
1975	OBrien Eug C	R. L. Polk Co.	Image pg. A19
1970	OBRIEN EUG C	R. L. Polk Co.	Image pg. A22
1966	OBrien Eug C	R.L. Polk CO.	Image pg. A25
1955	OBrien Eug C	Minneapolis Directory Co.	Image pg. A32
1950	OBrien Eug C	Minneapolis Directory Co.	Image pg. A36

### 5347 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1975	Anderson Helen Mrs	R. L. Polk Co.	Image pg. A19
1970	ANDERSON HELEN MRS	R. L. Polk Co.	Image pg. A22

## FINDINGS

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1966	Anderson Lloyd C	R.L. Polk CO.	Image pg. A25
1955	Anderson Lloyd C	Minneapolis Directory Co.	Image pg. A32
1950	Anderson Lloyd	Minneapolis Directory Co.	Image pg. A36

### 5351 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1993	Bamt Not Verified	R.L. Polk CO.	Image pg. A8
	Wold Otto L IJ+	R.L. Polk CO.	Image pg. A8
1989	BsnstPatefield Lisa C	R. L. Polk Co.	Image pg. A11
	Wold Jennie M Mrs	R. L. Polk Co.	Image pg. A11
1985	Wold Jennie M Mrs	R. L. Polk Co.	Image pg. A14
1979	Wold Jennie M Mrs	R.L. Polk Co. Publishers	Image pg. A17
1975	Wold Otto L	R. L. Polk Co.	Image pg. A19
1970	WOLD OTTO L	R. L. Polk Co.	Image pg. A22
1966	Wold Otto L	R.L. Polk CO.	Image pg. A25
1955	Wold Otto L	Minneapolis Directory Co.	Image pg. A32
1950	Wold Otto L	Minneapolis Directory Co.	Image pg. A36

### 5352 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	NP	Cole Information Services	Image pg. A1
1989	Mersy B	R. L. Polk Co.	Image pg. A11
	Buckley J C	R. L. Polk Co.	Image pg. A11
1985	Vanderwall Wm	R. L. Polk Co.	Image pg. A14
1979	Hurah Philip W	R.L. Polk Co. Publishers	Image pg. A17
1975	Hurah Philip W	R. L. Polk Co.	Image pg. A19
1970	HURSH PHILIP W	R. L. Polk Co.	Image pg. A22
1966	Hursh Philip W	R.L. Polk CO.	Image pg. A25
1955	Hursh Philip W	Minneapolis Directory Co.	Image pg. A32
1950	Danielson Carl F Rev	Minneapolis Directory Co.	Image pg. A36

### 5355 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1989	Hilgeman Philip H	R. L. Polk Co.	Image pg. A11
1985	Hilgeman Philip H	R. L. Polk Co.	Image pg. A14
1979	Hilgeman Philip H	R.L. Polk Co. Publishers	Image pg. A17
1975	Hilgeman Philip H	R. L. Polk Co.	Image pg. A19
1970	HILGEMAN PHILIP H	R. L. Polk Co.	Image pg. A22
1966	Hilgeman Philip H	R.L. Polk CO.	Image pg. A25

## FINDINGS

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1955	Dongaske Leonard	Minneapolis Directory Co.	Image pg. A32
1950	Dongoske Leonard	Minneapolis Directory Co.	Image pg. A36

### 5356 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Karen Kuzeltka Schafer	Cole Information Services	Image pg. A1
	John Regis Schafer	Cole Information Services	Image pg. A1
1989	Schindler Robt C	R. L. Polk Co.	Image pg. A11
1985	Schindler Robt C	R. L. Polk Co.	Image pg. A14
1979	Mc Namara Martin A	R.L. Polk Co. Publishers	Image pg. A17
1975	Mc Namara Martin A	R. L. Polk Co.	Image pg. A19
1970	CRAIGHEAD HERMAN W	R. L. Polk Co.	Image pg. A22
1966	Craighead Herman W	R.L. Polk CO.	Image pg. A25
1955	Craighead Herman W pntr	Minneapolis Directory Co.	Image pg. A32

### 5359 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1999	Knudsen Martha K Eh+	R.L. Polk CO.	Image pg. A4
1993	Knudsen Kipp	R.L. Polk CO.	Image pg. A8
1989	Knudsen Martha I Mrs	R. L. Polk Co.	Image pg. A11
1985	Knudsen Martha I Mrs	R. L. Polk Co.	Image pg. A14
1979	Knudsen Martha I Mrs	R.L. Polk Co. Publishers	Image pg. A17
1975	Knudsen Martha I Mrs	R. L. Polk Co.	Image pg. A19
1970	KNUDSEN MARTHA I MRS	R. L. Polk Co.	Image pg. A22
1966	Triangle Construction Co contrs	R.L. Polk CO.	Image pg. A25
	Knudsen Kermit L	R.L. Polk CO.	Image pg. A25
1955	Knudsen Kermit L	Minneapolis Directory Co.	Image pg. A32
1950	Under construction	Minneapolis Directory Co.	Image pg. A36

### 5360 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Joans Marie Block	Cole Information Services	Image pg. A1
	Sherry Ann Block	Cole Information Services	Image pg. A1
1999	Block Michael J E	R.L. Polk CO.	Image pg. A4
1993	Block Sherry	R.L. Polk CO.	Image pg. A8
	Block Shei	R.L. Polk CO.	Image pg. A8
	Block Joann M	R.L. Polk CO.	Image pg. A8
1989	Block Joann M	R. L. Polk Co.	Image pg. A11
1985	Block Joann M	R. L. Polk Co.	Image pg. A14

## FINDINGS

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1979	Block Wm A	R.L. Polk Co. Publishers	Image pg. A17
1975	Lownebury Gregg	R. L. Polk Co.	Image pg. A19
1970	CUDERMAN BART S	R. L. Polk Co.	Image pg. A22
1966	Larson Edwin W	R.L. Polk CO.	Image pg. A25
1955	Larson Edwin W	Minneapolis Directory Co.	Image pg. A32
1950	Larson Edwin W	Minneapolis Directory Co.	Image pg. A36

### 5362 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1993	KImpin P C	R.L. Polk CO.	Image pg. A8
	Heath E M	R.L. Polk CO.	Image pg. A8
	Buckley J C	R.L. Polk CO.	Image pg. A8

### 5363 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1970	STANSBURY CLARICE J MRS	R. L. Polk Co.	Image pg. A22
1966	Stansbury Clarice J Mrs	R.L. Polk CO.	Image pg. A25

### 5366 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1993	Hilgeman Phil Ip H & Lillian M IB+	R.L. Polk CO.	Image pg. A8

### 5367 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1966	Doris Philip	R.L. Polk CO.	Image pg. A25
1955	Doris Philip	Minneapolis Directory Co.	Image pg. A32
1950	Doris Philip	Minneapolis Directory Co.	Image pg. A36

### 5371 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1966	Kennedy Chas D	R.L. Polk CO.	Image pg. A25
1955	Duncan Loyal R	Minneapolis Directory Co.	Image pg. A32
1950	Haugh Geo E	Minneapolis Directory Co.	Image pg. A36
	White Robt A	Minneapolis Directory Co.	Image pg. A36

### 5372 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1993	BJerknes H&sine W IB+	R.L. Polk CO.	Image pg. A8
1989	Bjerknes Hansine W Mrs	R. L. Polk Co.	Image pg. A11
1985	Bjerknes Hansine W Mrs	R. L. Polk Co.	Image pg. A14

## FINDINGS

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1979	Bjerknes Benj F	R.L. Polk Co. Publishers	Image pg. A17
1975	Bjerknes Benj F	R. L. Polk Co.	Image pg. A19
1970	BJERKNES BENJ F	R. L. Polk Co.	Image pg. A22
1966	Bjerkness Benj F	R.L. Polk CO.	Image pg. A25
1955	Bjerkness Benj F	Minneapolis Directory Co.	Image pg. A32
1950	Bjerknes Benj F	Minneapolis Directory Co.	Image pg. A36

### 5375 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1966	Rich Jas	R.L. Polk CO.	Image pg. A25
1955	Rich Jas	Minneapolis Directory Co.	Image pg. A32
1950	Rich Jas	Minneapolis Directory Co.	Image pg. A36

### 5376 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1970	SOLVIE CLAIRE G MRS	R. L. Polk Co.	Image pg. A22
1966	Solvie Claire G Mrs	R.L. Polk CO.	Image pg. A25
1955	Solvie Adolph B	Minneapolis Directory Co.	Image pg. A32
1950	Solvie Adolph V	Minneapolis Directory Co.	Image pg. A36

### 5379 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1966	Hilton Donald E	R.L. Polk CO.	Image pg. A25
1955	Becker Lloyd S	Minneapolis Directory Co.	Image pg. A32
1950	White Chas J	Minneapolis Directory Co.	Image pg. A36

### 5380 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1970	BLAKE HAROLD E	R. L. Polk Co.	Image pg. A22
1966	Nordskog Gordon H	R.L. Polk CO.	Image pg. A25
1955	Nordskog Gordon H	Minneapolis Directory Co.	Image pg. A32
1950	Tupper Saml H	Minneapolis Directory Co.	Image pg. A36

### 5383 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1966	Grygelko Anton G	R.L. Polk CO.	Image pg. A25
1955	Grygelko Anton G	Minneapolis Directory Co.	Image pg. A32
1950	Grygelho Anton G	Minneapolis Directory Co.	Image pg. A36



## FINDINGS

### 5384 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1993	Bolduc M W	R.L. Polk CO.	Image pg. A8
1989	CITY LIMITS	R. L. Polk Co.	Image pg. A11
	Bolduc M	R. L. Polk Co.	Image pg. A11
1985	CITY LIMITS	R. L. Polk Co.	Image pg. A14
	Levine David M	R. L. Polk Co.	Image pg. A14
1979	Ferrell M	R.L. Polk Co. Publishers	Image pg. A17
1975	CITY LIMITS	R. L. Polk Co.	Image pg. A19
	Bauerly Ginger L	R. L. Polk Co.	Image pg. A19
1970	CITY LIMITS	R. L. Polk Co.	Image pg. A22
	SMITH JAMES W	R. L. Polk Co.	Image pg. A22
1966	Hanson Lee J	R.L. Polk CO.	Image pg. A25
1955	Burnet J	Minneapolis Directory Co.	Image pg. A32

### 5386 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1993	Byers Dolly E	R.L. Polk CO.	Image pg. A8

### 5387 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1966	Pierce Michl J	R.L. Polk CO.	Image pg. A25
1955	Under construction	Minneapolis Directory Co.	Image pg. A32

### 5391 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1966	Lamberton Donald W	R.L. Polk CO.	Image pg. A25
1955	Lamberton Donald W	Minneapolis Directory Co.	Image pg. A32

### 5395 RIVERVIEW RD

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1966	Gordon Leo P	R.L. Polk CO.	Image pg. A25

### Riverview Road

#### 5360 Riverview Road

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
2005	Joans Marie Block	Cole Information Services	Image pg. A1
	Sherry Ann Block	Cole Information Services	Image pg. A1
1999	Block Michael J E	R.L. Polk CO.	Image pg. A4
1993	Block Joann M	R.L. Polk CO.	Image pg. A8

## FINDINGS

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1993	Block Shei	R.L. Polk CO.	Image pg. A8
	Block Sherry	R.L. Polk CO.	Image pg. A8
1989	Block Joann M	R. L. Polk Co.	Image pg. A11
1985	Block Joann M	R. L. Polk Co.	Image pg. A14
1979	Block Wm A	R.L. Polk Co. Publishers	Image pg. A17
1975	Lownebury Gregg	R. L. Polk Co.	Image pg. A19
1970	CUDERMAN BART S	R. L. Polk Co.	Image pg. A22
1966	Larson Edwin W	R.L. Polk CO.	Image pg. A25
1955	Larson Edwin W	Minneapolis Directory Co.	Image pg. A32
1950	Larson Edwin W	Minneapolis Directory Co.	Image pg. A36

### W 54TH ST

#### 5109 W 54TH ST

<u>Year</u>	<u>Uses</u>	<u>Source</u>	
1957	Keller Paul F Rev	R.L. Polk and Co. Publishers	Image pg. A30

## FINDINGS

### TARGET PROPERTY: ADDRESS NOT IDENTIFIED IN RESEARCH SOURCE

The following Target Property addresses were researched for this report, and the addresses were not identified in the research source.

#### Address Researched

5348 Riverview Road

#### Address Not Identified in Research Source

2013, 2008, 1988, 1976, 1971, 1962, 1957, 1940, 1935, 1930, 1925, 1920

### ADJOINING PROPERTY: ADDRESSES NOT IDENTIFIED IN RESEARCH SOURCE

The following Adjoining Property addresses were researched for this report, and the addresses were not identified in research source.

#### Address Researched

0 54TH ST E

#### Address Not Identified in Research Source

2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1925, 1920

5000 54TH E

2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1946, 1940, 1935, 1930, 1925, 1920

5000 54TH St E

2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1940, 1935, 1930, 1925, 1920

5000 E 54TH ST

2013, 2008, 1988, 1976, 1975, 1971, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920

5006 54TH E

2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1946, 1940, 1935, 1930, 1925, 1920

5006 54TH St E

2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1940, 1935, 1930, 1925, 1920

5006 E 54TH ST

2013, 2008, 1988, 1976, 1975, 1971, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920

5010 54TH E

2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1930, 1925, 1920

5010 E 54TH ST

2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1920

5012 54TH E

2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1946, 1940, 1935, 1930, 1925, 1920

5012 54TH St E

2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1940, 1935, 1930, 1925, 1920

5012 E 54TH ST

2013, 2008, 2005, 1999, 1988, 1976, 1975, 1971, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920

5015 E 54TH ST

2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920

5015 E 54TH ST

2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920

5015 E. 54th Street

2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920

5016 54TH E

2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1946, 1940, 1935, 1930, 1925, 1920

5016 E 54TH ST

2013, 2008, 1988, 1976, 1975, 1971, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920

## FINDINGS

<b><u>Address Researched</u></b>	<b><u>Address Not Identified in Research Source</u></b>
5025 E 54TH ST	2013, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5025 E 54TH ST	2013, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5025 E. 54th Street	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5100 54TH E	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1946, 1930, 1925, 1920
5100 54TH ST E	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1925, 1920
5100 54TH St E	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1940, 1935, 1930, 1925, 1920
5100 E 54TH ST	2013, 2008, 2005, 1999, 1988, 1976, 1975, 1971, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5106 54TH E	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1946, 1930, 1925, 1920
5106 54TH St E	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1940, 1935, 1930, 1925, 1920
5106 E 54TH ST	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1920
5109 W 54TH ST	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5110 E 54TH ST	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5114 54TH E	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5114 54TH St E	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1940, 1935, 1930, 1925, 1920
5114 E 54TH ST	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5307 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5307 RIVERVIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1971, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5311 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5311 RIVERVIEW RD	2013, 2008, 2005, 1999, 1988, 1976, 1971, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5315 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5315 RIVERVIEW RD	2013, 2008, 2005, 1999, 1988, 1976, 1975, 1971, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5316 RIVERVIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5319 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5319 RIVERVIEW RD	2013, 2008, 2005, 1989, 1988, 1976, 1971, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920

## FINDINGS

### **Address Researched**

### **Address Not Identified in Research Source**

5323 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5323 RIVERVIEW RD	2013, 2008, 2005, 1988, 1976, 1971, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5324 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5324 RIVERVIEW RD	2013, 2008, 1999, 1988, 1976, 1971, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5327 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5327 RIVERVIEW RD	2013, 2008, 2005, 1999, 1993, 1988, 1976, 1971, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5331 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5331 RIVERVIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5332 HIAWATHA AVE	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1976, 1971, 1962, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5332 HIAWATHA LN	2013, 2008, 1999, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5332 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5332 RIVERVIEW RD	2013, 2008, 1988, 1976, 1975, 1971, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5333 HIAWATHA AVE	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1976, 1971, 1962, 1957, 1925, 1920
5333 HIAWATHA LN	2013, 2008, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5335 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5335 RIVERVIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1962, 1960, 1957, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5336 HIAWATHA AVE	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1976, 1971, 1962, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5336 HIAWATHA LN	2013, 2008, 1999, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5336 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5336 RIVERVIEW RD	2013, 2008, 1988, 1976, 1971, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5339 HIAWATHA AVE	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1976, 1971, 1962, 1957, 1920
5339 HIAWATHA LN	2013, 2008, 1999, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5339 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5339 RIVERVIEW RD	2013, 2008, 2005, 1993, 1988, 1976, 1971, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5340 HIAWATHA AVE	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1976, 1971, 1962, 1957, 1946, 1940, 1935, 1930, 1925, 1920



## FINDINGS

### **Address Researched**

### **Address Not Identified in Research Source**

5352 RIVERVIEW RD	2013, 2008, 1999, 1993, 1988, 1976, 1971, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5355 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5355 RIVERVIEW RD	2013, 2008, 2005, 1999, 1993, 1988, 1976, 1971, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5356 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5356 RIVERVIEW RD	2013, 2008, 1999, 1993, 1988, 1976, 1971, 1962, 1960, 1957, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5358 HIAWATHA AVE	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1976, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5358 HIAWATHA LN	2013, 2008, 1999, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5359 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5359 RIVERVIEW RD	2013, 2008, 2005, 1988, 1976, 1971, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5360 HIAWATHA AVE	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1976, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5360 HIAWATHA LN	2013, 2008, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5360 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5360 RIVERVIEW RD	2013, 2008, 1988, 1976, 1971, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5360 Riverview Road	2013, 2008, 1988, 1976, 1971, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5362 RIVERVIEW RD	2013, 2008, 2005, 1999, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5363 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5363 RIVERVIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5366 RIVERVIEW RD	2013, 2008, 2005, 1999, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1960, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5367 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5367 RIVERVIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5371 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5371 RIVERVIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920
5372 RIVER VIEW RD	2013, 2008, 2005, 1999, 1993, 1989, 1988, 1985, 1979, 1976, 1975, 1971, 1970, 1966, 1962, 1957, 1955, 1950, 1946, 1940, 1935, 1930, 1925, 1920
5372 RIVERVIEW RD	2013, 2008, 2005, 1999, 1988, 1976, 1971, 1962, 1960, 1957, 1946, 1940, 1935, 1930, 1925, 1920





## **Source Page Images Appendix**

RIVERVIEW RD 2005

RIVERVIEW RD

Table listing property addresses and owners for Riverview Rd, including Lot 17406, 17407, 17408, etc.

CONCORD DR INTS

Table listing property addresses and owners for Concord Dr Ints, including 20706, 20707, 20708.

SPYGLASS DR INTS

Table listing property addresses and owners for Spyglass Dr Ints, including 12110, 12122, 12123, etc.

RIVERVIEW RD NE

Table listing property addresses and owners for Riverview Rd Ne, including CT 1008.02, RR2, 11305, etc.

MOOER LN INTS

Table listing property addresses and owners for Moer Ln Ints, including 12608, 12609, 12610, etc.

FLYING CLOUD DR INTS

Table listing property addresses and owners for Flying Cloud Dr Ints, including 13381, 13382.

RIVERVIEW RD

Table listing property addresses and owners for Riverview Rd, including CT 119.9E, 5324, 5364, etc.

E 54TH ST INTS

Table listing property addresses and owners for E 54th St Ints, including 5324, 5325, 5326, etc.

RIVERVIEW RD

Table listing property addresses and owners for Riverview Rd, including CT 1009.00, RR3, 100, etc.

EDGEWATER DR INTS

Table listing property addresses and owners for Edgewater Dr Ints, including 100, 101, 102, etc.

COLE

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Table listing property addresses and owners for Cole, including 110, 111, 112, 113, 114, etc.

8TH ST NE INTS

Table listing property addresses and owners for 8th St Ne Ints, including 11902, 11903, 11904, etc.

RIVERVIEW TER NE

Table listing property addresses and owners for Riverview Ter Ne, including CT 512.01, CT 511.01, etc.

62ND WAY NE INTS

Table listing property addresses and owners for 62nd Way Ne Ints, including 6201, 6202, 6203, etc.

64 1/2 WAY NE INTS

Table listing property addresses and owners for 64 1/2 Way Ne Ints, including 6200, 6320, 6321, etc.

MISSISSIPPI PL NE INTS

Table listing property addresses and owners for Mississippi Pl Ne Ints, including 6416, 6417, 6418, etc.

RIVERVIEW ENTRY

Table listing property addresses and owners for Riverview Entry, including CT 269.0E, 5701, 5733, etc.

RIVER RD INTS

Table listing property addresses and owners for River Rd Ints, including 5701, 5702, 5703, etc.

RIVERWOOD CIR

Table listing property addresses and owners for Riverwood Cir, including CT 607.0E, 12013, 12054, etc.

RIVERWOOD DR INTS

Table listing property addresses and owners for Riverwood Dr Ints, including 12013A, 12013B, etc.

RIVERWOOD DR

Table listing property addresses and owners for Riverwood Dr, including CT 607.0E, 1103, 12211, etc.

2005 MINNEAPOLIS

Table listing property addresses and owners for 2005 Minneapolis, including 71050, 71051, 71052, etc.

CHERYL ST NE INTS

Table listing property addresses and owners for Cheryl St Ne Ints, including 7921, 7941, 7942, etc.

GLENCOE ST NE INTS

Table listing property addresses and owners for Glencoe St Ne Ints, including 8001, 8021, 8031, etc.

IRONTON ST NE INTS

Table listing property addresses and owners for Iron-ton St Ne Ints, including 8141, 8142, 8143, etc.

KIMBALL ST NE INTS

Table listing property addresses and owners for Kimball St Ne Ints, including 8215, 8216, 8217, etc.

RIVERVIEW ENTRY

Table listing property addresses and owners for Riverview Entry, including CT 269.0E, 5701, 5733, etc.

RIVER RD INTS

Table listing property addresses and owners for River Rd Ints, including 5701, 5702, 5703, etc.

RIVERWOOD CIR

Table listing property addresses and owners for Riverwood Cir, including CT 607.0E, 12013, 12054, etc.

RIVERWOOD DR INTS

Table listing property addresses and owners for Riverwood Dr Ints, including 12013A, 12013B, etc.

RIVERWOOD DR

Table listing property addresses and owners for Riverwood Dr, including CT 607.0E, 1103, 12211, etc.

12TH AVE S INTS

Table listing property addresses and owners for 12th Ave S Ints, including 1103, 12211, etc.

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E 54TH ST 2005

E 54TH ST

Table listing properties on E 54th St, including addresses, owner names, and phone numbers.

W 54TH ST

Table listing properties on W 54th St, including addresses, owner names, and phone numbers.

GARFIELD AVE S INTS

Table listing properties at Garfield Ave S Ints, including addresses, owner names, and phone numbers.

LYNDALE AVE S INTS

Table listing properties at Lyndale Ave S Ints, including addresses, owner names, and phone numbers.

ALDRICH AVE S INTS

Table listing properties at Aldrich Ave S Ints, including addresses, owner names, and phone numbers.

BRYANT AVE S INTS

Table listing properties at Bryant Ave S Ints, including addresses, owner names, and phone numbers.

DUPONT AVE S INTS

Table listing properties at Dupont Ave S Ints, including addresses, owner names, and phone numbers.

HIRARD AVE S INTS

Table listing properties at Hirdard Ave S Ints, including addresses, owner names, and phone numbers.

IRVING AVE S INTS

Table listing properties at Irving Ave S Ints, including addresses, owner names, and phone numbers.

KNOX AVE S INTS

Table listing properties at Knox Ave S Ints, including addresses, owner names, and phone numbers.

LOGAN AVE S INTS

Table listing properties at Logan Ave S Ints, including addresses, owner names, and phone numbers.

NEWTON AVE S INTS

Table listing properties at Newton Ave S Ints, including addresses, owner names, and phone numbers.

PENN AVE S INTS

Table listing properties at Penn Ave S Ints, including addresses, owner names, and phone numbers.

QUEEN AVE S INTS

Table listing properties at Queen Ave S Ints, including addresses, owner names, and phone numbers.

COLE

Table listing properties on Cole Ave, including addresses, owner names, and phone numbers.

ZENITH AVE S INTS

Table listing properties at Zenith Ave S Ints, including addresses, owner names, and phone numbers.

BEARD AVE S INTS

Table listing properties at Beard Ave S Ints, including addresses, owner names, and phone numbers.

CHOWEN AVE S INTS

Table listing properties at Chowen Ave S Ints, including addresses, owner names, and phone numbers.

FRANCE AVE S INTS

Table listing properties at France Ave S Ints, including addresses, owner names, and phone numbers.

HALIFAX LN INTS

Table listing properties at Halifax Ln Ints, including addresses, owner names, and phone numbers.

MINNEHAHA BLVD INTS

Table listing properties at Minnehaha Blvd Ints, including addresses, owner names, and phone numbers.

BROOKVIEW AVE S INTS

Table listing properties at Brookview Ave S Ints, including addresses, owner names, and phone numbers.

54 1/2 ST NE

Table listing properties at 54 1/2 St NE, including addresses, owner names, and phone numbers.

LAUNDER AVE NE INTS

Table listing properties at Laundry Ave NE Ints, including addresses, owner names, and phone numbers.

MARK A BEAVER

Table listing properties at Mark A Beaver, including addresses, owner names, and phone numbers.

11423 Apartments

Table listing properties at 11423 Apartments, including addresses, owner names, and phone numbers.

65TH AVE N

Table listing properties on 65th Ave N, including addresses, owner names, and phone numbers.

LYNDALE AVE N INTS

Table listing properties at Lyndale Ave N Ints, including addresses, owner names, and phone numbers.

COLE

Table listing properties on Cole Ave, including addresses, owner names, and phone numbers.

JAMES AVE N INTS

Table listing properties at James Ave N Ints, including addresses, owner names, and phone numbers.

LOGAN AVE N INTS

Table listing properties at Logan Ave N Ints, including addresses, owner names, and phone numbers.

MORGAN AVE N INTS

Table listing properties at Morgan Ave N Ints, including addresses, owner names, and phone numbers.

PENN AVE N INTS

Table listing properties at Penn Ave N Ints, including addresses, owner names, and phone numbers.

OLIVER AVE N INTS

Table listing properties at Oliver Ave N Ints, including addresses, owner names, and phone numbers.

QUEEN AVE N INTS

Table listing properties at Queen Ave N Ints, including addresses, owner names, and phone numbers.

FRANCE AVE N INTS

Table listing properties at France Ave N Ints, including addresses, owner names, and phone numbers.

RUSSELL AVE N INTS

Table listing properties at Russell Ave N Ints, including addresses, owner names, and phone numbers.

3600 - 3700

Table listing properties between 3600 and 3700, including addresses, owner names, and phone numbers.

6315 Apartments

Table listing properties at 6315 Apartments, including addresses, owner names, and phone numbers.

2050 O Carlson

Table listing properties at 2050 O Carlson, including addresses, owner names, and phone numbers.

2050 O Carlson

Table listing properties at 2050 O Carlson, including addresses, owner names, and phone numbers.

2050 O Carlson

Table listing properties at 2050 O Carlson, including addresses, owner names, and phone numbers.

2005 MINNEAPOLIS

Table listing properties in Minneapolis, including addresses, owner names, and phone numbers.

9900 - 13335

Table listing properties between 9900 and 13335, including addresses, owner names, and phone numbers.

9900 Apartments

Table listing properties at 9900 Apartments, including addresses, owner names, and phone numbers.

QUEBEC AVE N INTS

Table listing properties at Quebec Ave N Ints, including addresses, owner names, and phone numbers.

SUMNER AVE N INTS

Table listing properties at Sumner Ave N Ints, including addresses, owner names, and phone numbers.

WINNETKA AVE N INTS

Table listing properties at Winnetka Ave N Ints, including addresses, owner names, and phone numbers.

9900 Apartments

Table listing properties at 9900 Apartments, including addresses, owner names, and phone numbers.

TRENDON LN INTS

Table listing properties at Trendon Ln Ints, including addresses, owner names, and phone numbers.

10705 \*CSD\*

Table listing properties at 10705 \*CSD\*, including addresses, owner names, and phone numbers.

10705 \*CSD\*

Table listing properties at 10705 \*CSD\*, including addresses, owner names, and phone numbers.

10705 \*CSD\*

Table listing properties at 10705 \*CSD\*, including addresses, owner names, and phone numbers.

10705 \*CSD\*

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10705 \*CSD\*

Table listing properties at 10705 \*CSD\*, including addresses, owner names, and phone numbers.

10705 \*CSD\*

Table listing properties at 10705 \*CSD\*, including addresses, owner names, and phone numbers.

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HIAWATHA LN 2005

COLE

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HIAWATHA AVE

Table listing properties on Hiawatha Ave with columns for address, owner name, and phone number.

HIAWATHA AVE

Summary table for Hiawatha Ave with columns for address, phone number, and business status.

HIAWATHA AVE

Table listing properties on Hiawatha Ave with columns for address, owner name, and phone number.

35TH AVE S INTS

Table listing properties on 35th Ave S Ints with columns for address, owner name, and phone number.

40TH AVE S INTS

Table listing properties on 40th Ave S Ints with columns for address, owner name, and phone number.

45TH AVE S INTS

Table listing properties on 45th Ave S Ints with columns for address, owner name, and phone number.

47TH AVE S INTS

Table listing properties on 47th Ave S Ints with columns for address, owner name, and phone number.

48TH AVE S INTS

Table listing properties on 48th Ave S Ints with columns for address, owner name, and phone number.

HIAWATHA CIR

Table listing properties on Hiawatha Cir with columns for address, owner name, and phone number.

BEETHOVEN AVE INTS

Table listing properties on Beethoven Ave Ints with columns for address, owner name, and phone number.

HIAWATHA CT

Table listing properties on Hiawatha Ct with columns for address, owner name, and phone number.

HIAWATHA DR

Table listing properties on Hiawatha Dr with columns for address, owner name, and phone number.

HIAWATHA LN

Table listing properties on Hiawatha Ln with columns for address, owner name, and phone number.

MINNEHAHA AVE INTS

Table listing properties on Minnehaha Ave Ints with columns for address, owner name, and phone number.

54TH ST INTS

Table listing properties on 54th St Ints with columns for address, owner name, and phone number.

5000+ CAPS GRILLS

Table listing properties on 5000+ Caps Grills with columns for address, owner name, and phone number.

5108 APARTMENTS

Table listing properties on 5108 Apartments with columns for address, owner name, and phone number.

5130 APARTMENTS

Table listing properties on 5130 Apartments with columns for address, owner name, and phone number.

5136 APARTMENTS

Table listing properties on 5136 Apartments with columns for address, owner name, and phone number.

HIAWATHA BEACH DR NE

Table listing properties on Hiawatha Beach Dr Ne with columns for address, owner name, and phone number.

2005 MINNEAPOLIS

Table listing properties in Minneapolis 2005 with columns for address, owner name, and phone number.

HIBISCUS AVE

Table listing properties on Hibiscus Ave with columns for address, owner name, and phone number.

HIBISCUS AVE

Table listing properties on Hibiscus Ave with columns for address, owner name, and phone number.

HIBISCUS AVE

Table listing properties on Hibiscus Ave with columns for address, owner name, and phone number.

HIBISCUS AVE

Table listing properties on Hibiscus Ave with columns for address, owner name, and phone number.

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Table listing properties on Hibiscus Ave with columns for address, owner name, and phone number.

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Table listing properties on Hibiscus Ave with columns for address, owner name, and phone number.

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Table listing properties on Hibiscus Ave with columns for address, owner name, and phone number.

HIBISCUS AVE

Table listing properties on Hibiscus Ave with columns for address, owner name, and phone number.

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E 54TH ST 1999

54TH AVE N TO 55TH AVE N

54TH AVE N (P)
12625 Kieve Michael W 550-8129
12635 Feler John B 559-5422
12645 Fish Donald R 550-9512
+PINEVIEW LN INTERSECTS
12700 Mackin James A & Lori 577-0188
12710 Kimmel Jim 551-1249
Mittelholz Steven J 557-9946
12725 Ellison Mary S 557-9923
12730 Lawson Neal J & Christine 557-9050
12805 K F ENTERPRISES busn svcs 550-0899
Kibsov Yuri S & Galina 550-0899
12815 Hussey Jacqueline A 551-1847
12830 Hanson David C 559-5341
12835 Gunn Bradley J & Elizabeth 559-3695
12840 Gordon Daniel L & Cindy 551-4875
12845 Surprenant Jerome P 559-2188
SURPRENANT JUDY child day care svcs 559-2188
12850 Campbell David C Jr & Susie 577-0946
12855 Brian Charles W 557-9515
12860 Pietsch Mary D & Keith 553-2830
12865 Seamon Michael D & Cynthia 557-1101
SEAMON MICHAEL D CO mgmt crstng svcs 557-1101
12915 Barsad David A & Lanette 559-4724
12925 Stiemper John A & Cindy 559-4071
12935 Hubbell Victor L 557-0218
+SCYAMORE LN N BEGINS
+NORTHWEST BLVD INTERSECTS
+NORTHWEST BLVD CONTINUES
ZIP CODE 55442 CAR-RT C000
13115 Khoras Avastar D 551-3916
+TEAKWOOD LN N BEGINS
13205 Stokes Thomas C & Michele 550-1634
13210 Herndl S 550-8927
Wood David C 550-8927
13225 Steiner Fred D 558-4841
13230 Somers K F 559-1080
+UNDERWOOD LN N BEGINS
13325 Peterson Troy A & Elizabeth 559-8683
13335 Tran Khai W & MaryKay 594-8669
13345 Clairmont Catherine M 509-9381
13355 Cagnine Rick D 559-5547
Jacobson Anthony S 559-5547
13400 Marhe Lori C 559-1557
13415 Pleur John C & Jill 551-0695
13410 Beuville Erich A & Ann 551-1465
13415 TRU LINE CO heavy const 559-5880
Wold Todd J 557-7370
13425 Johnson Jennifer R 550-9216
+VINEWOOD LN N BEGINS
BUSINESSES 12 HOUSEHOLDS 106
54TH AVE NE (MINNEAPOLIS)-FROM
5309 4TH ST NE EAST
+57TH ST NE INTERSECTS
+6TH ST NE ENDS
ZIP CODE 55421 CAR-RT C011
451 Johnson Megan M 572-8156
LARSON JAN child day care svcs 571-7074
+Mulkern S 574-9204
+7TH ST NE INTERSECTS
505 Reiland Jerry D 572-0391
516 Allard Scott E & Karen 574-7492
524 Agerter Ronny 574-7109
537 Lulihar P 574-0353
540 Snekeder Kenneth W & Monica 572-9093
545 Mathes Edwin A III & Cheryl 571-2749
548 Wright Thomas A 571-5533
553 Topp Ricky A & Tamara 572-9284
556 Jurek Robert J & Violet 572-9028
577 Warner Carrie L 574-8190
580 Lynch Brian C 572-9097
585 Orlick Donald C 572-0485
+MADISON ST NE INTERSECTS
BUSINESSES 1 HOUSEHOLDS 14
54TH CIR NE (ROGERS)-
ZIP CODE 55374 CAR-RT R004
10600 Regan Brian D 428-8363
HOUSEHOLDS 1
54TH PL N (MINNEAPOLIS)-FROM 5467
NATHAN LN N NORTHWEST
ZIP CODE 55442 CAR-RT C057
9800 Billings Heien M 553-0984
@Brookings Loren E 550-9855
@Gurnaud E A 551-9607
3 Goetz David C 551-9607
5 Maric Albert C & Mary 559-0302
6 Schaller Bartha R 553-1251
7 Kessler Michele R 557-7350
9805 Baizium Brian K 559-4320
4 Moonen Elizabeth M 550-1349
6 Christensen Jill L 551-5996

54TH PL N (P)
+55TH AVE N INTERSECTS
HOUSEHOLDS 10
54TH ST NE (ROGERS)-FROM 5253
NEEDHAM AVE NE EAST
ZIP CODE 55374 CAR-RT R004
13823 Swanson James H 497-4505
13851 @Raginski Czeslaw 497-2007
@Raginski Laura 497-2007
RAGINIAK LAURA child day care svcs 497-2007
13881 Borer Daniel F 497-4786
13935 Garrath Timothy B 497-5418
14042 Hohag Patricia A 497-1811
14043 Huro Thomas E 497-1987
@Kuzmich Deborah S 497-1987
14071 Graham Michael L & Susan 497-2000
14076 McClain Dan A & Dina 497-1706
+NELMARC AVE NE INTERSECTS
+OGREN AVE NE CONTINUES
14588 Kientz Paul M 497-2712
14593 Westh Patricia 497-3306
14630 Becker Thomas W & Joanne 497-3787
14670 @Woods Patrick E 497-3158
14681 Lato Robert B 497-4033
14684 Corbin Leon L & Donna 497-3256
14695 Kienlen Frances U 497-3256
15614 @Emerson Sherry K 428-2880
Mutterer Ernest E 428-2880
15657 FIRST CHOICE COFFEE & VEND SERVICES busn svcs 538-3003
15666 Patterson Sylvia A & Harvey 428-8255
15730 Lira Thomas M 428-2000
+PARSONS AVE NE ENDS
15815 Corbin Patricia M 428-8744
15821 Kohanek Patricia M 428-2151
15830 @Glasgow Ronald 428-2686
15835 @Glasgow Sue 428-2880
15860 Yager Path J 428-7373
15915 Barnes Patrick E & Rebekah 428-9711
15926 @Augusta Christine M 428-3612
15943 Darner Jeffrey A & Linda 428-4222
15975 @McDonough Earl M 428-4222
15980 Wiczek Richard J 428-4277
16184 DAVID MOLINE Inc truckng lcl FISHER DOUG TRUCKING lcl 428-2864
STEEL STALLIONS truckng 428-4311
16195 US FILTER/WATERPRO SUPPLIES indus equlp 428-7473
16290 ALLIED GRAPHICS comrc printing 428-8365
16295 CROW RIVER FRAME & ALIGNMENT auto 428-2118
+QUAM AVE NE INTERSECTS
BUSINESSES 8 HOUSEHOLDS 31
E 54TH ST (MINNEAPOLIS)-FROM 5399
NICOLLET AVE EAST
ZIP CODE 55419 CAR-RT C009
17 Schonberg Willard C 825-6319
19 Robinson Terry E 825-3779
2301 @Trotter Debra 825-7000
27 Gregg Cynthia R 823-4167
99 Anderson Donna L 823-1289
@Fischer J 824-6078
@Jagers Brent 824-9219
@Miller Jill 821-0872
@Roles N L 823-2212
@Rygh Gerald D 825-8496
3 Kail Patricia 825-5701
6 Bliven Daniel P 823-8620
7 Turgeon Jean P 823-6985
15 Christensen Jay P 824-1209
+1ST AVE S INTERSECTS
101 @Endshaw Genet I 824-6661
Flock Cynthia M 827-7059
@Greene Chris 825-6582
@Greene Lynn 825-6582
@Grundahl Randi 825-4277
@Hanson B 824-6855
@Heard Y 824-2987
@Hegge Genevieve M 822-2582
Henke Marion E 824-0551
@Singhkar Sarjit 821-5005
203 Roach Patricia M 822-2876
204 Kuhn J 824-0475
205 Nielsen Yolanda K 823-1584
208 Orsler Theresa A 825-7458
302 Tesfaye Fanosie 824-6661
303 Selvert M P 824-4587
304 Terrell Shawn S 827-4865
306 Heard Yolanda K 822-5824
+2ND AVE S CONTINUES
+3RD AVE S INTERSECTS
+CLINTON AVE INTERSECTS
+HAMPSHIRE AVE N INTERSECTS
ZIP CODE 55417 CAR-RT C010
624 Ingold E 823-4582
3 Goetz David C 551-9607
5 Maric Albert C & Mary 559-0302
6 Schaller Bartha R 553-1251
7 Kessler Michele R 557-7350
9805 Baizium Brian K 559-4320
4 Moonen Elizabeth M 550-1349
6 Christensen Jill L 551-5996

E 54TH ST (M)
+17TH AVE S INTERSECTS
+12TH AVE S INTERSECTS
ZIP CODE 55417 CAR-RT C007
1215 Hicks Barbara A 823-5455
1220 HALE ELEMENTARY SCHOOL 827-2387
+13TH AVE S INTERSECTS
1307 Chambers Basil M Jr 823-6065
1315 Doran Florence M 825-7433
+14TH AVE S INTERSECTS
ZIP CODE 55417 CAR-RT C023
1400 @Garden Pierre 825-3109
1408 Holan Lynn H 823-2577
1418 Holy WEST COMMUNITY CHURCH religious orgs 827-5901
+EDGEWATER BLVD BEGINS
+15TH AVE S INTERSECTS
+BLOOMINGTON AVE INTERSECTS
ZIP CODE 55417 CAR-RT C008
1530 ALEXANDER ILGA child day care svcs 722-4106
15340 @Santhony Karen 721-1294
@Santhony Neal 721-1294
1538 Orbeck Godfrey J & Agnes 729-8495
15420 @Abraham Amy 722-2885
@Abraham John D 722-2885
+W NOKOMIS PKWY INTERSECTS
+WOODLAWN BLVD CONTINUES
+SHOREVIEW AVE INTERSECTS
+24TH AVE S BEGINS
+25TH AVE S INTERSECTS
+27TH AVE S INTERSECTS
+28TH AVE S INTERSECTS
+29TH AVE S INTERSECTS
+30TH AVE S INTERSECTS
+NOKOMIS AVE INTERSECTS
+31ST AVE S INTERSECTS
ZIP CODE 55417 CAR-RT C021
3106 Fuehrer Gerald L & Mary 724-8070
3112 Orouc Interco 724-0441
3118 St. Richard C & Elyane 722-2385
31300 @Zaragoza D 722-6852
3210 Wellhausen Harold E 729-7882
3217 Hamm Sheila A 729-0751
3221 McElroy Thomas J 724-1242
+33RD AVE S INTERSECTS
3300 @Ritter Kristine E 721-0965
@Schave Ivan 722-5811
3306 @United Eleanor L & Albert 722-7511
3310 Duane Jeffrey A 724-2416
3319 TOM THUMB grocery store 721-6165
3321 AIRPORT PHARMACY drug store 721-5321
+34TH AVE S INTERSECTS
ZIP CODE 55417 CAR-RT C022
3405 Kolb Ronald C & Joyce 721-3405
3411 Kopschke Paul E 721-2825
3417 Holtzer James J Jr & Bonnie 721-2957
3421 Perrin Joan L 721-2351
3425 Zimmerman Larry D 725-0380
+35TH AVE S INTERSECTS
3509 ROSEMARY'S PLACE misc grnt 727-1943
3527 Platt David L & Sheila 725-0868
+36TH AVE S INTERSECTS
3601 @Kasper G 727-3244
3607 Strickstock Lucille A & Markus 721-3587
3611 @Madness Jana K 727-2060
3617 Benedet James A 726-9399
+37TH AVE S INTERSECTS
3701 Larson Robin J 724-1871
3712 @Tappaz Ted 727-3321
3709 @McGrane Shawn 727-3153
3723 Gunnar Martin J 724-3417
3727 Murray Gregory M & Michelle 727-3332
3729 Chilton Donovan C 727-3332
+38TH AVE S INTERSECTS
3809 @Kreky Maraya 727-1040
3817 Anderson Donald J 727-1994
+39TH AVE S INTERSECTS
3921 Olson Martin O 727-3749
3903 Carlson Douglas S 727-2831
3907 Hesse Ronald M 727-1058
3911 @Harland Wendy 726-1853
3921 Katzen Scott A 726-1853
+40TH AVE S INTERSECTS
4005 Williams Matthew S 725-0509
4021 Kelley Kathleen M 726-9562
4025 Pedersen Helen D 727-1917
+41ST AVE S INTERSECTS
4115 Stone Gerald K 727-1824
4120 @Dennig M L 726-5186
+42ND AVE S INTERSECTS
ZIP CODE 55417 CAR-RT C017
4200 HOME VIDEO video tape rental svcs 723-1130
4201 @Levin Sharon 727-2989
WELLNESS CENTER ETC physcal trng svcs 727-2889
4205 WENDY'S TV SERVICE radio tv rp 869-9762
4207 WENDY'S DOGHOUSE animal spcty svcs 726-1740
4220 Riley Cheryl J & Pauline 726-1214
+43RD AVE S INTERSECTS
4301 WRIGHT COMPANY cldg m-order 726-1864
4309 CHOICE CARPET CLEANERS crpt uphstry cldg 726-9494
13 CONSIGNMENT CENTER used merch stores 727-1974

E 54TH ST
+44TH AVE S INTERSECTS
+45TH AVE S INTERSECTS
+46TH AVE S INTERSECTS
+47TH AVE S ENDS
+48TH AVE S ENDS
+MINNEHAHA AVE BEGINS
ZIP CODE 55417 CAR-RT C030
500 Vasiljevic Erika R 724-7678
@Wiesner Barney 724-7678
5006 Gerasimo Jerry 729-7141
5016 Love Ray E 722-0980
+HAWATHA LN ENDS
+RIVERVIEW RD ENDS
+RAILROAD CROSSES
BUSINESSES 15 HOUSEHOLDS 91
W 54TH ST (EDINA)-
ZIP CODE 55410 CAR-RT C007
2312 Kulest Laurits S 928-8270
2316 Darby Oral M 922-0488
2322 Whelan Richard M & Mary 922-8928
2326 Butts Gayle M 922-8928
+49TH AVE S INTERSECTS
2406 Wareham John R 922-1026
2410 @Daniel Thomas C 922-0751
2420 @Harris Jan 928-8047
@Tavaas Matthew S 920-7687
+RUSSELL AVE S INTERSECTS
+CUMBERLAND RD BEGINS
2505 Olson Timothy J 925-5587
2516 Stoner Rebecca S 925-5503
2517 FULL CIRCLE HEALTH CONSULTING hltl aid svcs 920-1735
2521 McHugh Jeffery J 927-9299
+CROWWELL CT BEGINS
2600 @Sweat Michael R 927-0742
2601 Miller Ethel V 926-2565
2607 @Coffee M C 920-6209
Sinnichsen Roger P 920-6209
2615 Korak Maria D 920-0721
2700 Vanoverey Drexol K 926-4741
2707 Healy Charles M 922-0355
271300 @Cook Kenneth 926-4385
+50TH AVE S INTERSECTS
2813 Jacobson Douglas K 922-7597
2823 @Salerno Richard J 929-3390
+VINCENT AVE S INTERSECTS
ZIP CODE 55410 CAR-RT C012
2911 Fagnoliu Carlo A & Margaret 926-4811
2917 Kirtka Kolthun M 926-4992
@McKenne Rebecca L 926-4992
2921 Russell Harry J 928-4982
+WASHTON AVE S INTERSECTS
3005 Hole Guy E & Hazel 927-9002
3009 Rindal Earl D & Olive 926-0158
3015 @Anderson Carley 927-7470
+XERXES AVE S INTERSECTS
ZIP CODE 55410 CAR-RT C003
3113 Josephson Jeffrey S 926-2981
+BEARD AVE S ENDS
ZIP CODE 55410 CAR-RT C004
3301 Bassett Stephen E 927-8691
+ABBOTT AVE S ENDS
+ABBOTT PL BEGINS
+BEARD AVE S ENDS
ZIP CODE 55410 CAR-RT C022
3305 Durose Jack R 924-0225
3317 Ronayne Rita M 929-9038
+CHOWER AVE S ENDS
3605 Philip Mark W & Susan 926-9385
3609 @Hughes Christine B & Patrick 926-7896
3617 Morrison Thomas R 927-9427
3621 @Rickard James D 922-8383
@Rickard Kelly 922-5383
3625 Philip Mark W & Susan 926-4616
+DREW AVE S ENDS
3701 Borden Kenneth L & Elizabeth 927-8489
3705 Hart Kevin C 922-9484
3809 Westgard Richard N 927-5998
+FRANCE AVE N ENDS
+FRANCE AVE S BEGINS
BUSINESSES 2 HOUSEHOLDS 46
W 54TH ST (MINNEAPOLIS)-FROM 5390
HARRIET AVE WEST
ZIP CODE 55419 CAR-RT C015
500 Skodje Glorae K 825-2513
509 ANNUNCIATION CHURCH religious svcs 822-0787
5100 @Fay Frances 822-8349
520 Schirmers Carol B 824-4310
525 ANNUNCIATION SCHOOL armtry 822-4394
+GARFIELD AVE INTERSECTS
614 MR MOVIES video tape rental 822-6718
624 MARQUO KYRO DESIGN control art gr deg 824-0277
MARTY CHIROPRACTIC CLINICS ocls cns chrptr 827-2611
+LYNDALE AVE S INTERSECTS
ZIP CODE 55419 CAR-RT C019
710 @Kag Susan 922-5195
+ALDRICH AVE INTERSECTS
821 Wendt Dolores J 824-5140
BRYANT AVE S INTERSECTS

W 54TH ST (M)
+ZIP CODE 55419 CAR-RT C003
1010 Craig Daniel R 823-8425
+EMERSON AVE S INTERSECTS
+FREMONT AVE S INTERSECTS
+GIRARD AVE S INTERSECTS
ZIP CODE 55419 CAR-RT C007
1405 Bracchi Mary A 924-9170
+HUMBOLDT AVE S INTERSECTS
+IRVING AVE S INTERSECTS
+JAMES AVE S INTERSECTS
+KNOX AVE S INTERSECTS
ZIP CODE 55419 CAR-RT C004
1800 Ellis John A & Catherine 926-3697
+LOGAN AVE S INTERSECTS
ZIP CODE 55419 CAR-RT C005
1908 Pinnell Ellen E 924-0448
1912 Ebel Robert L 925-2401
1918 Meyer Gayle L 920-4809
+MORGAN AVE S INTERSECTS
2006 Haines Jerry W 926-2350
2010 Johnson Leonard A 926-3872
2016 Desmond John F 926-3865
2020 Champton Joyce L 925-3610
+NEWTOWN AVE S INTERSECTS
2211 CROSSROADS STAMP SHOP misc rlt stns 928-0119
2213 MOORE CYNTHIA gift shop 927-1074
ZIP CODE 55419 CAR-RT C001
2214 AMERICAN-RUSSIAN TRADE mgmt crntng svcs 922-1163
+PENN AVE S INTERSECTS
ZIP CODE 55424 CAR-RT C008
3907 PICKET FENCE sewing ndk 920-7888
3908 @Nielsen A 924-0893
Oyewole Adelina G 922-6584
@Oyewole Daniel G 920-8645
+HALIFAX LN BEGINS
+HALIFAX AVE S INTERSECTS
4113 CREKESIDE CHILDRENS PLACE child strng care svcs ndk 928-1410
EDINA COMMUNITY LUTHERAN CHURCH religious orgs 926-3808
+MINNEHAHA BLVD ENDS
+MINNEHAHA AVE BEGINS
+OAKLAWN AVE INTERSECTS
+KELLOGG AVE INTERSECTS
+WOODDALE AVE INTERSECTS
BUSINESSES 11 HOUSEHOLDS 18
55TH AVE N (MINNEAPOLIS)-FROM
5601 LYNDALE AVE N WEST
+N 4TH ST CONTINUES
ZIP CODE 55430 CAR-RT C008
501 Shelton Eugene H 560-0790
516 Peterson Darrell J & Maryanne 560-2569
520 Stuech Victoria 566-5449
+CAMDEN AVE N INTERSECTS
+ALDRICH DR N BEGINS
800 Swanson Victor 566-1890
+BRYANT AVE N INTERSECTS
ZIP CODE 55430 CAR-RT C017
920 Green Polor E 566-3329
+ABBOTT AVE N INTERSECTS
+DUFRONT AVE N INTERSECTS
EMERSON AVE N INTERSECTS
1220 HOME SERVICES TOP TO BOTTOM engl-farm hngsr org 561-9499
+FREMONT AVE N INTERSECTS
1300 @Schwitzer C 566-7087
@Schwitzer E 566-7087
+GIRARD AVE N INTERSECTS
1424 Erd Randy W & Judy 581-0078
1425 @Bennett G B 566-7216
@Polo Robert M 585-0565
@Rogers Ginger L 560-5422
+HUMBOLDT AVE N INTERSECTS
ZIP CODE 55430 CAR-RT C004
1504 Michal Fred A Jr 580-2221
+IRVING AVE N INTERSECTS
1600 Brodie Paula H 560-0545
@Hallman Arlo 566-5936
@Hallman Carol 566-5936
+JAMES AVE N INTERSECTS
+KNOX AVE N INTERSECTS
ZIP CODE 55430 CAR-RT C011
561-5321
+LOGAN AVE N INTERSECTS
+MORGAN AVE N INTERSECTS
1912 Lynn Edward A 566-3019
2006 Gordon Don R 560-0899
2012 Braech Larry R 580-0878
+OLIVER AVE N INTERSECTS
2100 Abraham Robert L & Charlene 560-8339
2106 Raich Roberta M 561-3526
2112 Lindh Everett C & Ruth 580-0835
2112 Skodje Glorae K 580-8742
2113 Goddard Rudy D 580-9353
2118 McArthur Ernie M 560-0191
2200 Hultgren Dorothy 566-6974
2201 Krokaleberg Susan B & Daniel 566-9688
2206 Johnson Judy E 566-3343
2207 ERIKSSON WENDELL H mgmt crntng svcs 566-6188
2212 Downing Gerry L & Janice 566-2980
2213 Neull Orville F & Frances 580-9746
2216 Valerius Richard T & Shen 561-8208
2219 Salizwood Michael G & Dawn 561-6233
2224 @Fay Frances 561-4343
+PENN AVE N INTERSECTS
2300 Swanson Henry Jr & Audrey 580-9743

HIAWATHA LN 1999

HIAWATHA AVE to N HICKORY ST

654

HOMEOWNER

NEW N

HIAWATHA AVE (M)
+28TH AVE S INTERSECTS
+ E 36TH ST INTERSECTS
3601 CAMMINS & SELLE FURNITURE CO furniture 729-4230
CEDAR VAN LINES kl truck 729-4700
ENVIRONMENTAL WAREHOUSE genl whrs 729-4230
HOSE USA indus mach... 722-4243
T L C CEDAR VAN MOVING & DISTRL kl truck w/strge 721-8077
+28TH AVE S INTERSECTS
+ E 37TH ST INTERSECTS
3745 ARCHER DANIELS MIDLAND CO fr gm mill prod 729-2302
+30TH AVE S INTERSECTS
+ E 38TH ST INTERSECTS
ZIP CODE 58406 CAR-RT C014
3901 NORTH CENTRAL AREA prepared leads 722-9581
3915 CHEMSTAR PRODUCTS COMPANY wet corn millng 722-0079
+ E 40TH ST INTERSECTS
4001 IAC INTERNATIONAL roudrubaie gds 724-7244
4041 CENTRAL CONTAINER CORPORATION genl whrsng 724-3004
+ E 41ST ST INTERSECTS
4121 MC DONALD'S eating places 729-4417
4135 ACTION SYSTEMS elec work 721-9000
+39RD AVE S INTERSECTS
+ E 42ND ST INTERSECTS
4201 STAR 1 AUTO auto rpr... 722-4688
4225 HIAWATHA PROPERTIES LLP rnsdnt bldg opt 724-3004
LAKE COUNTRY splg recrtnl goods 724-3999
PREMIER LIMOUSINE kl pass rran 722-4457
+34TH AVE S INTERSECTS
+ E 43RD ST INTERSECTS
+35TH AVE S INTERSECTS
+ E 44TH ST INTERSECTS
4411 HIAWATHA REDDY RENTS eopt 721-1111
4439 A & M MILLWORK imbr bldng mtr 721-1121
4443 PRO ELECTRIC OF TWIN FLES work 603-9772
+ E 45TH ST INTERSECTS
4501 MILSCO ENGINEERING misc consls 724-3655
4525 ALLIED LABS toilet prps 724-7522
C & S LABORATORY commrcal phys rchrs 729-1485
ZIP CODE 58406 CAR-RT C011
HEMESIS drgs rprtrs sdr 722-6394
+ E 46TH ST INTERSECTS
4601 CONOCO gas stations 729-4224
4608 BURGER KING eating places 729-1223
4711 CRYSTAL CHINESE RESTAURANT eating places 722-9358
4717 PRIVE CHIROPTIC CENTER ofcs chs cncpt 721-2146
4721 JAKUBAS DENTAL CLINIC ofcs chs dntst 721-3012
4723 MASTER PLAN HEALING AID CENTER misc rl strs 431-6338
MATRICIS srpd appl suppl 721-4817
4725 HIAWATHA ALTERATIONS sdrpt rsv 721-2641
4727 TOBACCO WAREHOUSE tobacco strs sdrpt 729-9772
4735 COAKLEY ED ALLSTATE AGENT ins agts/svcs 721-1883
DOMINOS PIZZA eating places 729-8388
4739 WE CARE HAIR beauty shops 722-0485
4741 ERICKSON INVESTMENT GROUP eating places 721-7534
4743 COPY EXPRESS duplicng svcs 724-8616
DELIVERING HUMAN RESOURCE SOLUTIONS busn conslntg 729-3922
MULLANS mgmt cnslng svcs 722-1838
RONNING SHEILA mgmt cnslng svcs 142 OMNICALL commcn svcs 470-6361
144 MAKARIA EDUCATIONAL OUTREACH schs edatl svcs 724-5696
4749 SAINT CROIX VALLEY HOUSNGS misc rl strs 729-1121
4751 WAGREENS drug store 722-4554
+ E MINNEHAHA PKWY INTERSECTS
+ 42ND AVE S INTERSECTS
+ E 48TH ST ENDS
ZIP CODE 58417 CAR-RT C012
4918 Macdonald AIBR R 722-1528
Westerlund M R 722-1528
4928 WESTPHAL JAMES P legal svcs 338-1453
4930 Holic Frank 722-3345
PETERSON DON CO busn conslntg 721-5400
4934 Kitchner R 721-4048
+ E 50TH ST INTERSECTS
5000 CAPTIONS CHOICE eating places 722-2277

HIAWATHA AVE
+44TH AVE S BEGINS
5028 Telle Duane K & Barbara 724-5306
5046 Peterson Sharon E 724-3586
Wimbauer Roger H 728-9405
5050 Holmberg Vernon D 729-6872
+45TH AVE S BEGINS
5106B Davies Paul L 724-9893
Korbel 724-9893
5108 Buddy John E 721-3954
5112 East Michelle A 724-7208
5130B Abbey J L 724-5971
Espander Valerie S 722-1137
Knake R 729-4374
Musolf Gail 722-1137
5136 S Wood Christopher J & Janice 728-0216
+46TH AVE S BEGINS
5152 GIVE US A CALL SERVICES secular svcs 866-1322
+47TH AVE S BEGINS
BUSINESSES 6 HOUSEHOLDS 21
HIAWATHA CIR (EDEN PRAIRIE)-FROM NORTHEAST
ZIP CODE 55447 CAR-RT C001
8204 Rogers Alice R & James 837-1963
8211 Lempesis William A & Leah 975-9670
8217 Peterson Thomas J & Cynthia 937-0559
8218 Anderson Louise A & Gordon 937-5462
8225 Hayden Douglas E & Cynthia 937-9370
8230B Lawrence K 949-9048
8237 Peters Myron C & Evelyn 937-2489
8241 O'Banion P 949-9089
Jones Julius Jr 949-9089
+HEATHER AVE BEGINS
8243Bryler Cheryl 906-9762
O'Hayler Steven 906-9762
HOUSEHOLDS 11
HIAWATHA DR (CHANNASSEN)-FROM 6599 NEE PERCE DR WEST
ZIP CODE 55317 CAR-RT R002
860 Hoffman Gary J & Jacqueline 470-8440
900 MYSEKIVITZ ANNE child day care svcs 474-8332
O'Paterson Thomas J 470-2218
921 Peterson Keith J 474-3905
BUSINESSES 1 HOUSEHOLDS 3
HIAWATHA LN (MINNEAPOLIS)-FROM 5231 MINNEHAHA AVE SOUTHEAST
ZIP CODE 55417 CAR-RT C030
8203 Dunker Diane M 722-1769
8207 McNamara James 722-6078
8209 Goodnow Gary A 722-5948
8219 Reid M 724-9330
8221 Lorenson J 722-3387
+ E 53RD ST INTERSECTS
8217-7418
8218Rassler Marc 722-1032
8219 Vanh Brian C 722-1032
8219 Andrews Judith K 722-3815
8220 Tracy Michael R 724-0036
8224 Robertson Larry K 721-8708
8225 Estes Shelton M 724-2387
8228 Lamb Kimberly S 729-4704
8239 Schirmer Randall F 729-7472
5333 Peterson Eric E & Blanche 722-6978
5343B Almqvist Darcy 722-9286
Doroy Darcy L & Cynthia 722-3815
5344D Workman Michael R 724-8364
5347Purkay Laurence T 724-2395
5348 Draw Ronald J 724-6254
5350 McCurdy Bobbie B 722-7158
5351 Bonin Francis G 724-2515
5360O'Garrahy G 724-7388
HOUSEHOLDS 23
HIBISCUS AVE (MINNEAPOLIS)-FROM 7407 KELLOGG AVE WEST
ZIP CODE 58435 CAR-RT C071
4500 Muharar Elizabeth A 920-4992
4505 Drees Thomas K 925-4356
4509 Lindell Denise 926-3813
4512O'Sullivan Marie 924-0772
O'Sullivan Thomas M 924-0772
4515 Skulley James F & Sheryl 920-8409
4517 Wegner John J & Deborah 929-0799
4600 Perkins Gary J & Kirstin 929-4879
4604 Grazzini Alan R & Patricia 920-5444
4608 Campbell Wallace B & Jane 922-5697
+ W SHORE DR INTERSECTS
ZIP CODE 55435 CAR-RT C088
4740N Nagib Mahmoud G 325-3573
4704B Puman Charles F 920-8916
4705 LANGUAGE & FRIENDSHIP agcy 922-0174
Thomson Kai M 927-7882
4709 Suttie Marie 926-2810
4712 Mullikin Herbert M & Joyce 926-3517
4713 Hawkins Douglas M 926-8117
4716 Demoss John R 922-8789
4721 Signoralli James R & Susan 926-1821

HIBISCUS AVE (M)
4724 Anderson Karim L 920-3584
4729 Rogel Henry C & Marjorie 922-9294
4733 Webb William A & Susan 920-3786
+ PHLOX LN BEGINS
4741 Hansing Charles I & Kathleen 926-1177
C P INC light eqpt 926-2244
4745 Nesbit William H 926-6688
+ MONARDO LN ENDS
4749 MIDWEST PACIFIC CORPORATION busn svcs 925-4770
Thomson Daniel F 928-0011
4753 Adams Glenn 922-6720
4754 Witteger Joseph W & Michelle 922-6339
4757 Pfeiffer Linda L 925-6125
+ TRILLIUM LN ENDS
4800 Gryga Jeffrey M 925-3978
4801 Hegener Dudley A 927-6663
4804 Porco Donald V & Grace 922-7989
4808O'Swan John H 920-7966
4809 Anderson Barbara G 926-7903
4812 Lundberg Vre Laurel V 926-6689
4814 Tuna Ishik C 920-1147
4904O'Christensen Roger A 920-7139
4905 McGraw Thelma B 922-7089
4908 Lichy Nancy C & Harry 926-7534
4909 Logan Lewis B 926-6689
4912 Jardine Thomas D 920-5331
BUSINESSES 3 HOUSEHOLDS 38
HICKORY AVE NE (PRIOR LAKE)-FROM 5901 MARTINDALE ST NE SOUTHEAST
ZIP CODE 55372 CAR-RT R014
13289 Huser William E & Robyn 445-6008
13324 Dessler Todd A & Andrea 445-6204
13329 Archibald Bruce R & Jeanne 498-1956
13360O'Neil Diane 498-3982
O'Zech Steven 445-3982
INSIDE SPACES busn svcs 445-3982
13380 Bohannon James K & Harold 445-2828
BUSINESSES 1 HOUSEHOLDS 6
HICKORY BLVD (BELLE PLAINE)-+ W 273RD ST BEGINS
ZIP CODE 56011 CAR-RT R001
23751 Stier John L 873-2973
+ W 27TH ST INTERSECTS
24025 MINNESOTA SAW repair svcs 873-2026
Tietz John G 873-2941
24080 TheraJohn Lon D & Ruthann 873-8236
24075 Bailey John M & Joyce 873-6331
24655 Jensen James E & Harold 873-8180
+ W 260TH ST INTERSECTS
25140 Koenig Robert H 873-2345
+ W 257TH ST INTERSECTS
25530 Voetsky Chad S & Sarah 873-4616
25740 Kuhn Dennis L 873-6624
26131 Raleigh Robert T & Sallie 873-6688
27465 Koenig Lawrence R 873-6871
27530 Gliczinski Steven P 873-6344
+ LAREDO AVE INTERSECTS
BUSINESSES 1 HOUSEHOLDS 11
HICKORY CIR (WACONIA)-FROM 5537 CAR-RT C034
1201 Brown Linnea C 442-4589
1202 Moore Bruce R & Jean 442-5429
1209 Northrup Lynn 442-5494
1217 Gynn Maria S 442-1233
1218 Kast Jeffrey E & Sandra 442-1330
HOUSEHOLDS 5
HICKORY CIR NE (MINNEAPOLIS)-FROM 6952 HICKORY DR NE
ZIP CODE 55432 CAR-RT C012
6957 Rieland Charles H 571-9661
6961 Neel James H 571-3331
6967 Swanson Mary 571-8933
6989 Pawlitsyn Mike N 571-9223
HOUSEHOLDS 4
HICKORY CT (EDEN PRAIRIE)-FROM 6782 WOODLAND DR
ZIP CODE 55346 CAR-RT C013
14809 Pauson James H & Cynthia 934-3540
14812 ONELL GLORIA REALTY real est agts/mgrs 934-8888
14822 McCoy Mary B 934-5081
14829O'Malley Eugene A 975-5003
14832 Evert Julia A 937-9247
14839 Punarolo Kevin A & Lavonne 937-1045
PUMARLO LAVONNE A child day care svcs 937-1045
14842 Nichols Harold A & Maria 949-9357
14852 Shevandel Dale T & Karen 937-2897
14862 Hamre David R 949-9454
O'Brien Nonces 937-0786
14872 Scott Lynn M 937-8770
14873 O'harry Robert J 934-8620
14882 Brooks Syne M 949-0873
14889 Berg Aggie J 934-4582
14892 Jensen Thomas L & Kathleen 949-9257

HICKORY CT (E P)
14802 AMONG FOUNDATION indvtl family svcs 975-5950
Madroon Lou L 937-1545
BUSINESSES 3 HOUSEHOLDS 15
HICKORY DR (HAMEL)-FROM 1023 HAMEL DR NORTH
ZIP CODE 55340 CAR-RT R005
3575 HAYS DRYWALL plstrng dwall instl 478-6309
3595 NU-SURFACE CO hwy str constr 478-9474
ZIP CODE 55340 CAR-RT R004
3600 D D SERVICE wet swg util in 478-6010
JORDAN AUTOMOTIVE SERVICE auto rpr 478-9708
BUSINESSES 4
HICKORY DR (MAPLE PLAIN)-FROM 8947 CUNNEY ROAD 15 NORTH
ZIP CODE 55359 CAR-RT R002
1300OBenson Elizabeth 472-1259
1375B Daugherty Jay C & Linda 472-2926
1400 Gray Terrence J & Sandra 472-2926
HOUSEHOLDS 3
HICKORY DR (WAZATA)-FROM 971 COUNTY ROAD 24 NORTHEAST
ZIP CODE 55391 CAR-RT R002
2022 Spalla Dennis J & Deirdra 473-5027
2025 Buckwater Jeffrey K 473-0167
2032 Mole Raymond M & Cathie 476-1223
2045 McLean Shannon L 404-9232
2052 Spack Michael F 476-2319
HOUSEHOLDS 5
HICKORY DR NE (MINNEAPOLIS)-FROM 2 69TH WAY NE NORTHEAST
ZIP CODE 55432 CAR-RT C012
6902 Hoffmann Mabel A 571-0695
+ HICKORY ST NE INTERSECTS
6901 Hanson Lorraine R 571-7037
6906 Schaefer Larry F & Sandra 571-7147
6909 McLaughlin Martin J 572-0845
6912 Geagre Terrence T & Helen 571-5925
6917 Boyum Jane 571-8522
6918 Cheever Richard J & Eileen 571-4917
6922 Adams Wilmer L 571-4917
6925 Schmit Joyce M 571-7559
6930B Sharp Cathy 571-8409
Warner D S & Nadine 571-0360
6933 Schigel Michael K & Karen 571-1157
6940 Mistein Donald R & Jordis 571-9172
6941 Wilson Roger D 571-0151
6942 Koenig R NE BEGINS
6949 Reflective Products clg ml-order hses 571-8997
6950 Prentice Tony L & Paulette 571-6475
+ HICKORY CIR NE ENDS
6972 LIL ADVENTURES WEEKEND 571-4366
6979 Gardner Kenneth J & Bernadette 571-5084
6987 Landvik Denise L 574-2052
6995 Weidmann Jeffrey J 572-8962
6999 Pauson James H 571-3016
+ 70TH WAY NE BEGINS
7003 Haley Charles H & Florence 571-2156
7010B Beckstrom Beverly 571-4225
7011 Larson Bradley J 571-5136
7027 Schloss Benjamin V 572-2227
7035 DAIRY PLUS HOME DELIVERY drcl sling estbmnts 574-1648
O'Lundequam Paul 574-1648
O'Lundequam Rose 574-1648
O'Rassussen Kirk A 574-2435
7043 Genosky Doris A 571-2972
7069 REFLECTIVE PRODUCTS clg ml-order hses 571-5070
7075O'Paterson Robert C 571-3795
7093O'Gresty David family svcs 574-1150
Andrews Nancy 574-1150
7084 Nguyen Lon T 572-1819
7091OKrasnik N 571-0021
7092Cresty Terry J 571-5177
+ E RIVER DR INTERSECTS
+ 71ST WAY NE BEGINS
BUSINESSES 3 HOUSEHOLDS 35
HICKORY LN (EXCelsior)-FROM 3703 RED CEDAR DR NORTHWEST
+ S CEDAR DR BEGINS
ZIP CODE 55331 CAR-RT R061
3628 Potts Samuel E & Velma 474-4650
3630 Moore James J & Patricia 474-7230
MOORE JJ ROOF MANAGEMENT mgmt cnslng svcs 474-3778
3632 Peterson C 474-7439
3714 Smith Alfred W 474-2180
3716B Berk Marvin N 474-8017
3724BANKS IRON 470-1876
O'Nelson Tim 470-1876
3728 Rask Jon E 474-1422
3732 Parsons Louis G 474-8152
3734O'Blaha Brenda 474-1404
3734 Morgan Michael K 474-9790
3738 Cresty Terry J 401-9172
+ JUNIPER AVE BEGINS

HICKORY LN (EX)
BUSINESSES 1 HOUSEHOLDS 12
HICKORY LN (MOUND)-FROM 4999 EDGEWATER DR SOUTH
ZIP CODE 55364 CAR-RT R006
2140O'Brethorst Ervin S 472-2701
+ ROSEDALE DR BEGINS
HOUSEHOLDS 1
HICKORY LN (SHAKOPEE)-ZIP CODE 55379 CAR-RT R005
124OKotechompo Sutep 445-7564
137 Lamoureux Nathan D 496-1888
164 Eldem Thomas M 445-4670
177 Krantz Jason M 496-2923
184 Williams Daniel R 493-0321
204 Brooks Jeffrey E & Annette 445-2731
217 Gilbertson Sharon G 496-3066
244 Peterson Mark C 403-0914
257O'Leah Amy 496-0060
277O'Leahs Dawn M & Craig 445-2731
284OSmith T J 445-9361
304 Brock Kenneth B 496-5520
307 Anderson Bradley J & Jodi 403-1074
337O'Leahs Robert M 496-5597
357 Johnson Blake C & Kendra 403-0644
364O'Leahs Robert M 445-5155
377O'Wistrick Harriet 403-0914
384 Ceno Jorge A 496-0334
HOUSEHOLDS 18
HICKORY PL NE (MINNEAPOLIS)-FROM 6943 HICKORY DR NE NORTH
ZIP CODE 55432 CAR-RT C012
6951OSmith L 571-5088
6952 Temple David E & Mary 571-7412
+ 70TH WAY NE INTERSECTS
HOUSEHOLDS 2
HICKORY ST NE (MINNEAPOLIS)-FROM 79 MISSISSIPPI ST NE NORTH
ZIP CODE 55432 CAR-RT C019
6502 Yurkew David A Sr 571-2668
6506 Brock Edward D & Chrlyle 574-7367
6544 Ambuhl Gregory J & Dawn 572-0778
6560 Norberg Bruce S & Juanita 571-8685
6580 Larson Eric 574-7369
+ 66TH WAY NE ENDS
6604 Schultz David A 572-1061
6680 Nelson Eldon D 571-0517
NELSON SANDRA child day care svcs 571-0317
+ RICE CREEK WAY NE INTERSECTS
+ LOCKE LAKE DR NE CONTINUES
6602 Ferber Richard H 571-4678
J & B CRAFTS hobby toy shop 571-0011
6607 Anderson Thomas A 571-5395
6609 Berg Vincent B 571-1667
6610 Koenen Clarence A & Ruby 571-8052
6613 Ostrowski Jeffrey W 574-1750
6614 Nystrom Rosie G & Elnor 571-3052
6617 Anderson Todd L & Dawn 574-0386
6625 Linker Michelle A 571-5073
+ HICKORY DR NE BEGINS
+ 69TH WAY NE BEGINS
ZIP CODE 55432 CAR-RT C009
7831 GLOBAL HEALTH MINISTRIES religious orgs 586-9590
7849 DEWRO MACHINING indus mach 571-5395
7851 K & K MACHINING indus mach 571-5393
7853 C N C MANUFACTURING indus mach 571-8921
7855 HOLT CH COMPANY indus mach 572-2590
7871 BOMARK BINDERY bobbing rld wor 453-3354
SPEC PLATING CORP plating 571-5445
7890 MINNEGOLD STORE FIXTURE COMPANY wd partitons rld 571-5767
+ W 70TH ST INTERSECTS
+ 81ST AVE N CONTINUES
8201 WAYMORE TRANSPORTATION truck 786-8076
BUSINESSES 11 HOUSEHOLDS 15
N HICKORY ST (CHASKA)-FROM 499 W 1ST ST NORTHWEST
+ S HICKORY ST BEGINS
ZIP CODE 55318 CAR-RT C001
100 Lunning Sherry L 448-4207
113Glatz Walter 448-4668
112 Mullins Gretchen 388-4316
115OSluis Romanus 448-2448
120 Kingstutz Daniel A & Mary 448-4683
121 Smith Juliana H 448-2030
125 Lutzschmiser Edward J 448-4832
+ W 2ND ST ENDS
2066B Charles E 448-7008
O'Ward Diane 448-7008
208O'Fallon Judy 448-3566
220Burger Mary 448-7664
221 Frey Esther 448-4470
222 Ezz Amy J 388-9450
225 Quest Handy L & Mary 448-2546
+ W 3RD ST ENDS

N HICKORY
3038Snyder
312 First
+ RAILROD
ZIP CODE
463 SALLI
sch
BUSINESS
\$ HICKOR
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+ W 1ST I
ZIP CODE
119O'Stan
HICKORY
ZIP CODE
4300 FRIE
Hills
4340 CAMP
4351 BOW
BCH
4376B art
BAJ
cnet
4466 Israe
4487 Lami
4451 May
4550 NOR
4652 BOU
GEI
475 Thel
4805 Riac
4891O'Con
4913 Darr
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BUSINESS
HIDDEN I
806
8000 New
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8020 Cre
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8040 Brad
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8061 Agh
8061 Buc
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HIAWATHA LN 1993

368

\* NEW NEIGHBOR

824-5141  
in A 824-5141  
+ 823-2794

ie W 824-5141

822-5932

822-5932

822-0139

& Mary

8288

822-0962

825-6192

827-7033

825-8700

825-5063

827-2240

827-7685

827-8910

824-3655

827-0566

822-6153

822-6153

823-1766

825-0837

822-7707

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826-7602

824-2764

e tax

y shop

822-5938

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Ann M

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INFORMS

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HENNEPIN AV-Contd

4 Fred Cindy

2 Sweet Stephen & Fuki 825-5033

2 Espinoza Eliz A 822-5033

3424 Lunda T 825-5033

Lower Not Verified

Upper Landis C 824-5323

3428 Houghelin Paul A piano tech 823-2312

2 Gibbs Pat D & Caroline 825-3614

Lower Houghelin Paul A 823-8838

Monson Todd & Joanne 825-7930

Upper Nystuen Michael 827-0385

Upper Black Russell A 827-0385

Lower Dille Jennifer & Terese C 825-1761

3435 Green Steph W & Connie J 823-6305

823-6305

3436 Rattigan Peter J & Becky 823-7030

Upper Drink Todd 824-4063

Upper Chun R 824-4093

Lower Weibel Lori 822-2478

Upper Wiese Jason 827-8150

Upper Thielen Joe 827-8150

Upper Leland David W 827-8150

Upper Wise Ronald 827-8150

Upper Gilbas Scott 827-4702

Upper Mc Guire Peggy 827-4702

Upper Engellhardt Bayard 823-6702

Lvr Nobles T 823-6702

3443 Drever Larry D 824-3601

Lower Deslauriers Annette 823-1434

Lower Urlicher R 823-1434

Upper Klemp Aaron

Upper Corel Crystal M

Lower Ravaz-Mittlemark Michl

Lower Brosnan Robin M 824-6653

Upper James Michl 824-6653

Upper Kuntz Christopher 824-6632

3448 Swanson R J 823-3429

1 Gallagher Bamba B 822-3429

2 Ender Tim & Dana 827-2771

3450 Lane Richd C 824-4603

W 25TH ST INTERSECTS

3501 Vacant (2 Businesses)

3505 PLAY IT AGAIN SPORTS used sporting goods 824-1231

3513 Apartments

214 Misewicz Mike E

202 Livingston John 827-1496

202 Arthur Brad J 827-1496

203 Espeland Jenny 823-7416

204 Dudley Ed carp 822-4150

205 King Alyce L 827-4902

3514 Apartments

1 Bocsalis 823-7151

3 O'Neill D J 822-7151

101 Story Nancy 827-0474

102 Todd Kathleen A 823-8442

103 Thompson Julie 823-2021

104 Chase P 824-8704

201 Lyness D K 822-3756

202 Gale Lisa A 825-7216

203 Vacant

204 Liengang G 825-2686

Not Verified

A CALHOUN PODIATRY CENTER foot med surgical treatment 822-5847

A FIELSTAD K D podiatrist 822-5847

C ISLES BEAUTY SALON 822-0308

B GLAMOUR TAILORS alterations 825-2085

E L'ARGENT-TRINH DESIGNS JEWELERS custom mfg & repr 822-2694

D MODERN TIME WATCH REPR LAKESWOOD PRODUCTS INC 824-2500

3517 BUILDERS & REMODELERS INC 827-5481

Not Verified

PETERSON TOM CONSTRUCTION CO 822-9932

3523 REPAINTING PROGRAMS busn conslg 823-3144

ASTROLOGY BY MOONRABBIT Downstairs Mahoney Michael 827-5752

1 Vacant 824-6027

4 Osberg Craig 825-5510

3525\*Ferm Suzanne

Disen John

\*Okan

Not Verified

Not Verified

ZIMMERMAN FRAN psychologist 823-1517

3527 ELLISON TOM ARCHITECTS 824-3474

\*Fes

A CHOICE WOOD COMPANY 827-6227

3529 METZGAR AQUATICAL ENGINEERING 822-4505

AQUARIUM PLACE THE 822-4343

FISH MAN THE 824-2000

3539 GENERAL SPORTS SHOWS INC 827-5853

BOAT SHOW THE 827-5833

NORTHWEST SPORTSHOW 827-5833

3540 GREENHOUSE APARTMENTS

101 Moore B 823-0682

102 Kosmoski Danl P 823-0682

103 Kosmoski E 825-0982

104 Chism Lennie 825-7058

100\*Ferral Hector 824-5385

106 Bedford W I 822-4306

107 Shear K 823-8833

108\*Thorne Brian

109 Miller B 823-8833

110 Not Verified

111\*Harty V 823-8833

112\*Bauerly Francis S & Janet 825-0307

114\*Clark Bonnie 827-5604

115\*Martin K 825-4550

116\*King Laurie & Florence A 827-0481

117\*Huel Mary Pat 825-8903

118\*Osterberg P R 825-6172

119 George Robt P 827-2770

120\*Butke Barbara

121 Not Verified

122\*Hoffman Sheri L 827-3125

123\*Holbrook Peter 823-3586

124\*Bierie Clark

\*Frenick Mary L 827-7619

202\*Halstone Neil 824-5458

202 Carter-Gina E Clair 824-5458

203\*Houassa Richd 824-3541

204 Heneman Katharine 823-5785

205 Van Wyke R 823-9816

206\*Frost A M 825-7679

207 Kapius Mildred F 824-0163

208\*Price Sally 827-2885

209 Sorenson Steven J

210\*Rice Steve

211\*Radovanovic Philip & Vera 823-9816

212 Kopyar Matthew 823-1434

213 Kopyar Roberta

213 Not Verified

214\*Gelliff Timothy

214 Sell Paul

215\*Addante Caren 825-8102

216 Kraemer Thom M 823-0056

217 Sima Elza C 824-0183

218\*Valman Patti A 825-0807

219\*Winkelstein David 827-2779

220 Mark Marie 825-0165

221 Granger Virgil 823-9816

222 Meyer Taml 823-9816

223\*Williams S 827-1481

224 Weinschel Eric 824-4355

225\*Johnson Sheila R 827-7205

302\*Maisel Gregory 825-7779

303\*Eckel Julie 825-2917

304\*Rammanujan Banganathar

305 Mc Crea C 822-9030

306 Bellfuss Lou J 825-8752

307\*Wheelan Irene 824-3469

308\*Leander Ken 827-4700

309\*Manske Karen 824-8612

310 TICKLE M E 822-8536

311 Orth Genevieve 823-5312

312\*Taft John S

313 Bellefeuille J

313 Not Verified

314 Rust George W 823-2087

315\*Weber Craig W 825-3296

316 Coursole J R 827-4313

317 Banks D 824-6990

318\*Shaw M 824-6990

319 Stabler Kenneth E 824-5061

320 Johnson Erik R 822-9032

321 Belmer E L 823-3659

322\*Solne Eric 823-3289

324 Gilbertson Brian 825-3517

325 Sherry 825-3517

3563 Vacant

W 25TH ST INTERSECTS

3600 LAKEWOOD CEMETERY ASSOCIATION 822-2171

983 HOUSEHOLDS

442 BUSINESSES

307

HIAWATHA AV -FROM S 8TH ST AND 18TH AV E SOUTHEAST 1 WEST OF CEDAR AV

\* ZIP CODE 55404

1907 Not Verified

Not Verified</







E 54TH ST 1985

CRYSTAL SHAMROCK, INC. logo and address: 6000 Douglas Drive N., Minneapolis (55429-2399)

CRYSTAL SHAMROCK, INC.

Aircraft Sales New & Used • Aircraft Rental • Complete Aircraft Maintenance • Avionics Sales & Service TEL. (612) 533-2214

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IRIE OFFICE Y OAK ROAD RIE, MN 55344 144-5210

SECTS SECTS Mrs @ 728-2102

HARRIET AV WEST MOND LAKE RD

824-3502 58 @ 824-9000 @ 824-5671 @ 824-3482 823-0196 823-7465 @ 823-9024 frs @ 824-5888 @ 824-7547 @ 824-7487 824-7415 @ 823-3610 823-5231 @ 824-8491 @ (Training Center) hony 825-0403 @ R 824-1162 @ 827-8646 22-8619 @ C 823-5875 en 824-4312 time 824-2271 T 824-7251 R 824-1274 Mrs 828-6230

A 827-5450 323-3298 3305 terry 328-9646 8376 A 823-4721 327-3418 3-8771 33-9256 526-1231 P 824-8351 822-2292 Mrs 822-7988 3-0885 L 824-3712 82-3144 27-4347 822-5838 822-8396 322-3884 T 823-2231 on 822-8736 C 822-1506 8-5997 @ 823-8376 824-7249 2143 822-8680 F H 823-5405 n 824-3508 L 827-3168 82-4978 @ 7929 822-3823 714-659 824-2078 Mrs 823-7538

24-1255 823-0095 4-3750 823-4390 L 825-4871 323-3888 323-3083 5-3460 824-8408 22-0723 nia M 822-5149 323-7087 T 824-7066 M 823-8894 7-2257 622-5223 22-4030 D 822-3840 3-825-6017 35-7969 6074 23-3346 34-9089 24-3147 A 825-3554 827-3177 E 825-0801

SECTS professional association hys 823-5225 823-8225 225 5226 23-5225

W 63D ST—Contd 720 Weiser Lee A @ 825-2190 724 Pearson Bertel @ 825-4058 725-Smith Wm A @ 825-5987 ALDRICH AV S INTERSECTS 800-Kersten Darrell @ 825-5791 801 Vacant 805 Larkin Lucille M Mrs @ 823-7073 808 Gilbert Ray L @ 824-1620 809-Pike Wm D @ 824-4273 810 Thorpy Perry J @ 822-1143 814 McChane Douglas 824-2948 815 Soutor Ashley C 823-6381 818 Erser Harry J @ 822-4028 819 McLaughlin David L @ 827-1060 825 Brooks Jay C @ 827-1365 BRYANT AV S INTERSECTS 900 Overend John @ 823-1743 906 Andrews Craig B @ 822-4090 910 Gunderson Thom M gent contr @ 825-9389 914 Field Dan @ 823-7369 919-Mc Murry Peter H @ 823-7369 920 Anderson Gary D @ 827-8062 924 Schumacher Anna P Mrs @ 824-3438 COLPAX AV S INTERSECTS 1000 Simondet Jerome B @ 824-7212 1001-Stain Richard E @ 824-3907 1007 Melcher Anthony M @ 825-1756 1010 Scheurer Wm T @ 823-5843 1011 Lee Jean A @ 825-2304 1014 Unthahn John C @ 1015 Stolson Juan 823-7047 1019 Friable R F @ 1020 Lagrandeur Philip H @ 823-5078 \*Lagrandeur Alice 1024 Norbye Rodolfe L @ 822-7332 DUPONT AV S INTERSECTS 1100 Anderson Geo R @ 823-2957 1101 Stree Madelin @ 823-1475 1106-Louis Kevin 1107 Olson Russell E @ 823-7982 1110 Wendling Oran J @ 822-0627 1111 La Sola Donald W @ 824-3463 1114 Peck Wm A landscape archt @ 824-4122 1115-Ringdahl Paul D @ 822-0729 1118 Johnson Maurice A @ 825-2147 1119 O'Toole Edw M @ 823-7532 1122 Kester Cheryl 825-3505 1123 Samuelson Ronald W @ 824-8956 \*Brunner David C 822-1797 EMERSON AV S INTERSECTS 1200 Larson Larry D @ 824-7114 1202 Lindahl John R @ 823-8489 1206 Anne Burg @ 823-5843 1209 Veit Lee H @ 823-4629 1210 Schulz Leonard @ 824-1816 1214 Reay Edw S Jr @ 823-0626 1216 Brasuhn Robt J @ 823-6887 1218 Schubert Richd M @ 827-7469 1219 Hansen Jack A @ 824-4747 1222 Bonnarena Henrietta W @ 822-7852 1223 Magnuson Ralph R @ 823-6887 1226 Johnson Duane A @ 824-0295 FREMONT AV S INTERSECTS 1300 Raymond Alan D @ 822-8683 1310 Korda Carol L 824-5477 GIRDARD AV S INTERSECTS

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54TH ST E—FROM NICOLLET AV EAST 1 NORTH OF E DIAMOND LAKE RD ZIP CODE 55419 17 Mc Kinney Sara W @ 824-7538 \*Lennam Julie 824-9558 19 Robinson T E @ 825-3779 21 Heider Alan J @ 23-Hilfstrandt Nina B 823-1678 25 Smith Philip J @ 825-9319 27 Barron Joanne K @ 825-1527 38 Karmel Apartments 1 Benjamin Marilyn B 827-5171 2 Bratich Viola 825-8121 3 Heiker Beth R 824-2222 4\*Gronberg Steve 823-5429 5 Brown Martha D Mrs 827-2414 6 Paulsen Lucy W 822-9710 7 Turgen J F 822-3965 8 Johnson Gida B 824-5814 9\*Eyer Jeen 824-0149 10 Christoph Marian K 822-8444 11 Page Laurin M 827-1108 12 Rawson Donna 824-9846 13\*Givons Kelly 823-0368 14\*Juntti J E 822-0470 15 Nilson Bonnie B 825-7552 16 Anderson Mabel C 825-5352 17 Barnes Curtis D 822-3622 IST AV S INTERSECTS 101 Apartments 101 Ross Milton W 823-7701 102 Roth Russell P 822-3033 103 Mehr George 823-3937 104 Hegg J M 105 Budak John C 824-0965 106 Karnes M D 825-1541 107\*Storoy L M 824-4057 201-Burns P R 822-2729 202 Taylor Irene F 825-5157 203 Thompson Marjorie G 825-6497 204 Fie Homer E 822-2727 205 Smith Gladys L 824-1076 206\*Nicoloff C 207 Nelson Beas C 822-5035 301 Henke Marion A 824-0051 302\*Schaller M 303\*Faulkner L M 823-4128 304 Mc Ginty Kath E 824-8933 305 Holte Ardis 822-5756 306\*Jorgensen Ken 307 Johnson Clara G 822-4953 STEVENS AV INTERSECTS

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3301 P K G Oil-Motor Self Serve 722-9665

E 33D ST INTERSECTS
26TH AV S INTERSECTS
3301 P K G Oil-Motor Self Serve 722-9665

E 33D ST INTERSECTS
26TH AV S INTERSECTS
3301 P K G Oil-Motor Self Serve 722-9665

E 33D ST INTERSECTS
26TH AV S INTERSECTS
3301 P K G Oil-Motor Self Serve 722-9665

E 33D ST INTERSECTS
26TH AV S INTERSECTS
3301 P K G Oil-Motor Self Serve 722-9665

E 33D ST INTERSECTS
26TH AV S INTERSECTS
3301 P K G Oil-Motor Self Serve 722-9665

E 33D ST INTERSECTS
26TH AV S INTERSECTS
3301 P K G Oil-Motor Self Serve 722-9665

E 33D ST INTERSECTS
26TH AV S INTERSECTS
3301 P K G Oil-Motor Self Serve 722-9665

E 33D ST INTERSECTS
26TH AV S INTERSECTS
3301 P K G Oil-Motor Self Serve 722-9665

E 33D ST INTERSECTS
26TH AV S INTERSECTS
3301 P K G Oil-Motor Self Serve 722-9665

E 33D ST INTERSECTS
26TH AV S INTERSECTS
3301 P K G Oil-Motor Self Serve 722-9665

E 33D ST INTERSECTS
26TH AV S INTERSECTS
3301 P K G Oil-Motor Self Serve 722-9665

E 33D ST INTERSECTS
26TH AV S INTERSECTS
3301 P K G Oil-Motor Self Serve 722-9665

E 33D ST INTERSECTS
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3301 P K G Oil-Motor Self Serve 722-9665

E 33D ST INTERSECTS
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3301 P K G Oil-Motor Self Serve 722-9665

E 33D ST INTERSECTS
26TH AV S INTERSECTS
3301 P K G Oil-Motor Self Serve 722-9665

E 33D ST INTERSECTS
26TH AV S INTERSECTS
3301 P K G Oil-Motor Self Serve 722-9665

E 33D ST INTERSECTS
26TH AV S INTERSECTS
3301 P K G Oil-Motor Self Serve 722-9665

MEMBER FDIC ESTABLISHED 1872

800 800 810 815 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900



E 54TH ST 1979

OF ST. LOUIS PARK

5050 Excelsior Blvd.

St. Louis Park (55416)

Tel. 86

NAEGELE OUTDOOR ADVERTISING COMPANY OF TWIN CITIES, Inc.

1700 West 78th Street, Richfield

E 54TH ST--Cont'd
14 Christoph Miriam K 822-5444
15 Nilson Bonnie B 822-5242
16 Anderson Mabel C 825-5352
17 O'Leary P 822-2802
18T AV S INTERSECTS
101 Apartments
101 Rose Milton W 823-7701
102 Langemo E M 824-4128
103 Norton Adolph P 825-6900
104 Lundquist C L 824-1185
105 Bude John C 824-0985
106\*Knoolhuizen Z 822-4226
107\*Schulman J 822-2908
201 Bogle La Verne E Mrs 824-0314
1202 Taylor Irene F 825-8157
203 Thompson Marjorie G 825-5497
204 Pike Homer B 822-2750
205 Smith Gladys L 824-1076
206 Stanchfield Mae Mrs 823-4515
207 Noonan Beas C 822-5035
301 Henke Marion A 824-0551
302 Johnson Kenneth 822-5817
Bankhoff Dean L 822-1926
304 Mc Ginty Kathryn D Mrs 824-9233
305 Hoite Aris 822-5785
306 Rosell Robt S 824-9626
307 Johnson Clara M 823-4333
STEVENS AV INTERSECTS
2D AV S INTERSECTS
4D AV S INTERSECTS
CLINTON AV INTERSECTS
HAMPSHIRE DR INTERSECTS
PORTLAND AV INTERSECTS
PARK AV INTERSECTS
COLUMBUS AV INTERSECTS
ZIP CODE 55417
624 Inkie Keith @ 823-4862
740 Edgewater Beauty Salon 823-6626
742 Academy Dental Laboratory 822-5553
811 Structural Restorations genl contr 822-8914
Edgewater Contracting Co genl contr 823-2420
ELLIOT AV INTERSECTS
10TH AV S INTERSECTS
11TH AV S INTERSECTS
12TH AV S INTERSECTS
1201 Wold Shirley E Mrs @ 825-3607
1207 Neighborhood Realty
Faltow John @ 822-1571
1215\*Hicks Ralph @
1220 Hale Nathan School 827-4889
1221 Curo Orest J @ 823-7607
12TH AV S INTERSECTS
1307 Schreiber Susan M
1315 Doran Andrew J @ 825-7433
1323 Harms Ernest A @ 822-1950
14TH AV S INTERSECTS
1400 No Return
1408 Holan Chester H @ 823-2677
15TH AV S INTERSECTS
BLOOMINGTON AV INTERSECTS
1528 No Return
1530 Steele M June Mrs 728-2702
Burgstahler E M Mrs 728-8039
1534 Oram Edw R @ 721-2492
1540 Goodrich Robert @ 729-1921
1542 Skurdalvold Edith X @ 722-2102
W LAKE NOKOMIS PKWY INTERSECTS
WOODLAWN BLVD INTERSECTS
SHOREVIEW AV INTERSECTS
25TH AV S INTERSECTS
26TH AV S INTERSECTS
27TH AV S INTERSECTS
2705 Dorda Fredk A @ 729-0694
28TH AV S INTERSECTS
29TH AV S INTERSECTS
30TH AV S INTERSECTS
NOKOMIS AV INTERSECTS
31ST AV S INTERSECTS
310C Erhard Geo A @ 721-2570
3106 Fuehrer Gerald L @ 724-0071
3112 Orest Bertrand F @ 724-0041
3118 Suron Richd @ 722-0281
3122 Marinos Edna D Mrs @ 722-8116
3130 Running Douglas S @ 722-0895
3132 Nordin Dayle @ 724-0612
32D AV S INTERSECTS
3210 Wellhausen Harold E @ 729-7882
3215\*Blake Wm G @ 722-0939
33D AV S INTERSECTS
3300 Schave Ivan H @ 722-8611
3306 Schulzand Albert E @ 722-7511
3310 Mathison Viola J 724-8514
3319 Tom Thumb Bros 721-6165
3321 Airport Cleaners 724-2928
3321 Airport Pharmacy 729-3206
3324 At The Studio pianos 727-2549
34TH AV S INTERSECTS
3405 Kolb Ronald C @ 727-3405
3411 Paulson Myrtle J Mrs @ 727-1380
3417 Jurkovski Jerry G @ 727-3309
3421 Vacant
3425 Ohnsorge Ralph G @ 727-1447
35TH AV S INTERSECTS
3501\*Robertson Evon @ 727-2639
3505 Karos Donald M @ 727-3889
3509 No Return
3517 Christianson Keith
3521 Noble Frances V @ 727-1408
Hokanson Florence 727-1322
3525 New John H @ 727-1176
3527 Olmest Chester W @ 727-3663
36TH AV S INTERSECTS
3601 Hoyt Garland L @ 727-3244
3607 Strickrock Markus J @ 727-3587
3611 Pitman Charlotte Mrs @ 727-3540
3615 Stogren Steph H @ 727-1220
3617 Jacobson Abel E @ 727-3334
3619 Moore Linda @ 722-4495
37TH AV S INTERSECTS
3701\*Hindock J L @ 727-3568
3704 Denjak Sophia Mrs @ 727-4400
3707 Espersen Nancy L @ 727-3936
3709 Damberg Theo P @ 727-2052
3715 Vacant
3723 Gunner Allen D @ 727-3153
3728 Sally's Dairy Store gro 727-3332
Chilton Donovan C @ 727-3332
38TH AV S INTERSECTS
3811 Pitman Charlotte Mrs @ 727-3540
3815 Cichy James F @ 727-1876
3817 Anderson Donald T
Anderson Walter F @ 727-1994
3821 Keller Carole O @ 727-1118
39TH AV S INTERSECTS
3901 Vacant
3903 Martin Michel Jr @ 727-1959
3907 Hesse Ron 727-2931
3911 Beach Inga M Mrs @ 727-1892
3921 Alquist Virgil L @ 727-1819
3923\*Troutman Terry @ 727-1859
40TH AV S INTERSECTS
4001 Frondell Leonard C @ 727-1760
4005 Johnson David E @ 727-1828
4011 Anderson Kath M @ 727-2565
4017\*Haag Robt @ 727-3079
4021 Anderson Hugo L @ 727-1850
4025 Pedersen Peter M @ 727-1917
4028 Swetlow Roman A @ 727-1975
41ST AV S INTERSECTS
4101 Kruenwald Edw @ 727-1766
4111\*Gilbert Terry L @ 727-1810
4115 Soine Melvin R @ 727-1834
4118 Olson Frances P 722-1925
4119 Schroeder Raymond A dentist 727-1827
4120 No Return
42D AV S INTERSECTS
4200 One Hour Martinizing 721-7664
4201 Houser Pharmacy 727-2701
4203 Hansen J M Mrs @ 727-2517
4205 Ken T Service 866-9762
4207 Tolrud Bob Office Equipment 727-1564
4229 Vacant
4220 Riley Daryl J 729-1214
43D AV S INTERSECTS
4301 Turgeon George Co genl contr
4303 Jerry's Vacuum Center 728-9197
4305 Herron Distributors mail handling equip 727-1212
4307 Gene's Barber Shop
4308 Consignment Center (Stage)
4315 Consignment Center antique 727-1974
44TH AV S INTERSECTS
45TH AV S INTERSECTS
46TH AV S INTERSECTS
47TH AV S INTERSECTS
4704 Korkowski Joan C @ 721-1415
48TH AV S INTERSECTS
MINNEHAHA AV ENDS
4915 Holt Lois M Mrs 729-0801
HIAWATHA LA ENDS
5000 Nelson Edwin G @ 721-3972
5006 Baumgaertner James C @ 721-5964
5012 Loza John @ 724-5944
5016 Love Ray E @ 722-0980
5100 Tuerberg Richd V @
5118 Larson Ruth J Mrs @ 729-3418
54TH ST W--FROM HARRIET AV AND W DIAMOND LAKE RD WEST
ZIP CODE 55419
HARRIET AV INTERSECTS
500 Maley Anna T Mrs @ 824-3775
501 Annunciation Church 824-0279
506 Magnum Theodora J @ 824-0800
508 Annunciation Rectory 824-0787
Hayes Terrence M Rev 824-0787
510 Curtin Erwin A @ 822-4701
520 Schreiber Michel @ 823-6752
524 Vacant
525 Annunciation School 823-4394
GARFIELD AV INTERSECTS
608 Annunciation Church Convent 827-2121
614 Kenney Realty Inc 823-4466
Mc Niff Accounting 827-5738
Masters Construction genl contr 825-9705
Light Enterprises Inc 827-4926
615 Shepherd Gate 825-9287
624 State Farm Insurance 827-0691
LYNDALE AV S INTERSECTS
715 Jones Earl M @ 823-1585
719 Jones' Beauty Salon 823-1585
ALDRICH AV S INTERSECTS
821 Schroeder Lloyd @
BRYANT AV INTERSECTS
1010\*Nolan Gregory R @ 824-1116
DUPONT AV S INTERSECTS
EMERSON AV S INTERSECTS
FREMONT AV S INTERSECTS
GIRARD AV S INTERSECTS
1408 Bracchi Sam P @ 824-9170
HUMBOLDT AV S INTERSECTS
1501 First Church Of The Nazarene 827-5901
IRVING AV S INTERSECTS
JAMES AV S INTERSECTS
KNOX AV S INTERSECTS
1800 Ellis John A @ 926-3697
LOGAN AV S INTERSECTS
1900 Jungers Celestina A Mrs @ 926-5298
\*Jurgens Clarence N @
1906 Vaccaro
1912 Johnson Verner J @ 926-5608
1918\*Vigants Konrad S @ 922-3123
1922\*Arenson David C @ 925-5293
MORGAN AV S INTERSECTS
2000 Smith Alan R civil eng @ 926-4365
2006 Haines Jerry W @ 926-2350
2010 Taggart George H @ 926-5289
2016 Desmond John F @ 926-3848
2020 Champion C F @ 725-9610
NEWTON AV S INTERSECTS
OLIVER AV S INTERSECTS
2211 Vacant
2213 Pipka's Work Shop gift shop
PENN AV S INTERSECTS
ZIP CODE 55410
2312 Kestelov Lauritz S @ 926-8270
2318 Derby Lewis E @ 922-0498
2322 Wheaton Richd M @ 922-6928
2326 Butta Clinton M @ 922-5156
QUEEN AV S INTERSECTS
2400 Anderson Edna H Mrs @ 926-7185
2406 Warehouse John R @ 922-1026
2410 Coffman Eug D II @ 926-3921
2414 Sherman Mitchell @ 926-6568
2416\*Vancat Richd J @ 925-2934
RUSSELL AV S INTERSECTS
CUMBERLAND RD INTERSECTS
2500 Oborn Ken @ 922-1493
2508 Mc Chesney Ruth A Mrs @ 920-1884
2509\*Ciok J M 926-2207
2515 Colehour Warren I @ 926-1755
2517 Ferradas Felipe A @ 920-1580
2526 Stranberg Fred D @ 922-9556
2600 Mc Garvey Edw H @ 922-4939
2601 Willer Rudolph G @ 926-2665
2607 Sonnenchein Roger P @ 920-6209
2615 Lewis Edw H @ 922-1929
2619 Siderman Thos J @ 920-1876
THOMAS AV S INTERSECTS
2700 Van Every Harold @ 926-4471
2707 Healy Charles F @ 922-0355
2713 Dole Kenneth K @ 926-3091
UPTON AV S INTERSECTS
2812 Anderson Douglas K @ 922-7597
2817 Anderson Willard C @ 926-5853
2821 No Return
2829 Kost John @ 927-4921
VINCENT AV S INTERSECTS
2901 Luhm Anthony J @ 922-4747
2905 Uhler Stanley G @ 926-5242
2911 Pagrelius Carl A @ 926-3409
2928 Rindal Earl @ 926-0158
2921 Eichhorn Arth F @ 926-9916
WASHBURN AV S INTERSECTS
3005 Hole Guy E @ 927-8385
3008 Rindal Earl @ 926-0158
3015 Johnson Paul N @ 926-8796
XERXES AV S INTERSECTS
YORK AV S INTERSECTS
3218TH AV S INTERSECTS
ABBOTT AV S INTERSECTS
BEARD AV S INTERSECTS
CHOWEN AV S INTERSECTS
DREW AV S INTERSECTS
ERWING AV S INTERSECTS
FRANCE AV S INTERSECTS
58TH ST E--FROM PORTLAND AV EAST 7 NORTH OF E 42D ST
ZIP CODE 55417
CHICAGO AV S INTERSECTS
ELLIOT AV INTERSECTS
10TH AV INTERSECTS
11TH AV S INTERSECTS
12TH AV S INTERSECTS
13TH AV S INTERSECTS
14TH AV S INTERSECTS
1404 Rustad Arnold L @ 824-8941
1420 Bannochie Norval J @ 822-6229
15TH AV S INTERSECTS
WOODLAWN BLVD INTERSECTS
SHOREVIEW AV INTERSECTS
23D AV S INTERSECTS
2308 Dick Ronald C @ 721-6975
2310 Schiller Alf K @ 722-7785
2314 Verhol Joseph @ 722-1998
24TH AV S INTERSECTS
25TH AV S INTERSECTS
26TH AV S INTERSECTS
27TH AV S INTERSECTS
2723 Johnson Wayne F @ 721-4026
28TH AV S INTERSECTS
2800\*Larson Tol 722-7147
2802\*Green Geo 724-5571
2820 Reynolds Jack F @ 729-0191
29TH AV INTERSECTS
2900 Downing Leo R @ 721-1754
30TH AV S INTERSECTS
307H AV S INTERSECTS
NOKOMIS AV S INTERSECTS
31ST AV S INTERSECTS
32D AV S INTERSECTS
33D AV S INTERSECTS
34TH AV S INTERSECTS
3412 Pomroy Francis E Jr @ 727-3937
3415 Vacant
3420\*Barber Barbara E Mrs @
35TH AV S INTERSECTS
3600 Sloboda Edw T @ 727-3395
3502 Oweier Gida B Mrs @ 727-3636
3508 Stenstrom Irene B Mrs @ 727-3239
3512 Bain Harold C @ 727-3239
3516 Menke Alvoa A @ 727-3442
3520 Fredrickson M L @ 727-3085
3524 Ellingson Alfreda Mrs @ 727-1329
36TH AV S INTERSECTS
3600 Bassmore Eug W @ 727-1533
3604 Hammergren Eunice M @ 727-1366
Hammergren Reuben W @ 727-1366
3606 Beattie John E @ 727-3743
3612 O'Day Michl J 727-1421
3616 Jackson F C Land Surveyor 727-3484
Jackson F Clayton @ 727-3484
3620 Johnson Geo H @ 727-2060
3624 Lindahl Elmer J @ 727-3683
37TH AV S INTERSECTS
3700 Newlin Iva M Mrs @ 727-3399
3704\*Taylor James P @ 727-5509
3708 Kruusoo Anne W @ 727-3530
3712 Dille Earl H @ 727-3386
3716 Hilden R J 727-3109
3720 Stark Frank M @ 727-2026
38TH AV S INTERSECTS
3800 West Eunice L Mrs @ 727-2796
3804 Lundahl Mary F Mrs @ 727-1639
3808 Borris Joseph @ 727-2373
3812 Friberg Carl @ 727-1691
3816 Peter Jan Rev @ 727-1015
3820 Burge Eleanor Mrs @ 727-2673
3825 Anderson L M Mrs @ 727-1660
39TH AV S INTERSECTS
3902 Vacant
3904\*Blanski Paula
3908\*Jacobs CA @ 727-3110
3912 Syte Kenneth O @ 727-1182
3914 Eitors Dale R @ 727-3914
3916 Dvorak Thos @ 727-1640
3920 Anderson Paul M @ 727-1606
40TH AV S INTERSECTS
4000\*Bergwall Harry N @ 727-3755
4004 Vanderhyde Thos 727-3098
4008 Eli Jerome A @ 727-1013
4016 Vacant
4020 Kimmel Clarence M Jr @ 727-1019
4024 Fernstrom Lloyd E @ 727-1016
4100 Skelly Robt W @ 727-2594
4102 Kobias John H @ 727-1001
4104 Gustafson Walter R @ 727-2461
4114\*Anderson Mary 727-3733
4118 Withuhn Robin D @ 727-2770
4122 Larson Joyce A @ 727-3462
42D AV S INTERSECTS
43D AV S INTERSECTS
44TH AV S INTERSECTS
45TH AV S INTERSECTS
46TH AV S INTERSECTS
4616 Danielson Marjorie C 727-1711
46TH AV S INTERSECTS
58TH ST W--FROM PLEASANT AV WEST 1 SOUTH OF DIAMOND LAKE RD
ZIP CODE 55419
GRAND AV INTERSECTS
HARRIET AV INTERSECTS
GARFIELD AV INTERSECTS
600 Woodward Edw M @ 824-3436
LYNDALE AV S INTERSECTS
704 Medallion Realty Co 827-6161
Peterson Dorothy T Realty 827-2686
ALDRICH AV S INTERSECTS
BRYANT AV S INTERSECTS
925 Pleasant Dora L Mrs @ 823-3386
925 Solomonson Ross @ 823-6152
COLFAX AV S INTERSECTS
DUPONT AV S INTERSECTS
1100 Luret Maxine C Mrs @ 822-6618
1112\*Pankonien Ken H @ 825-0864
EMERSON AV S INTERSECTS
FREMONT AV S INTERSECTS
GIRARD AV S INTERSECTS
1412 Fraser Wm H @ 929-7248
1416\*Ehrlich David K Rev @ 922-6991
HUMBOLDT AV S INTERSECTS
1500 Nordens Harold E @ 922-8917
1506 O'Rourke Robt A @ 922-6542
1510 Kosmas Pany W @ 922-4179
OLIVER AV S INTERSECTS
2221 Ingvaldson W S @ 926-4824
ZIP CODE 55410
QUEEN AV S INTERSECTS
RICHMOND CURVE INTERSECTS.
2521 Admanson Thos N @ 925-1442
CUMBERLAND RD INTERSECTS
2604 Mc Glennen Howard B @ 926-4759
2607 Drake Eliz @ 920-1151
2608 Nielsen Geo L @ 926-9657
2612\*Mc Kay Janet @ 929-3608
2616 Friberg Belva O Mrs @ 922-8023
2620 Erickson Veikko W @ 926-8996
2700 Hallberg Luverne D @ 922-9167
2706 Bloomquist Ethel M Mrs @ 926-3880
2710 Bertan Frank @ 828-5310
2714\*Norell M A @ 920-8267
UPTON AV S INTERSECTS
2800 Anderson Richd A @ 920-7644
2804 Anderson Jerome A 922-1887
2808 Gleason R D Sales sporting gds mfrs repr 826-8421
Gleason Robt D @ 926-8421
2812 Booth Mary E @ 926-1756
2816 Hopper Kenneth B @ 922-1990
2822 Van Tassel James W @ 927-7461

Piper, Jaffray & Hopwood INCORPORATED INVESTMENT RESEARCH INVESTMENT IDEAS TELEPHONE 371-6111

RIVERVIEW RD 1979

200 PLYMOUTH AVE.

PHONE 333-0201

374

**RIVERSIDE AV—Cont'd**  
 Vin Peter 338-5580  
 U of M (Urban & Regional Affairs Dept)  
 2102 U of M (Sub Ofc)  
 2122 U of M (Soc Research Dept)  
 U of M (Small Group Research Lab)  
 S 6TH ST INTERSECTS  
 2124 Nn Return  
 2127\*Harris Janice A  
 2129\*Swanson Julie  
 North Country Co Op ret & whol foods  
 338-1100  
 22D AV S INTERSECTS  
 2200 Smiley's Point Clinic 336-5791  
 2206 Vacant  
 2206½ Parking Lot  
 2208 Fairview Hospital (Pk Lot)  
 2323 Augsburg College Inc Arena 338-5181  
 Chimo Skating Supply ala 339-4772  
 S 7TH ST INTERSECTS  
 23D AV S INTERSECTS  
 24 AV S INTERSECTS  
 2405 Augsburg College (Mice Dept) 332-5161  
 2409 Augsburg College (Mice Dept)  
 2411 Augsburg College (Mice Dept)  
 2413 Augsburg College (Mice Dept)  
 2415 Augsburg College Little Theatre 332-5181  
 2425 Abigail Unitim Shop 336-7574  
 2431 Preston Frank S Jr phs 336-6368  
 2433\*Herridge S 341-2784  
 2435 Riverside Florists 332-7441  
 S 8TH ST INTERSECTS  
 25TH AV S INTERSECTS  
 2500 Pontillo's Pizzeria 332-5551  
 \*Wynne David  
 2506 Campus Travel Center 338-6705  
 2508 Campus Travel Center (Sub Ofc)  
 2510 Jensen Richard (338)  
 Doyle K 338-4519  
 \*Gebel David 376-1799  
 Commercial Graphics Inc prntg 333-4876  
 2517 Fairmar Motel 332-5200  
 26TH AV S INTERSECTS  
 27TH AV S INTERSECTS  
 S 9TH ST INTERSECTS  
 28TH AV S INTERSECTS  
 2817 Len's Standard Service 332-8969  
 29TH AV S INTERSECTS  
 FRANKLIN AV E INTERSECTS

**ROLLINS AV—FROM 926 14TH AV SE EAST**  
 2 SOUTH OF COMO AV SE  
 ZIP CODE 55414  
 1420 Harris Boat & Towing Co 331-5244  
 15TH AV SE INTERSECTS  
 1505 Pax Marion L Mrs @ 331-2358  
 1509 Vacant  
 1519\*Strand S Y 379-1183  
 1523 Hird Ethel C @ 331-1000  
 17TH AV SE INTERSECTS  
 1716 Standel Roger @  
 1717 Gaffney James H @ 331-5552  
 1720 Olson Mildred Mrs @ 331-1020  
 1721 Thatcher Beverly J @ 331-6616  
 1724 Apartments  
 1\*Johnson K A 331-1564  
 2 Hammett Emma J Mrs 331-9403  
 3\*Yoshinari Yoichi 378-2468  
 4\*Wang Jon Y 331-9396  
 5\*Bohl Chris J 331-8344  
 6\*Jacobson Thos 331-7008  
 7\*Graham J  
 1732 Apartments  
 1\*Pederson K 331-3789  
 2\*Morgan Michl E 331-6843  
 3\*Anker R  
 4 Starnes W J  
 5\*Boucher F  
 6\*Streicher C 331-1224  
 7\*Nordaker Phil

**ROOSEVELT ST NE—FROM NE TRAFFIC**  
 ST NORTH 1 EAST OF NE STINSON BLVD  
 ZIP CODE 55413  
 325 Midwest Fire Protection Inc sprinkler sys  
 331-1411  
 222 Gopher Pattern Works Inc 331-6512  
 NE KENNEDY ST INTERSECTS  
 (NOT OPENED BETWEEN NE KENNEDY  
 & 22D AV NE)  
 ZIP CODE 55418  
 22D AV NE INTERSECTS  
 2229 Daleska Fred W @ 781-1396  
 2201\*Swenson Jerry @  
 2206\*Booths Steph K @ 788-1382  
 2207 Bittner Minnie J Mrs @ 781-7549  
 2210 Zaccardi Nick @ 781-8894  
 2211 Ordes David G @ 781-4735  
 2214 Masley Proctor S @ 789-4461  
 2215 Gorman John L @ 788-2896  
 2218 Vacant  
 2219 Norman Michl @ 788-2952  
 2222 Coleman John G @ 789-0766  
 2223 Nolan James V @ 789-3659  
 2227 Playman Geo F @ 789-6015  
 2228 Lane Darrell D @ 781-4250  
 2231 Gardin Roger F @ 781-0019  
 2232 Kuharski Bernard T @ 789-5726  
 2235 Habstritt Jerome C @ 789-6278  
 2236 Swierkowski Stanley W @ 789-0876  
 2239 No Return  
 2240 Dee Denis @ 789-2335  
 2243 Gerber Philip C @ 781-3224  
 23D AV NE INTERSECTS  
 2305 Ridge Wm G @ 789-4570  
 2301 Dancelo Edna J Mrs @ 789-9389  
 2306 Younk Eug A @ 789-2610  
 2307 Buchwald Lidwina S Mrs @ 781-7640  
 2310 Knell Vernon @ 788-2718  
 2311 Sheridan Judson D @ 781-8731  
 2314 Balstad Gerhard O @ 789-7153  
 2315 Rimarczyk Chester L @ 789-2028  
 2318 Jacobson David C @ 781-2233  
 2319 Grimshaw Ulmont L @ 789-7010  
 2323 No Return  
 2324 Borgstrom David E @ 789-7997  
 2327 Nelson Eunice J @ 789-4170  
 2330 Swanson Carl F @ 789-7033  
 2331 Hammes Dennis S  
 Hautala Ida S Mrs @ 781-1896  
 2334 Meajak Theo J @ 789-0091  
 2335 Budnick Henry A @ 781-7733  
 2336\*Haider David @  
 2339 Gallus Norman O @ 789-4431  
 2342 Ahlquist Donald T @ 781-8453  
 2343 Kara Helen R Mrs @ 789-8328  
 2345 Smude Frank W @ 789-0518  
 2346 Vacant  
 2347 Butshaw Vernon L @ 861-1381  
 2348 Jewell Clare E Mrs @ 861-3712  
 2353 Larsen Kenneth T @ 866-0332  
 358 Vacant  
 364 Petersen Etile A @ 866-8840  
 370 Paulson Arnold C @ 866-3171  
 375 Williams Orville E @ 869-8320  
 380 Diamond Lake Services vending machs  
 866-2478  
 Lindberg Carval L @ 866-3152  
 388 Noonan Florence J Mrs @ 863-5544  
 398 Spiller Reginald  
 CHESTER ST INTERSECTS

**ROOSEVELT ST NE—FROM NE TRAFFIC**  
 ST NORTH 1 EAST OF NE STINSON BLVD  
 ZIP CODE 55413  
 325 Midwest Fire Protection Inc sprinkler sys  
 331-1411  
 222 Gopher Pattern Works Inc 331-6512  
 NE KENNEDY ST INTERSECTS  
 (NOT OPENED BETWEEN NE KENNEDY  
 & 22D AV NE)  
 ZIP CODE 55418  
 22D AV NE INTERSECTS  
 2229 Daleska Fred W @ 781-1396  
 2201\*Swenson Jerry @  
 2206\*Booths Steph K @ 788-1382  
 2207 Bittner Minnie J Mrs @ 781-7549  
 2210 Zaccardi Nick @ 781-8894  
 2211 Ordes David G @ 781-4735  
 2214 Masley Proctor S @ 789-4461  
 2215 Gorman John L @ 788-2896  
 2218 Vacant  
 2219 Norman Michl @ 788-2952  
 2222 Coleman John G @ 789-0766  
 2223 Nolan James V @ 789-3659  
 2227 Playman Geo F @ 789-6015  
 2228 Lane Darrell D @ 781-4250  
 2231 Gardin Roger F @ 781-0019  
 2232 Kuharski Bernard T @ 789-5726  
 2235 Habstritt Jerome C @ 789-6278  
 2236 Swierkowski Stanley W @ 789-0876  
 2239 No Return  
 2240 Dee Denis @ 789-2335  
 2243 Gerber Philip C @ 781-3224  
 23D AV NE INTERSECTS  
 2305 Ridge Wm G @ 789-4570  
 2301 Dancelo Edna J Mrs @ 789-9389  
 2306 Younk Eug A @ 789-2610  
 2307 Buchwald Lidwina S Mrs @ 781-7640  
 2310 Knell Vernon @ 788-2718  
 2311 Sheridan Judson D @ 781-8731  
 2314 Balstad Gerhard O @ 789-7153  
 2315 Rimarczyk Chester L @ 789-2028  
 2318 Jacobson David C @ 781-2233  
 2319 Grimshaw Ulmont L @ 789-7010  
 2323 No Return  
 2324 Borgstrom David E @ 789-7997  
 2327 Nelson Eunice J @ 789-4170  
 2330 Swanson Carl F @ 789-7033  
 2331 Hammes Dennis S  
 Hautala Ida S Mrs @ 781-1896  
 2334 Meajak Theo J @ 789-0091  
 2335 Budnick Henry A @ 781-7733  
 2336\*Haider David @  
 2339 Gallus Norman O @ 789-4431  
 2342 Ahlquist Donald T @ 781-8453  
 2343 Kara Helen R Mrs @ 789-8328  
 2345 Smude Frank W @ 789-0518  
 2346 Vacant  
 2347 Butshaw Vernon L @ 861-1381  
 2348 Jewell Clare E Mrs @ 861-3712  
 2353 Larsen Kenneth T @ 866-0332  
 358 Vacant  
 364 Petersen Etile A @ 866-8840  
 370 Paulson Arnold C @ 866-3171  
 375 Williams Orville E @ 869-8320  
 380 Diamond Lake Services vending machs  
 866-2478  
 Lindberg Carval L @ 866-3152  
 388 Noonan Florence J Mrs @ 863-5544  
 398 Spiller Reginald  
 CHESTER ST INTERSECTS

**ROSLYN PL—FROM 6926 CLINTON AV**  
 EAST  
 ZIP CODE 55419  
 386\*Ejorlund Rodney R @ 866-7642  
 387 De Field Steph L @ 866-2746  
 390 Lindberg Carl M Mrs @ 866-4128  
 343 Olson Norman C @ 866-6663  
 346 Martin Robt L @ 866-9596  
 347 Butshaw Vernon L @ 861-1381  
 352 Jewell Clare E Mrs @ 861-3712  
 353 Larsen Kenneth T @ 866-0332  
 354 Vacant  
 364 Petersen Etile A @ 866-8840  
 370 Paulson Arnold C @ 866-3171  
 375 Williams Orville E @ 869-8320  
 380 Diamond Lake Services vending machs  
 866-2478  
 Lindberg Carval L @ 866-3152  
 388 Noonan Florence J Mrs @ 863-5544  
 398 Spiller Reginald  
 CHESTER ST INTERSECTS

**ROYALSTON AV—FROM GLENWOOD AV**  
 AND N 12TH NORTHWEST  
 ZIP CODE 55405  
 2 Mico Independent Oil 339-8313  
 Mix Inc whol oil 333-8326  
 201 Affiliated Hospital Service Inc 333-1221  
 Community Hospital Linn Services Inc  
 339-8214  
 299 North Country Sales poultry ala 338-3842  
 HOLDEN ST INTERSECTS  
 301 Beckman Proctor whol 339-8119  
 315 Loop Balden Porter genl contr 333-1518

401 Stark Electronic's Supply Co electronics distr  
 415 K-P Mfg Co lubricating equip 336-5811  
 HIGHLAND AV BEGINS  
 5TH AV N INTERSECTS  
 ZIP CODE 55405  
 BNY CROSSES  
 GLENWOOD AV INTERSECTS  
 323 Bogema Ida Mrs @ 374-4053  
 Gaskiewicz Lila E @ 374-5368  
 324 Fowler James J @ 374-3484  
 328 Schwabe Harry P @ 374-2173  
 329\*Cook Phillip @ 374-4772  
 333 Pozinski Edw @ 374-3016  
 4TH AV N INTERSECTS  
 400 Will Gordon @ 377-3522  
 403 Anderson Kermit E @ 377-3447  
 406 Steans Sam @ 377-9005  
 407 Peterson Charles W @ 374-1541  
 408 Knowles Robt C @ 374-4646  
 410 Benson Alma H Mrs @ 374-4389  
 411 Seury Frank @ 377-7304  
 414 Peterson Harold A @ 374-4626  
 415\*Galeon Linda J @ 377-8964  
 418 Anonen Danl G @ 374-1605  
 419 Cook Mahlon A @ 374-4710  
 422 Gustick Glenn F @ 374-1517  
 423 O'Connor Pauline @ 377-7912  
 426 Suomala Walno E @ 377-2968  
 427\*Jones Carol  
 431 Connor Gerald F @ 377-4894  
 433 Josephson Eino A @ 374-4146  
 435 Ottney Olga M 374-2935  
 5TH AV N INTERSECTS  
 500\*Wyllie Rosa A 374-5702  
 \*Burke T J 374-3425  
 501 Alajoki Elmer H Rev @ 374-1459  
 506 Johnson Marian E Mrs @ 374-1455  
 507\*Bell Ward T 374-2209  
 514 Conroy Michl D @ 374-1807  
 518 Forare Swen M @ 374-4462  
 519 Anderson Avia L @ 374-5498  
 Carpenter John 374-5343  
 Hill Shirley 374-1882  
 525 Douglas Jack C @ 377-0285  
 526 Idelkope Ned @ 374-9538  
 528 No Return  
 529 Hirsch Harold W @ 374-1717  
 539 Montgomery  
 OLSON MEM HWY INTERSECTS  
 ZIP CODE 55411  
 614 Goodman Harry C @ 521-1580  
 618 No Return  
 617\*Rich Dan T 588-2505  
 616 Garelick Jack @ 521-3984  
 622 Braetman Saml @ 522-1829  
 623 Griffin Lucille @ 521-1450  
 626 Robinson Gladys J Mrs @ 523-5971  
 627 No Return  
 702\*Bell Reginald S 588-0263  
 706 Rice Edmund V @ 523-4391  
 707\*Brkovich Victor M @ 521-0029  
 710\*Perkins Z L 521-6689  
 711 Martin Charles H @ 529-7287  
 713 No Return  
 714\*Williams Royce @ 522-8389  
 715 Rogers Marjorie  
 718 Bergman Cheryl @ 529-7378  
 719 Pritchett Hl M Mrs @  
 722 Peterson Betty Mrs @  
 723 Slaughter Glen W @ 522-8298  
 725\*Hosli Bryan @ 588-4453  
 727\*Wingness David @ 522-9090  
 731\*McAfee Tracy L @ 521-6929  
 733\*Taylor D L Jr 522-6006  
 8TH AV N INTERSECTS

801\*Patras John 588-8713  
 809\*Gatin Gloria 429-0608  
 811 Price Ernie @ 621-9396  
 812 Vacant  
 819 Mondeng Norman W @ 821-2994  
 823\*Behlin Gary @  
 824\*Waldacker Arlo 529-0747  
 825\*Thomas Lonnie  
 900 Van Buren Dora J 521-3994  
 901 Miller Earl W @ 529-2821  
 909 Sharkey Joanne  
 909 Townsend Albert L 588-5365  
 910 Hanson Judith D @ 521-5182  
 914 Harris Eula M Mrs @ 521-3794  
 915 Harris Donna  
 918 No Return  
 919 Galbreath Odessa Mrs @ 529-8580  
 \*Galbreath Odell  
 922 Zimmer Walter A @ 522-7398  
 923\*Donder Willie @  
 925 Robinson Wade J @ 522-1626  
 926\*Keerber Paul @  
 927\*Sugga Betty J  
 928\*Gravett Neil  
 \*Wandry John  
 Jacobson Thos N 521-9068  
 OAK PARK AV INTERSECTS  
 1000 Betty Louise  
 1001 Collins Jacob R Jr @ 529-7208  
 1008 Reguimti Gordon 588-1219  
 1009 Wesson Emery @ 522-3802  
 1024 Wallace Perry Jr @ 588-9654  
 1015 Barnes Abb L @ 521-9691  
 1018 Andrade Emanuel H Rev @ 521-2501  
 1019\*Underhill Eldon 21-7543  
 1024 Buchan Dewes 588-9137  
 1027 Miles Frank P Mrs @ 522-0534  
 1101 Summers Alberta C Mrs @ 522-8944  
 1102 Parkes Elsie P Mrs @ 529-1770  
 1107 Savage James @ 529-8759  
 1108 Taylor Melvyn D @ 521-7810  
 1111\*Ingram Angela @  
 1114 Leader Betty @ 521-2124  
 1121 Bredlow Colette @ 523-3666  
 Russell Edw G @ 529-5883  
 12TH AV N INTERSECTS  
 1200 Rance Constance L Mrs @ 521-8317  
 1205 Vacant  
 1206 Rodgers Clara 529-7134

1211 Scott Melba E Mrs @ 521-2425  
 1212 Graham Theresa M Mrs 521-8565  
 1215 Junina Norwood @ 523-0847  
 1218 Dole James H @ 521-8071  
 1221 Olson Fred H @ 588-9532  
 1224 Edoni Robt Y 521-0766  
 1227 Ford Henry @ 521-1888  
 1230 Hollie Oree J @ 521-4596  
 1233 Williams Mc Kenneth @ 528-5843  
 1236 Mc Kinney Kenneth W @ 529-1684  
 1238 Hil Horace R @ 521-3768  
 1240 Cushman Benj A III @ 522-8440  
 1243 Clark Mollie E @ 522-0743  
 1244 Anderson Bernadette D @ 529-1945  
 1247 Alexander B R @ 521-1913  
 1248 Jackson Leroy W @ 529-4657  
 1251 Rice Edmund D Jr @ 522-0408  
 1254\*Hinnum Audrey  
 1255 Brown Tillman @ 529-1023  
 1256 Haignunth Ronald G @ 588-4839  
 PLYMOUTH AV INTERSECTS  
 1311 Fleming Cynthia @ 521-9747  
 1312 Lewis Maurice @  
 1314 Overton James E @ 529-6730  
 1317 Snoddy James 529-5269  
 1320 Allen Donald R @ 588-9239  
 \*Mc Henry Florence  
 1321 Preyer Villanova Mrs @  
 1323 Bogar Elijah 521-8115  
 \*Hardy Rebecca  
 1328 Crossland Lee E @ 521-5275  
 \*Crossland Lewis 521-9227  
 1329\*Smith Mary 521-8208  
 1332 Naber Larry L @ 529-2557  
 1333 Elliott Harry @ 529-7123  
 1335 Granderson Ronald 588-0346  
 1336 Rance Russell T @ 522-1673  
 1341 Peterson Elin J Mrs @ 529-4534  
 1348 Thompson Harry @ 521-1369  
 1348 Grigsby Lois M 521-5636  
 1349 Brown Roger W @ 521-5513  
 1353\*Curry R M 522-5814  
 14TH AV N INTERSECTS  
 1400\*Puckford Jimmy  
 1411 Jones Donna F @ 588-6054  
 1404 Osborne Owen D @ 521-3753  
 1407 Wierum Elisabeth @ 522-2326  
 1410 Black Steven @ 529-9634  
 1411 No Return  
 1416 Pettiford Ira @ 529-4557  
 1416 Baker Sheila M 522-1493  
 1419 Veith Geo H III @ 521-3000  
 1420 Woods Claude @ 588-0458  
 1424\*Hopkins Roberts @ 588-1817  
 1425 Masalingil Billy G @ 522-8271  
 1500 Hardge Lisa A  
 1501 Brown Margt L @ 523-3907  
 1502 Brown Crane Mrs 521-9640  
 1504\*Mc Nuff C J 621-9480  
 1506 Williams Larry T @ 588-5586  
 1508 Vacant  
 1509 Coley Thos M @ 529-3889  
 1511 Battles Dorothy B @ 588-8539  
 1512 Lee Rose M @  
 1516 Hardeman Rebecca B @ 521-6320  
 1517 Livingston Lucy 522-8325  
 1521\*Pettiford Clara M 529-4714  
 1522\*Mc Kinney Nettie @ 521-5520  
 1527 Olson Paul K @ 521-9916  
 1530 Metropolitan Cultural Arts Center 522-8658  
 Menash-Willard Child Care Center 521-3581  
 Lutheran Church Of The Messiah 522-5162  
 1531 Churnose Roger L Rev 529-0015  
 15TH AV N INTERSECTS  
 1601\*Leche Dawn  
 1605 Lynn Darrell E @ 522-6487  
 1611 Johnson Chattie S Mrs @ 521-4524  
 1615 Jones Larry T @ 521-3374  
 1618 Green Charles J @ 522-3410  
 1627 Adams Charles Jr @ 522-1675  
 1631 La Pre Sandra K  
 Rathitt Cloyce A 522-3879  
 1647 Davis Inell @ 521-4878  
 1659 Byers Ruby A 521-3876  
 Lewis J C 521-3303  
 1643 Bryant Girthel S Mrs @ 521-3135  
 1647 Davis Inell @ 521-4878  
 1649 Suddath Mary 522-9453  
 Suddath Nina M Mrs 522-9453  
 1653 Pettig Olive M @ 522-0794  
 1659 Sumpter D

17TH AV N INTERSECTS  
 1700 Novak Christine J Mrs @  
 1701\*Twetten Suzanne  
 1706\*Emond John @ 522-6485  
 1707\*Mooley Betty 588-2063  
 1709 Berry Stanley M @ 522-2961  
 1710 Freeman Gladys R Mrs @ 521-4666  
 1714 Jackson Geroline Mrs @ 529-3138  
 1715 Vamvakas Peter S @ 522-9284  
 1717 Hahn Lyman L @ 522-5839  
 1718 Vacant  
 1722 Adams Thos @  
 1801 Vacant  
 1802 Canfield Wm G @ 521-2050  
 1803 Johnson Mary M Mrs @ 529-4923  
 1806 Thompson Willie R Mrs @ 521-5741  
 1807 Woods Jimmie N 588-2059  
 1810 Elita Alonzo @ 529-8170  
 1811 Herman Neia P 588-9170  
 1814\*Davis Letaha  
 \*Parrot Eunice 521-9663  
 1815 Colquhoun Muriel L @ 529-3668  
 Lineburg Emily C Mrs @ 529-3668  
 1818 Daniels Eug C @  
 1819 Olson Judy A 522-2685  
 GOLDEN VALLEY RD INTERSECTS  
 1900 Williams Iola Mrs @ 588-6871  
 1806 Barnes Sharon L 529-8337  
 1821 Smith Franklin W @ 522-3921  
 1910 Shelton Wm G @ 522-8423  
 1911 Melaha Clara E Mrs @ 522-8254  
 1914 Barber Dorothy 521-8670  
 1917 Leavoser Harry @ 529-8243  
 1918 Lee Denzil A @ 529-4560  
 1922 Hanson Jerome W @  
 1923 White Helen M Mrs 529-5011  
 1925 Miller Arth E @ 521-8187  
 1927 Gustafson Leonard S @ 521-9665  
 2002 Glennly Joan @  
 2003 Jackson Hattie A 522-7595  
 2006\*Hammond Patricia 522-8591

167

263

134

83

183

184

45

133

HIAWATHA AVE 1979

260 Plymouth Ave. N. (Minneapolis 55411)

Phone 339-8261

HENNEPIN AV—Cont'd

114 Keller Glady Mrs 827-7245
115\*Halley A L 826-8377
116 Office J
117 Halvorson Margt C 824-7373
118 Wegner G W 825-9105
119 Fields R D 825-1912
120\*Valant V G 824-7295
121 Mc Crae C 822-9030
122\*Mueller J L 822-5224
123\*Kurovsky R E 823-5625
124\*Sagatuen W
201 Gillson Marian K 827-7157
202 Burke Thos A 827-6407
203 Frederickson F 822-1620
204 Emerick Frances D Mrs 824-5040
205 Arlington G E 822-1853
206 Olson Howard 823-9493
207 Kapinos Mildred F 824-0163
208 Olson L A 823-5772
209\*Ames N E 822-3810
210\*Johnson L
211 Camp D A 825-9074
212 Compton Martha H Mrs 827-6683
213\*Doerflinger J L 827-3068
214 Rothermel Della M 825-0534
215\*Walloch D
216\*Wima M M 822-4376
217\*Simla Ellis C 824-0183
218 Campbell G D Mrs 825-1258
219\*Schlener M L 823-7146
220\*Small R
221 Kunkel Joyce C 822-3918
222\*Solie Kenneth L 823-7880
223 Solie S M 823-0927
224 Rafahol J 827-5044
301 Lindmor Evelyn 823-5797
302\*Buck D P 827-5191
303 Burton Curot E
304\*Wernone
305 Pruschard Wm Mrs 823-5404
306\*Salon L
307 Mercier Eunice 825-7931
308 Warden S K 824-1674
309\*Carlson E
310 Thompson Karlotte 827-6390
311 Orth Genevieve 823-5312
312\*Joseph G P 822-3814
313 Dahl Walter G 823-8897
314 Stokes Minnie M Mrs 822-6120
315 Schneider Eliz R 823-2137
316\*Coursolle J
317 Ryberg Elton 825-1775
318 Flowers Beulah G 823-2086
319 Lindell L 824-6552
320\*O'Driscoll D
321\*Bellotte E
322\*Gillard B
323 Johnston Sara J 827-7530
324\*Seessel R
3553 Brandt Agencies Inc 827-2646
W 36TH ST INTERSECTS
3600 Lakewood Cemetery Association 822-2171

HIAWATHA AV —FROM 8 6TH ST AND 15TH AV S SOUTHEAST 1 WEST OF CEDAR AV

ZIP CODE 55404
1907 Video Midwest Inc video prod distr 338-6825
1916 Mailadvertising Inc letter shop 338-5667
Morgan Printing Co 338-5667
E 24TH ST INTERSECTS
E 25 1/2 ST ENDS
E 26TH ST INTERSECTS
ZIP CODE 55407
E 26TH ST INTERSECTS
2600 Mill Rd (Southtown Yd) 729-1312
C M ST P & P RY CROSSES
E 29TH ST INTERSECTS
E LAKE ST INTERSECTS
E 31ST ST INTERSECTS

ZIP CODE 55406

3108 Oycsum George Cash & Carry bldg mate 729-2309
3108 Accent Promotions adv distr 721-6301
\*Long Wm P
\*Silva Jerry 722-3037
3117 Furn Barn Inc (Whse)
3121 Furniture Barn Inc distr 721-5347
3147 N S P Co (Sub Sta)
3161 Ace Foundry Co Inc 721-6666
E 32D ST INTERSECTS
3245 Donaldson's (Diar Center) 721-6221

E 33D ST INTERSECTS

3301 Imperial Refineries Of Minnesota gas sta 729-9709
3324 Electramatic Inc electronic equip mfrs 721-5074
3335 Capp Homes Div Of Evans Products bldg centre 721-3561
Evans Financial Corp 721-4851
E 34TH ST INTERSECTS
3401 National Vitamin Products Co animal feeds mfrs 722-6861
3445 Crestown Sweeping Corp parking lot mtee 729-2000
27TH AV S INTERSECTS
E 35TH ST INTERSECTS
3501 A-D-M Milling Co (Flour & Mill) 729-2382
28TH AV S INTERSECTS

E 36TH ST INTERSECTS

3601 Donaldson's (Whse) 332-3113
E 37TH ST INTERSECTS
3745 Archer-Daniels-Midland Co (MILL) 729-2302
E 38TH ST INTERSECTS
3901 Ralston Purina Co feed mfrs 722-9561
E 39TH ST INTERSECTS
3151 AV S INTERSECTS
3915 Huhn A Manufacturing Co machy 729-1515
3960 Vacant
3961 N S P Co (Sub Sta)
E 40TH ST INTERSECTS
4001 Bellis Paper Co whol 721-4885
Belkin Joseph acct 721-6859
4041 Central Container Corp corrugated box mfrs 721-6224
E 41ST ST INTERSECTS
4121 Mc Donald's rest 729-4417
33D AV S INTERSECTS
4135 Inland Truck Parts Co whol 722-6007
4151 Central Equip Co (Site)
4155 Hiawatha Reddy Rest 722-9816
E 42D ST INTERSECTS
4201 Flanery Bros Mobil Service 729-9902
4225 Cronstroms Mfg Inc mtl stamping 722-6671
4251 Cherche's A & W Drive In 729-3694
E 43D ST INTERSECTS
4325 Vacant
E 44TH ST INTERSECTS
4411 Olson Equipment Co contr sup 729-8364
4439 Beverage-Service Inc 721-7405
Beverage Service Inc vending dept
E 45TH ST INTERSECTS
4501 Milbeck Engineering distr lawn sprinklers 724-3655
4525 Litho Supply Depot Inc 721-3511
4539 Vacant
4547 Country Club Market 721-4855
E 46TH ST INTERSECTS
4601 Hiawatha Automotive 724-3455
4641 Capp Homes (Trans & Purch Ofc) 721-8861
E 47TH ST INTERSECTS
4757 Parkway Service Inc 729-8314
Parkway Motor Hotel 729-8314
Parkway Restaurant 724-4693

NAWADABA BLVD INTERSECTS

E MINNEHAHA PKWY INTERSECTS
ZIP CODE 55417
E 48TH ST INTERSECTS
4916 Benda Mary @ 722-7144
4918\*Theisen Joseph A 721-7660
4926 Forsland Vernon L @ 722-1240
4930 Holick Frank @ 722-5345
4934 Rizzi Nadine 724-9427
E 50TH ST INTERSECTS
6000 Hudson Oil Co 724-9656
6028\*Eldsmo Danl T 729-5647
6040 Bovey Harvey H @ 724-6658
6046\*Howorka Randy S @ 721-4459
6050 Holmberg Vernon D @ 729-6872
E 51ST ST INTERSECTS
6106\*New Harvey 722-8923
6108\*Boyle Terry M 722-0300
6110 Aren Eug 724-9650
6112 Olson K G 721-4182
6114 Saunders Mavis L Mrs 722-4211
6120\*Le Chapele Duwayn
6122 No Return
6130 Apartments
Welsh Al J 722-0332
2 Vacant
3 No Return
4 Abbey
5136 Apartments
Linn Mary L 721-2070
3\*Coz Gordon P
3 Boosalis Chris M 721-3020
4\*Paulling Donald C 724-3909
5 Dircks Wm E 722-8731
6 Humick Paul J 724-5698
6140\*Hauschildt J L @ 728-2928
6152 C & K Sales lawn tractors als & serv 721-7478
E 62D ST ENDS

HIAWATHA LA —FROM 5300 HIAWATHA AV SOUTH

E 63D ST INTERSECTS
5300 Blackman Juanita M @ 722-5016
5301 Graftnas Hazel I Mrs @ 722-1464
5306 Kriech James P @ 722-9379
5309 Fisher Wm F @
5312\*Moel Leland
5314 Vacant
5315\*Griffin Dorothy B 722-4233
5320 Sundin Amy E Mrs @ 724-7310
5321 Scheffer Lester H @ 721-1964
5324 Tobiasson Terry @ 721-5919
5325 Estes Shelton @ 724-2387
5328 Fleming Jim T Jr @ 721-1507
5329 Holten Thom G @ 721-1295
5332 Graham J A 722-0600
5333 Ingalls Park E @ 724-0967
5336 Gear Louie E @ 724-5790
5339 Clobes Donald H 722-5083
5340 Rutoingha Steven 929-3596
5343 Dupont Carmel O @ 722-3605
5344 Hullerman Cath M @ 724-8364
5347 Wickman Ruth P Mrs @ 724-2395
5348 Drew Ronald J @ 724-6254
5350 Rundgren Richd L @ 721-7288
5351 Bonin Florence M Mrs @ 724-2515
5358\*Blakson Greg L 721-2189
5360 Engin Donald C @ 722-5465

E 54TH ST INTERSECTS

HIGH ST —FROM HENNEPIN AV EAST 3 NORTH OF WASHINGTON AV S
ZIP CODE 55401
2D AV S INTERSECTS
HIGHLAND PL —FROM BORDER AV EAST
ZIP CODE 55421
HIGHVIEW PL —FROM PROSPECT AV SOUTH IN A CIR BETWEEN GLADSTONE AV AND HARRIET AV
ZIP CODE 55419
27 Garner Frank L @ 824-9111
35 No Return

HILLSIDE AV —FROM IRVING AV N AND 21ST AV N NORTHWEST 1 NORTH OF W BROADWAY ST

ZIP CODE 55411
1059\*Mc Gram Charles @ 522-1177
1513 Nowling Ronald L @ 521-8543
1514\*Singleton S @ 898-9070
1517 Fleming Kenneth H @
1521 Akerman Kenneth C @ 529-2702
1822 Apartments
1\*Jacobson Paul 522-4269
2 Nelson Edna V 521-8952
3 Swanson Cora O Mrs 522-8307
4 Emswirth Ardie M 588-4649
5\*Hallenbeck Roberta 588-5815
6\*Allen David 521-4601
7\*Lunde C C 522-2841
8 Vacant
1528\*Mc Collyny R
1529\*Hanes Bill @ 522-8756
1530 Kurtz Paul @ 521-2151
1533 Whiteford Robt @ 529-7924
1543\*Wadick Julie A Mrs 521-4350
1554 Pentz James J @ 529-5471
1537 Fectner Edwin M @ 521-7210
1538\*Coffman Le Ann 588-8483
\*Shimek Laurie 522-8288
1541 Peters Alvin J @ 529-7061
1542 Dondlinger John A @ 529-0766
1545 Holm Keith A @ 688-8819
1546 Walker Kath M Mrs 521-6439
1547 Felker Robt H @ 522-2503
No Return
1550\*MacKenzie D @ 521-9017
1551 Mac Donald Harry @
1554 Spruiell Kath S 522-9388
1555 Vacant
1558 Sitt Severin V @ 522-7173
Sitt Janice T 522-0615
1561 Mc Gee Mary 529-1718
1564 Noel Rudolph E @ 521-3836
1565 Bradeson Mabel H Mrs @ 521-5014
Charbonneau Obel I 529-2289
1600 Holmes Mary
1601 Brabeck Irving W @ 529-4397
1602 Podiasck Eug R @ 521-5191
1607 No Return
1608\*Wilson Lois
1611\*Wilday Dennis
1612\*Hime Charles 521-7204
1617 Ross Dorothy 588-5145
1618 Baranski Patk @ 529-0689
1621 Burns Brian K 521-9184
1622 Workman Vernon @ 521-5469
1623\*Woodward Edith 521-1758
Olson Nancy L 588-9144
1626 Sherer Pamela R @ 521-4938
1628 Fraystach Jack 521-7978
1634 Anderson David C @ 529-7285
1635 Anderson Linda M 588-8232
1636 Buchholdt Arvid N 522-7078
ILION AV INTERSECTS
1700 Skordahl Alvin A @ 521-5896
Peterson Janet K 521-1756
1706 Smith Charles @ 589-7085
1707 Pearson Barbara R Mrs @
1708 Hart Emily T Mrs @ 529-4093
1711 Hill Rosalind L 529-5089
1712 Borick Paul M @ 521-9436
1714 Zachar Doris Mrs @ 521-0607
1715 Peters Thos A @ 522-4993
JAMES AV N INTERSECTS
1814 Tischner Richd J 588-1079
1815 Rauma Rosemary 522-7698
1818 Vacant
1820 Walker James L @
LOGAN AV N INTERSECTS
24TH AV N INTERSECTS
1910\*Hunck Nancy J 521-6882
1812\*Mc Nott John 522-6409
1914\*Gwinney S 522-1379
Housmeier Aplay M @ 521-6919
1916\*Amundson Geraldine
1929 Madison Gordon C @ 529-0492
1933\*Davson Rose 588-4719
1935 Vacant
1939\*Madison Greg 521-0806
NEWTON AV N INTERSECTS
2003 Zaller Louis J @ 529-7965
2005 Wong Mary L Mrs @ 521-5335
Wong Chiu Hui 522-1056
2011\*Strom Wayne
2013\*Furry James
2017\*Binley Phillip 521-2445
2023 Vacant

HOAG AV —FROM HOLDEN ST NORTH 3 EAST OF LYNDALE AV N

ZIP CODE 55411
6TH AV N INTERSECTS

610 Lakeland Envelops (Sub Plant Sp) 7TH AV N INTERSECTS

5TH AV N INTERSECTS

HOLDEN ST —FROM N 9TH ST WEST 1 NORTH OF GLENWOOD AV

ZIP CODE 55403
10TH ST INTERSECTS
11TH ST INTERSECTS
12TH ST INTERSECTS
ROYALSTON AV INTERSECTS

HOLLYWOOD AV NE —FROM NE JOHNSON ST NORTHEAST 1 SOUTH OF 37TH AV NE

ZIP CODE 55418
1600 Anderson Gary C 781-6795
1601 Anderson Jerome R @ 781-3250
1606 Kuchwalski Marjell P Mrs @ 781-1573
1607 Spychala Joseph @ 789-7073
1612 Sexton Marjuri E Mrs @ 781-1871
1613 Hagen Mark J @ 781-2206
1618 Brockton Gordon F @ 781-3632
1619 Schroeder Alois C @ 781-4980
1624 Vang Robt C @ 781-2524
1625\*Kostrebu Ronald @ 781-1418
1630 Yakowenko John @ 781-3632
1631 Callender Wayne C @ 789-2767
1636 Van Gordon James L @ 789-9419
1637 Holloway Ruby C Mrs @ 781-8219
1642 Mahoney Violet M Mrs @ 789-5405
1643 Saylor M H 789-6745
1648 Tracy Le Roy D @ 789-6049
1649 Raeth Dorothy I @ 789-6696
1654 No Return
NE HAYES ST INTERSECTS
1700 Loppnow Helen M Mrs @ 781-2318
1701 Goodsell James M @ 789-6530
1708 Koch Chester @ 789-0225
1707 Heck Russell J @ 781-8593
1712\*O Connor Jon T @ 781-9516
1713 Strangis Patk J @ 781-7769
1718\*Thiele Linda J @ 789-0642
1719 Reed Darrell L @ 781-3724
1724 Korus John P @ 789-7055
1748 Tracy Le Roy D @ 789-6049
1750 Lenard Stanley @ 789-2689
1756\*Sully Lois G Mrs @ 781-9477
1742 Rodmyre Thomas E @ 781-2368
1749\*Klein Ronald H @ 781-7296
1754 Allen T @ 789-1744
1760 Villella's Victor Dependable Upholstering 781-4970
Villella Victor J @ 781-4970
1766 Bourdoux Milbred E Mrs @ 789-8729
37TH AV NE INTERSECTS

HOLMES AV —FROM THE MALL SOUTH 1 WEST OF HENNEPIN AV

ZIP CODE 55408
2870\*E Lagoon Apartments
Bentl Vacant
101\*Johnson Carmen
102\*Crewe J B 822-4438
103\*Mattell Bruce 822-9176
104\*Rowler Marjion G Mrs 824-8724
105\*Jackson Nan 822-5909
106\*Anderson K
107 Blethen Jane 824-7448
108\*Suzemski Mary 822-0029
2011\*Rehberg Karla 824-8374
202 Fuller Dora W Mrs 825-0827
203\*Obermeier J M 827-1342
204\*Murphy L 827-2142
205\*Von Drahek N 824-4046
206 Roella Harriette 825-4302
207\*Niaka Judy 822-5749
208\*Swich M A 822-0607
301 Stillwell P
302 Redell June 827-2779
303 Harrington B J B 824-7314
304 Hussman Jane D Mrs 822-1333
306\*Kammenberg Curtis 824-6114
306 Mahlman B P 827-1526
307\*Lee M J 825-0667
308\*Lindstedt Lori 827-2463
2873 Lagoon Apartments
Bentl Curtis Amy J 827-3066
Williams Vernon C 825-9967
2\*Petri Nancy 825-9053
3\*Larsen D 825-8728
4 Rowlette Irene
5\*Ellis Richd 825-8617
6\*Frank C
7\*Brasher Tom 823-3341
8 Vacant
9\*Hines M J
10 Eichhorn Margt Mrs 825-6551
11 Re Margt E 823-2309
12 Wysocki Ann E 822-3817
2877 Lagoon Apartments
Bentl Ronning Florence L Mrs 824-4972
1 Westerdale Ruth B Mrs 822-6874
2 La Count Stan 825-4650
3 Anderson Carl L 822-8383
4\*Griffiths Annie 825-9632
5\*Thorndad Rebecca L 827-3270
6\*Lindgren June 822-2870
7 Curtis Fern L Mrs 825-3224
8 Maris Antonia N Mrs 825-7650
9 Nelson Tom 828-4338

Telephone (612) 370-5011

8441 Wazata Blvd., Suite 255

Golden Valley, MN

F. N. SHAFFER - M. O. WATSON Real Estate Appraisal and Consulting Service

# RIVERVIEW RD 1975

**C R**

**THE NATIONAL CASH REGISTER COMPANY**

Adding Machines • Accounting Machines • Cash Registers • Data Processing  
Computers and Data Entry Machines • Sales • Service • Supplies

**2523 WAYZATA BLVD. AT THOMAS AV. (55405) TEL. 377-8480**

**RIVERVIEW AV.—Contd**

Minnesota Couples Communications Program 332-4512

Trinity Lutheran Congregation 333-2661

Riverside Center Inc pub programming conf hall

2002 North Country Bookstore 336-7406

North Country Department Store 336-7406

North Country Dry Goods 336-7408

North Country Hardware 336-7406

2015 Vacant

2021\*Scholar N

2029 Oula's Tavern 338-9976

2031\*Olson Lawrence M 332-5990

2037 Hoff & Hoff Odette Printers 338-5513

21ST AV S INTERSECTS

2100\*Judd J 338-5271

\*Greenwood A F 332-4085

2102 Vacant

2122 Family Problem Solving Lab (U Of M)

Small Group Research Lab (U Of M)

S 6TH ST INTERSECTS

2124\*Blum P 338-1081

2127 Cedar Riverside Project Area Committee 336-7111

2129\*Freeland L C 339-1373

North Country Co Op ret & whol foods 338-1110

22D AV S INTERSECTS

2200 Smiley's Point Clinic (Fairview Hospital) 336-5791

2206 Riverside Self Service Laundry 333-9066

2206A Vacant

2208 Fairview Hospital (Pk Lot)

2223 Under Coats

S 7TH ST INTERSECTS

23D AV S INTERSECTS

ZIP CODE 55406

24 AV S INTERSECTS

400 No Return

2406 Roy's Garage 332-9221

2406 Saint Mary's Hospital (Stgo)

2409 Augsburg College (Mtee Dept)

2411 Augsburg College (Mtee Dept)

2413 Augsburg College (Mtee Dept)

2415 Augsburg College Little Theatre 332-6181

2426 Abigail Uniform Shop 336-7574

2431 Preston Frank B Jr phs 336-6366

2433 Vacant

2436 Purcell Bicycle Sales & Service 335-6701

S 7TH ST INTERSECTS

25TH AV S INTERSECTS

2000 Pioneer's Corner gift & greeting card shop 332-9686

\*Shawler Wm 322-7656

2606 Campus Travel Center 338-6706

2610 Vacant

Apartments

1 Vacant

2 Vacant

6 Vacant

2617-194 Riverside Mobil gas sta 333-9390

26TH AV S INTERSECTS

27TH AV S INTERSECTS

2610 Gibson Alex M @ 926-8703

2612 Lundquist Aron T Rev @ 922-3316

2616 Wilson Kevin H @ 922-2671

2616 Heinrich Margt L @ 922-1032

2619 Spannau Warren R @ 926-5597

2620\*Gow J @ 926-3461

2623 Billingsley Kathr Mrs @ 922-4134

2700 Nordrum Wm A Jr @ 920-3062

2701\*Delger James E @ 925-2223

2714 Sylvester Lavern P @ 926-7743

2705 Garner Karen C Mrs @ 922-7039

2710 Giombarro Camilla Mrs @ 925-2396

2711 Peterson Ernest H @ 920-1834

2714 Sylvester Lavern P @ 926-7743

2715 Bancroft Kenneth M @ 926-1403

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2814 Rose Staci S @ 926-5291

2801 Belanger Douglas E @ 922-3145

2801 Meloff Phyllis R @ 926-5291

2807 Kane Loyola S Mrs @ 926-5296

2809 Lynch Helen M Mrs @ 922-2427

2810 Kuntz Geo R @ 922-2164

2812 Budch Arthur M @ 922-2125

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2816 Berry John R @ 926-5291

2817 Lander Wm H @ 926-5189

2820 Sterling Hester B Mrs @ 927-6247

2823 Mitchell John W @ 920-5144

2824 Gower Ralph W @ 926-5698

2827 Cemetery Park @ 920-4139

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2 Vacant

6 Vacant

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26TH AV S INTERSECTS

27TH AV S INTERSECTS

**RIVERVIEW RD.—FROM E 53D ST SOUTH 1**

**EAST OF HIAWATHA AV**

ZIP CODE 55417

5033\*Wu Singe @ 729-4947

5037 No Return

5111 Kratz Alvin @ 721-2121

5115 Evans Clifford @ 722-5811

5119 Skarsten Harry I @ 724-6845

5123 Seefeldt Wilbert T Rev @ 721-1261

5124 Johnson Frances M Mrs @ 724-9412

5227\*Shannon Donald

5322 Papp Geta @ 722-2216

5326\*Hocking W

5338 Larson Rolt P @ 721-1554

5400 Larson Brons @ 729-7664

5443 Vacant

5544 O'Brien Bug C @ 729-7754

5547 Anderson Helen Mrs @ 724-7255

5548 Olson Victor E @ 724-9959

5561 Welt Otto L @ 729-1905

5562 Hursh Philip W @ 722-5056

5565 Higgenham Philip H @ 724-2976

5566 Mc Namara Martin A 721-3166

5589 Knudsen Martha I Mrs @ 729-4777

5586\*Lounsbury Gregg 724-1913

5584 Dille Theresa Mrs @ 724-1694

5583\*Last Kirk A 722-7649

5572 Bjorknes Benj F @ 724-7882

5580 Vacant

5584 Bawerly Ginger L 722-1651

CITY LIMITS

2505 Jarvey Kara B Mrs @ 925-3236

2506 Halberg Theo C @ 926-9472

2506 Clarke Elmer R 922-2348

2510 Griswold Ruth J Mrs @ 926-0914

2514 Hamblin Virginia A 922-4897

2518 Hall Clifford C @ 922-6282

2600 Semann Michael C @ 928-4228

2601 Moore Daria D Mrs @ 922-6756

2605 Bulen Willis L @ 922-6126

2606 Eller Roger F @ 922-7459

2608 Goulet Diane M Mrs @ 922-1463

**ROOSEVELT ST NE.—FROM NE TRAFFIC ST NORTH 1**

**EAST OF NE STINSON BLVD**

ZIP CODE 55413

325 Midwest Fire Protection Inc sprinkler sys 331-5411

422 Oophat Pattern Works Inc 331-5512

NE KENNEDY ST INTERSECTS

NOT OPENED BETWEEN NE KENNEDY & 22D AV NE

ZIP CODE 55418

501 Alupki Elmer H Rev @ 374-1459

506 Johnson Marian E Mrs @ 374-1455

507 Bell Ward T @ 374-2209

514\*Conner Michl P @ 374-1807

518 Poraze Sven M @ 374-4462

519 Anderson Avel L @ 374-5498

Capenator John @ 374-1817

526 Douglas Jack @ 377-0286

526 Ideokpe Nnd investments @ 374-2479

526 Ideokpe Sem investments @ 374-2479

528 No Return

531 Goye Harold W @ 374-1717

530 Berger Mark A @ 377-4021

OLSON MEM HWY INTERSECTS

ZIP CODE 55411

614 Goodman Harry C @ 621-1680

616 Vacant

617 Smith Martellar Mrs @ 629-2326

618 Geraldick Benj @ 629-6891

627 Britman Saml @ 622-1829

623 Irving Etta Mrs @ 521-0247

626 Robinson Earl A @ 529-5971

627\*Folks Florence

702 Henderson Naomi L Mrs @ 622-7709

706 Rice Edmund V @ 529-4991

707 Ferguson Alfred 521-8182

710 Ingram C Mrs 522-7293

711 Martin Charles H @ 529-7257

713 No Return

714 Johnson E @ 588-6693

715 Rogers Maya 521-7161

718 Swento Ruth A Mrs @ 529-5971

719 Prichon: He M Mrs @ 722\*Peterson C

Vacant

723 Slaughter Glenn W @ 522-8298

726\*Simon Tony G

727 Webb Ora L @ 621-1179

728\*Wadsworth 522-5283

729\*Daily Louise 522-5283

8TH AV N INTERSECTS

801 Vacant

808 Love Jeanette Mrs 529-4848

325 Midwest Fire Protection Inc sprinkler sys 331-5411

422 Oophat Pattern Works Inc 331-5512

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NOT OPENED BETWEEN NE KENNEDY & 22D AV NE

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710 Ingram C Mrs 522-7293

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**CRYSTAL LAKE CEMETERY**

*The Finest In Perpetual Care*

**Penn and Dowling Av. North Dial 521-7619**

# HIAWATHA AVE 1975

## AFL-CIO CENTRAL LABOR UNION COUNCIL OF MINNEAPOLIS

VIRGIL D. MOLINE, Pres.

312 Central Avenue, Minneapolis

Phone 338-5325

- 357
- HENNEPIN AV.—Cont'd**
- 3408 Coyne Wm G @ 824-8802  
 3408 Laughlin Clayton A @ 823-2197  
 3411 Apartments  
 1 House Frank A 823-8034  
 3 Bishop Clement A 824-4498  
 5 Lagge Helen B Mrs 822-7801  
 8# Chp Haasi A Mrs 825-9930  
 9 Palle Emma M 822-8056  
 10 Parham Kath M 823-2922  
 11 Mausolf Frances 827-1851  
 15# Camp Larry M  
 3412 Anderson John A 827-1810  
 3413 Apartments  
 2 Ferrault Robt E 827-1516  
 3 Simons Sophia J 827-1845  
 6 No Return  
 8 Rehl Esther A Mrs 824-6038  
 10# Farham K W  
 12 Larson Hazel R 822-8528  
 3416 Schlafer Harwood H @ 825-8777  
 3417 Return  
 3420 Flexible Bus Co  
 Mc Kinstry L Carlton @ 824-3848  
 3421 Apartments  
 1 Swanson Mae C Mrs 825-2295  
 3 Vacant  
 1 Winhall Dale R 827-1939  
 3423 Apartments  
 2# Kester Dan E 825-2040  
 4 Shoback Janice E 824-3069  
 3424# Franklin C 824-2917  
 Miller Joseph 823-2109  
 3425 Joyce Margt R Mrs @ 824-8914  
 3426# Milton Edw @ 825-6114  
 Rifkin Saml 824-7825  
 3429 Gilland Mary Mrs 822-7930  
 3432 Peterson Arch W @ 825-8784  
 Broberg Arth L 822-8864  
 3435# Tolerman Harley @ 822-9866  
 3436 Esterday Ruth J 823-6443  
 Johnson Myron V 825-1423  
 3439 Robinson Kenneth T @ 825-1835  
 # Brandon Maureen  
 3440 Apartments  
 Apt Burke Ruth Mrs 822-8623  
 Apt Crowhall Ella Mrs @ 825-1881  
 3443 Quinn Esther @ 825-1737  
 3444 Peter Donald E @ 825-6003  
 Dwyer Bonnie Mrs 825-2921  
 3445# Substator Eugene 823-8997  
 3448 Brevlin Michl L @ 822-5858  
 3449 Callagher Beata B 822-3429  
 3453 Leach Corvella R @ 824-4033  
 W 30TH ST INTERSECTS  
 3501 Garlock-French Roofing Co contr 823-8266  
 8895 Artistic Wood Covering 822-3444  
 8815 Apartments  
 201 Edmark Jean L  
 202 Jacobson Betty L 822-0379  
 203 Conway Lois  
 204 Masler Cecelia M  
 205# Olson N 823-2840  
 3514 Apartments  
 1 Welland Darwin 825-9236  
 3 Wickner Cheryl 826-7106  
 4# Edward J  
 101 Schilling John C 824-3992  
 102 Newmans Barbara J Mrs 825-4888  
 103# O'Brien Mildred L Mrs 823-8147  
 104# Wieg M J  
 201# Alan Jean  
 202# Beas H 823-8489  
 203 Hoffman Joseph P 825-8999  
 204 Dallas Violet G Mrs 825-2866  
 3515 Madison Inc mfg agts 827-3811  
 3517 Builders Supply 827-8381  
 Ross Gust inc painting cons 827-4781  
 Viking Pump Co 827-8759  
 Williams Joe Catering Co inc 827-4631  
 3523 Reese Fredrick J 823-1037  
 8524 City Civil Defense Emergency Preparation 825-3234  
 County Civ Defense Emergency Prep 824-0807  
 3526 No Return  
 3529 Regis Lee M Co monumental wkt 825-4471  
 3530 General Sports Shows Inc 827-5833  
 3540 Greenhouse Apartments  
 101 Vacant  
 102# Russell T 827-4485  
 105# Val M  
 105# Fischer Frank  
 107# Bergen R 825-3239  
 108# Ogilvie M 825-2120  
 109# Thompson T  
 110 Johnson Jo Ann 822-0169  
 111 Tisdall Charles  
 112# Hirtz Jack  
 114 Keller Cleora Mrs 827-7245  
 116 Vacant  
 117# Erickson N  
 118# Wagner G 825-9105  
 119# Hunt R  
 120# Smith D  
 121# Halverson Margt C 824-7373  
 122# Ryberg E 825-1775  
 123# Laing R 827-8888  
 12# Midrange Orchard 823-0135  
 201# Gillum M 822-7157  
 202 Burke Thos A 822-4670  
 203# Hanson Roy A 822-7406  
 204# Berner F  
 205# Krokum Ludwig 824-1422  
 206# Olson M 823-8493  
 207 Kaplowe Mildred P 824-0153  
 208# Zarlson V Richd 822-7760  
 209# Hanson R G 827-3923  
 210 Adams Elm 824-7747  
 211# Bertala D  
 212# Compton M 827-6683  
 213# Massey James S 825-3879  
 214# Reamer Bruce 824-3978  
 215# Thompson K 827-8390  
 216# Shihano Dorothy 825-7469  
 217 No Return  
 218# Mariska Rosemary 823-7096  
 219# Ring E 825-7431  
 220# Dahl C J 823-2768  
 221# Hutton  
 222# Richards B 827-7304  
 223# Hannes R 823-7579  
 224# Klasek Patricia H 331-1032  
 225# Lindone Evelyn 823-5787  
 302# Brandstater J 827-7578  
 303 Burton Carol E  
 304# Raine M  
 305# Fritchard Wm Mrs  
 306# Muenbrock A 825-3021  
 307# Marcus Eunice 825-7931  
 308# Lawson L 824-6583  
 309# Eide Ronald A 823-5907  
 310 Miller Wm 827-1649  
 311# Orth G 823-8312  
 312 Larson Paul D 827-1304  
 313 Campbell Gordon Mrs 825-1268  
 314# Stokes C 822-9120  
 315 Lawson Mabel C Mrs 823-2487  
 316# Aumann S  
 317 Gels Linda L 823-7538  
 318 Flowers Delah G 645-0011  
 319 Ayers James A 822-2996  
 320# Wolfson Elmer  
 321# Johnson Willis A  
 322# Wenzling S  
 323# Madden Mary J 825-1815  
 324# Lanctot Doris L 825-9532  
 3533 Brandt Agencies 827-2646  
 W 30TH ST INTERSECTS  
 3600 Lakewood Cemetery Assn Inc 822-2171  
 357
- HIAWATHA AV.—FROM S 5TH ST AND 18TH AV S SOUTHEAST 1 WEST OF CEDAR AV**
- ZIP CODE 55404  
 1807 Vacant  
 1915 Mail/Advertising inc letter shop 338-6887  
 Morgan Printing Co 338-6887  
 E 24TH ST INTERSECTS  
 E 26 1/2 ST ENDS  
 E 28TH ST INTERSECTS  
 ZIP CODE 55407  
 E 29TH ST INTERSECTS  
 2600 Mill Rd (Southwtn Yd) 729-0307  
 C M ST P & P RY CROSSES  
 E 29TH ST INTERSECTS  
 E LAKE ST INTERSECTS  
 E 31ST ST INTERSECTS  
 ZIP CODE 55406  
 3105 Gypsum Group Industries inc bldg matls 729-2309  
 3109 Account Promotions adv distr 721-6301  
 3117 B F Agency adv agcy 722-2254  
 3121 Economy Furniture distr ret 721-5347  
 3142 Peckack Charles R @ 721-4032  
 3146 Daryn Jean  
 3147 N S P Co (Sub Sta)  
 3151# Home Foundry Co Inc 721-6667  
 E 32D ST INTERSECTS  
 3240 Genuine Parts Co (Br) whol auto parts 721-6064  
 3245 Donaldson's (Dist Center) 721-8221  
 E 33D ST INTERSECTS  
 E 34TH ST INTERSECTS  
 3501 Imperial Refineries Of Minnesota gas sta 724-9868  
 3524 Electronic Inc electronic equip mfrs 721-5074  
 3535 Cappy Homes Div Of Evans Products bldg cons 721-3661  
 E 34TH ST INTERSECTS  
 3541 International Sugar Feed Co whol 721-8303  
 National Vitamin Products Co animal foods mfrs 722-9681  
 27TH AV S INTERSECTS  
 E 36TH ST INTERSECTS  
 3501 A-D-M Milling Co (ELEV) 728-8381  
 28TH AV S INTERSECTS  
 E 36TH ST INTERSECTS  
 3601 Donaldson's (Wash)  
 E 37TH ST INTERSECTS  
 3745 Archer-Daniels-Midland Co (MILL) 729-2292  
 E 38TH ST INTERSECTS  
 3815 Balfour Purina Co feed mfrs 722-9581  
 E 39TH ST INTERSECTS  
 3197 AV S INTERSECTS  
 3860 Vacant  
 3861 N S P Co (Sub Sta)  
 E 40TH ST INTERSECTS  
 4001 Bell Paper Co whol 721-4885  
 Belkin Joseph acct 721-5689  
 404 Central Container Corp corrugated box mfrs 721-8234  
 404# Cronstroms Mig Inc (Whee)  
 E 41ST ST INTERSECTS  
 4106 Landscaping Services 729-4057  
 4121 Mc Donald's rest 729-4417  
 33D AV S INTERSECTS  
 4130 Central Equipment Co contain equip 721-9434  
 Industrial & Truck Parts Inc whol 722-6607
- 4151 Central Equip Co (Sign)**  
 4155 Rent-A-Trailer System 722-6764  
 E 42D ST INTERSECTS  
 4200# Blaney Bros Mobil Service 729-9802  
 4202 Vacant  
 4225 Cronstroms Mig Inc ml stamping 722-6671  
 4251 Charles A & W Drive In 729-3694  
 E 43D ST INTERSECTS  
 4325 Printing inc coml prnter 722-6655  
 E 44TH ST INTERSECTS  
 4411 Olson Equipment Co contr supe 728-8364  
 4439 Beverage-Service Inc 721-7405  
 Beverage Service Inc vending dept  
 E 45TH ST INTERSECTS  
 4501 Milco Engineering distr lawn spraker & futn sup 724-3655  
 4525 Fuller Brush Co The 721-4483  
 4533# Brennan-Kennedy Inc jan sup 721-1641  
 4547 Country Club Market 721-4666  
 E 46TH ST INTERSECTS  
 4601 Hiawatha Standard Service Station 724-9943  
 4641 No Return  
 E 47TH ST INTERSECTS  
 4734 Vacant  
 4757 Parkway Service Inc hotel 728-8214  
 Parkway Motor Hotel 728-8314  
 Parkway Restaurant 724-4663  
 Parkway Motor Court  
 Parkway Motor Hotel 724-4663  
 NAWADABA BLVD INTERSECTS  
 E MINNEHAHA PKWY INTERSECTS  
 ZIP CODE 55417  
 E 49TH ST INTERSECTS  
 4916 Benda Mary 722-7744  
 4918 Rader Christian E @ 721-1918  
 4920 Vacant  
 4928 Foreland Vernon L @ 722-1240  
 4930 Holick Frank @ 722-3345  
 4934# Mc Neely A G 722-0296  
 E 50TH ST INTERSECTS  
 5000 Hudson Oil Co 724-9456  
 5028# Carlson E 724-6818  
 5040# Bevan Harvey H @ 724-6568  
 5046# Franzen Eug V @ 722-6872  
 5050# Himmlich Wm @ 722-6872  
 E 51ST ST INTERSECTS  
 5108 Sorensen Stanley C 724-4373  
 5108# Kuhnshak Jean A 724-5790  
 5110 No Return  
 5112 Murphy Clare  
 5114 Sandness Mavis L Mrs 722-4211  
 5120# Guther Barbara 721-2745  
 5122 Peterson Wm G @ 721-4544  
 Landberg James A  
 5130 Apartments  
 1 Finkel Barbara 722-5462  
 3# Raparia Robt J  
 3# Nasco Rosalee A 721-1154  
 4 Wade Wm 729-7828  
 5136 Apartments  
 1# Dignity Anthony  
 2# Fortman H 721-4246  
 3# Riley D J 729-1214  
 4# Negussaw Donovan 724-6325  
 5# Dircks Wm E 722-4701  
 6# Gjords S 729-4755  
 5140 Auntie Lewis E @ 724-6298  
 5152 C & R Belter lawn tractors als & serv 721-4748  
 E 52D ST ENDS  
 E 53D ST INTERSECTS  
 5300 Backlund Kenneth A @ 722-5316  
 5301 Grafana Hazel I Mrs @ 722-1464  
 5306 Kriech James B @ 722-6379  
 5308 Fisher Wm F @  
 5312 Vacant  
 5314# Stuckfort Dalores R 722-1306  
 5315 Mc Donald Pat A 721-8896  
 5320# Burdick Arny E Mrs @ 724-7310  
 5321 Wheeler Wilma Mrs @ 721-1964  
 5324 Wozley Lucille C Mrs @ 722-1806  
 5325# Leinert Sheldon J 724-2287  
 5328# Murrell Michl 724-2953  
 5329 Holten Thom G @ 721-1295  
 5332# Gracia  
 5333 Anderson J Alida Mrs @ 722-5463  
 5336 Goar Louis E Jr @ 724-3595  
 5339 Vacant  
 5340# Beeger Wm L @  
 5343 Dupont Carnet O @ 722-3605  
 5344 Hulleman Carl M @ 724-8364  
 5347 Workman Ruth F Mrs @ 729-2395  
 5348 Draw Ronald J @ 724-6254  
 5350 Rundgren Richd L @ 721-7288  
 5351 Bonin Firenze M Mrs @ 724-3515  
 5358 Carter James 722-5895  
 5360 Hume Julia D Mrs @ 728-1222  
 E 44TH ST INTERSECTS  
 5365 Kanin Myron D @ 823-8878
- HILLSIDE AV.—FROM IRVING AV N AND 21ST AV N NORTHWEST 1 NORTH OF W BROADWAY ST**
- ZIP CODE 55411  
 1509 Cary John P @ 522-7303  
 1614# Phillips Robt  
 Phillips Diana R Mrs 888-4292  
 1517# Fleming Kenneth H @ 528-0038  
 1821 Akerman Kenneth C @ 529-3702  
 1522 Apartments  
 2 Nelson Bernard E 521-8952  
 3 Swanson Cora C Mrs 522-8307  
 4 Vacant  
 5# Present Richd D 529-3500  
 6 No Return  
 7 Walstrom Emil J  
 8 Gilberston Bernard 888-8503  
 1525# Ralich Charles J Jr @ 529-0312  
 1529# Haines B  
 1530 No Return  
 1538 Whitford Robt @ 529-7224  
 1539# Waddick Julia A Mrs 521-4350  
 1543# Patis James J @ 528-6471  
 1537# Fechtner Edwin M @ 521-7210  
 1538# Hyder Paul A @ 528-4567  
 1541# Gries May M 529-2946  
 1541# Peters Alvin J @ 529-7081  
 1542# Schroeder Peter J 522-6090  
 1542# Dondlinger John A @ 529-0786  
 1546 Anderson Elaine R 522-5340  
 1546 Walker Kath M Mrs @ 521-6439  
 1547 Sheppard Grace M Mrs @ 522-0511  
 Vacant  
 1551# Mac Donald Harry S @  
 1554# Lacerda H  
 1555# Estabrook P J  
 1558# Strit Severin V @ 522-7178  
 1559# Mc Intosh Echo V Mrs @ 528-2114  
 1564# Noel Rudolph F Jr @ 521-3636  
 1560# Brodeur Mabel H Mrs @ 521-5014  
 Vacant  
 1600# Roberts Fredk @ 528-0062  
 1601# Meyer Ellen E Mrs @ 522-4340  
 1606# Podlasek Edg R @ 521-8191  
 1607# Hornsfeather Co fashion jewelry  
 Robertson Neil E @ 522-4800  
 1608# Burdick Wallace J @ 521-0643  
 1609# Burrell Jeffrey 522-2589  
 1611# Devary Laura N Mrs @  
 1612# Fowles Betty 522-1728  
 1613# Stabenow Lorraine M Mrs @ 521-3422  
 1614# Larson Mable Mrs 521-5122  
 1617# Gilmore Gall B @ 522-9134  
 # Collins Eug  
 # Regis Jane 521-8624  
 1618# Gruthike Henry H @ 522-3162  
 1621# Burns Wm F @  
 1622# Workman Varcoe @ 521-6469  
 # Landash Margt  
 Norwood Edith Mrs 521-1783  
 Nelson Marjorie  
 1625# Wikman Dale H @ 521-4907  
 1628# Mc Allister Chad L 529-7988  
 # Eulder Raymond E 522-6085  
 1634# Anderson David C @ 529-7285  
 Anderson Linda M 588-5825  
 1636# Niemele Ertha Mrs 522-9183  
 # Atlas Frank E 529-4341  
 1637# ILION AV INTERSECTS  
 1700# Skordahl Alvin A @ 521-6898  
 1701# Nelson John 822-6072  
 1706# Smith Charles @ 529-6075  
 1707# Pearson B R Mrs @  
 1708# Hart John H @ 522-4093  
 1711# Rosenthal Dancy R 529-2303  
 1712# Borick Paul M @ 521-0438  
 1714# Zachow Martin W @ 521-4422  
 1715# Peters Thos A @ 822-4903  
 JAMES AV N INTERSECTS  
 1814# Campbell Beata A Mrs @  
 1815# Kotaral Diane @ 588-1045  
 1818# Blawcoe B R 521-9315  
 1820# Walker James L @ 588-1594  
 LOCKAN AV N INTERSECTS  
 24TH AV N INTERSECTS  
 1910# Marth Mary Mrs 588-6329  
 1912# Zachar Marjorie J @ 522-2630  
 1914# Smith Sharon Mrs 529-2391  
 1916# Johnson Dore B Mrs @ 529-9087  
 1923 Vacant  
 1925 Vacant  
 1928# Mattson Gordon C @ 529-0492  
 1930# Pasha Ronald L 522-1978  
 1935# Jehu Delbert G @ 521-1375  
 1939# Rumbler Madelon I Mrs @ 529-3466  
 NEWTON AV N INTERSECTS  
 2003# Zallar Louis J @ 529-7965  
 2005# Wong Mary L Mrs @ 521-5335  
 # Wong Chew 522-1056  
 2011# Wiczek Lynn 522-4586  
 # Dallman Robt D 529-1660  
 2013 Vacant  
 2017# Whalen Thos M @ 528-5432  
 2023# Holm Richd 529-1561
- HOAG AV.—FROM HOLDEN ST NORTH 3 EAST OF LYNDALE AV N**
- ZIP CODE 55411  
 6TH AV N INTERSECTS  
 610 Gopher Glass Co 336-7628  
 7TH AV N INTERSECTS  
 8TH AV N INTERSECTS
- HIGHWAY PL.—FROM PROSPECT AV SOUTH IN A CORNER BETWEEN GLADSTONE AV AND HARRIET AV**
- ZIP CODE 55419  
 27# Garner Frank L @ 824-9111

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 ---CHILTON DONAVON C 724-4615  
 ---38TH AV S INTERSECTS  
 3811 CLAYTON HARLAN H • 722-1044  
 3815 ANDERSON WALTER F • 724-8437  
 ANDERSON DONALD T PIANO TUNER  
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 3821 CHRISTOPHERSON KENNETH L • 722-8231  
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 ---40TH AV S INTERSECTS  
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 4021 ANDERSON HUGO L • 722-3235  
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 4029 SWITALA ROMAN A • 724-7390  
 ---41ST AV S INTERSECTS  
 4101 JESSE THOS R • 724-5014  
 HAMMOND CATHY 721-5920  
 4111 RUDE AV S INTERSECTS  
 4115 SOLINE MELVIN B • 729-3571  
 4118 HILGEMAN GRETCHEN F 722-9222  
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 4203 HANSON J B MEAT CO RET 721-6419  
 4205 RALPH'S TACKLE SPORTING GOODS WARE 724-8243  
 4207 STEVE'S BARBER SHOP  
 4209 RAY-DEL RADIO TV SERVICE 724-4750  
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 4220 AUSEN WAYNE S • 722-8663  
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 4313 SAM'S FAIRWAY FOOD STORE 729-2700  
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 4704 KOKKONEN JOHAN C • 721-1415  
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 4912 HOLT LOIS M MRS 729-0801  
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 5000 NELSON EDWIN • 721-3972  
 5006 WILCOX ROBT H • 729-0891  
 5012 LOJA JOHN R • 724-8344  
 5016 LOVE RAY E • 722-0980  
 5100 MC CARTY ROBT F  
 5106 DONOSKE LEONARD • 722-9931  
 5110 BOB ROBT A • 721-4087  
 5114 WESTERHEIM STANLEY D • 724-4086  
 5118 LARSON RUTH J MRS • 729-3418  
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 ---ZIP CODE 55419  
 ---HARRIET AV INTERSECTS  
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 501 ANNUNCIATION CHURCH 824-0279  
 506 WAN DRAEK JULIA M MRS • 825-7018  
 509 COLBERT PAUL A REV 824-0787  
 510 CURTIN REALTY 824-4701  
 CURTIN ERWIN A • 822-4701  
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 612 GIFT NOOK THE 824-9108  
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 616 JIM'S BARBER SHOP 823-9439  
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 1501 FIRST CHURCH OF THE NAZARENE 827-5901  
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 1800 ELLIS JOHN A • 926-3697  
 ---LOGAN AV S INTERSECTS  
 1900 JUNGERS CELESTINE A MRS • 926-8298  
 1906 PHILLIPS EARL H • 922-7897  
 1912 JOHNSON VERNER J • 926-8608  
 1918 BORNHOLD RONALD E • 926-9259

1922 BREKKE PATRICIA P MRS • 926-8112  
 ---MORGAN AV S INTERSECTS  
 2000 SMITH ALAN R CIVIL ENG • 926-4368  
 2006 HAINES BERRY • 926-2350  
 2010 IRISH JEANNE L • 926-4760  
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 2020 SWANSON ESTHER F • 922-2798  
 ---NEWTOWN AV S INTERSECTS  
 ---OLIVER AV S INTERSECTS  
 2211 STAN-LO PRODUCTS KITCHEN CABINETS 922-7201  
 2213 LA-FERTE BEAUTY SALON 927-8633  
 ---PENW AV S INTERSECTS  
 ---ZIP CODE 55410  
 2312 KULSTAD LAURITZ S • 926-8581  
 2316 DERBY LEWIS E • 922-0488  
 2322 WHEATON RICHM • 922-0928  
 2326 BUTTS CLINTON M • 922-5156  
 ---QUEEN AV S INTERSECTS  
 2400 ANDERSON ETHEL I MRS • 926-7185  
 2406 WAREHAM JOHN R • 922-1026  
 2410 BYLUND CLARENCE W • 922-2203  
 2414 PERSCHMANN JOHN H • 920-3562  
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 ---RUSSELL AV S INTERSECTS  
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 2405 MC CHERNEY ERNEST A • 920-1864  
 2509 BUCKANAGA CHARLES V • 926-1755  
 2515 COLEMAN WARREN I • 926-0976  
 2517 BROWN NELLE W MRS • 927-4746  
 2521 ELLIS CHARLES S JR • 926-0209  
 2600 MCGARVEY EDW M • 922-5939  
 2601 WILKER RUDOLPH G • 926-2565  
 2607 SONNICHSEN ROGER P • 920-6209  
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 ---THOMAS AV S INTERSECTS  
 2700 VAN EVERY HAROLD • 926-4471  
 2707 CHARLES F HEALY • 922-0355  
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 2813 JACOBSON DOUGLAS K • 922-7507  
 2817 ANDERSON WILLARD C • 926-6583  
 2821 ANDERSON ANNA E MRS • 926-6491  
 2829 ABRAHAMSON EDITH MRS • 927-0095  
 ---VINCENT AV S INTERSECTS  
 2901 LUHM ANTHONY J • 922-2747  
 2905 UHLER STANLEY G 926-5242  
 2911 FAGRELIUS CARL A • 926-3409  
 2917 LIEB ROBT E • 922-8919  
 2921 EICHMORN ARTH F • 926-9916  
 ---WASHBURN AV S INTERSECTS  
 3006 MOLE GUY E • 927-8285  
 3009 RINDAL EARL D • 926-0158  
 3015 JOHNSON PAUL N • 926-8798  
 ---XERXES AV S INTERSECTS  
 ---YORK AV S INTERSECTS  
 ---ZENITH AV S INTERSECTS  
 ---ABBOTT AV S INTERSECTS  
 ---BEARD AV S INTERSECTS  
 ---CHOWEN AV S INTERSECTS  
 ---DREW AV S INTERSECTS  
 ---FRANCE AV S INTERSECTS  
 55TH ST E -FROM PORTLAND AV EAST, 7 NORTH OF E 62D ST 108  
 ---ZIP CODE 55419 196  
 ---PARK AV INTERSECTS  
 ---ELLIOT AV INTERSECTS  
 ---ZIP CODE 55417 108  
 ---CHICAGO AV INTERSECTS  
 ---CLINTON AV INTERSECTS  
 ---10TH AV S INTERSECTS  
 ---11TH AV S INTERSECTS  
 ---12TH AV S INTERSECTS  
 ---13TH AV S INTERSECTS  
 ---14TH AV S INTERSECTS  
 1404 RUSTAD ARNOLD L • 824-8941  
 1420 BANNOCHIE NORVAL J INT DEC • 822-6229  
 ---15TH AV S INTERSECTS  
 ---WOODLAWN BLVD INTERSECTS 168  
 ---SHOREVIEW AV INTERSECTS  
 ---23D AV S INTERSECTS  
 2308 DICK RONALD C • 721-2826  
 2310 OIGERS DENNIS G • 721-2826  
 2314 VARHOL JOSEPH • 722-1998  
 ---24TH AV S INTERSECTS  
 ---25TH AV S INTERSECTS 120  
 ---26TH AV S INTERSECTS  
 ---27TH AV S INTERSECTS  
 2723 BERGGREN MAE E MRS • 822-4942  
 ---28TH AV S INTERSECTS  
 2800 WALDRIP EDW E 29-5366  
 2802 ROCK WELBORN 721-7864  
 2820 MITCHELL PHILIP J • 729-6060  
 2900 DOWNING LEO R • 721-1754  
 ---30TH AV S INTERSECTS 169  
 ---NOKOMIS AV INTERSECTS  
 ---31ST AV S INTERSECTS  
 ---32D AV S INTERSECTS  
 ---33D AV S INTERSECTS  
 ---34TH AV S INTERSECTS 173  
 3412 POMROY FRANCIS E JR • 724-5217  
 3416 BISHARK SHELTON LAWN SERVICE 722-5881  
 BISHARK SHELTON L • 722-5881  
 3420 VOIT BARBARA E • 729-1731  
 ---35TH AV S INTERSECTS

3500 SLOBOD EDW T • 724-4097  
 3502 OSEEN SYDA B MRS • 722-1018  
 3508 STEENSON KENNETH V • 722-4678  
 3512 BAIN HAROLD C • 721-3971  
 3516 MENKE ALOYS A • 721-2778  
 3520 FREDRICKSSON MAJALIS A MRS • 724-7836  
 3524 ELLINGSON OLIVER • 724-4441  
 ---36TH AV S INTERSECTS  
 3600 BASSAMORE EUG W • 722-5088  
 3604 HAMMERGREN EUNICE M • 721-1366  
 HAMMERGREN REUBEN W • 721-1366  
 3608 BEATTIE JOHN E • 729-4170  
 3612 O'DAY MICHL M • 722-6806  
 3616 JACKSON F C LAND SURVEYOR 724-6481  
 3620 JOHNSON GEO H • 722-2428  
 3624 LINDAHL ELMER J • 724-7229  
 ---37TH AV S INTERSECTS  
 3700 NEELIN HENRY E • 722-8197  
 3704 TEVIK ANDREW • 729-0123  
 3708 VACANT  
 3712 DILLE EARL H • 722-4543  
 3716 KREBSBACH VIOLA A MRS • 729-4859  
 3720 STARK BIRANK M • 724-5602  
 ---38TH AV S INTERSECTS  
 3800 WEST EUNICE G MRS • 722-4592  
 3804 LUNDAHL MILD • 722-3295  
 3808 BORRIS JOSEPH • 722-5263  
 3812 FRIEBER EARL • 729-4681  
 3816 PAVEL JAN REV • 722-6233  
 3820 BURGE SANFORD M • 729-3697  
 3825 ANDERSON DONALD E • 721-3010  
 ---39TH AV S INTERSECTS 172  
 3902 ESTES VIVIAN C MRS • 729-9463  
 3904 SJOSTROM BEULAH E MRS • 722-9379  
 3908 OLSEN JENEL  
 3912 SYLVE KENNETH O • 722-8642  
 3916 DVORAK THOS R • 729-8145  
 3920 ANDERSON PAUL W • 722-7685  
 ---40TH AV S INTERSECTS  
 4000 SOKTERKA JOSEPH E • 721-2224  
 4004 CALLE J C 721-3026  
 4008 ELL JEROME A • 729-9139  
 4016 YAEGER DOUGLASS R • 724-8131  
 4020 KIMMEL CLARENCE M JR • 722-1781  
 4024 FERGUSON LLOYD E • 926-0714  
 4100 GORDON CALVIN D • 729-4325  
 4102 KOBLAS JOHN J • 722-3976  
 4104 GUSTAFSON WALTER R • 722-7757  
 4114 HAGBERG R A • 722-0955  
 4122 BUCKLEY JOHN C • 722-0955  
 ---42D AV S INTERSECTS 134  
 ---43D AV S INTERSECTS  
 ---44TH AV S INTERSECTS  
 ---45TH AV S INTERSECTS  
 4516 DANIELSON LLOYD 724-5919  
 ---46TH AV S INTERSECTS  
 55TH ST W -FROM PLEASANT AV WEST, 1 SOUTH OF DIAMOND LAKE RD  
 ---ZIP CODE 55419  
 ---GRAND AV INTERSECTS  
 ---HARRIET AV INTERSECTS  
 ---GARFIELD AV INTERSECTS  
 600 WOODWARD PAINTING & DECORATING CONTRS 824-4360  
 WOODWARD EDW M • 824-4360  
 ---LYNDALE AV S INTERSECTS 157  
 704 PETERSON DOROTHY T REALTOR 827-2686  
 PETERSON DOROTHY T • 827-2686  
 ---ALDRICH AV S INTERSECTS  
 ---BRYANT AV S INTERSECTS  
 920 PEARSON CARLY W • 923-3396  
 925 SABIN FREDK W • 827-3198  
 ---COLFAX AV S INTERSECTS  
 ---DUPONT AV S INTERSECTS  
 1100 LUREN MINNIE C • 822-6615  
 1112 PETERSON MELVIN W 822-5104  
 ---EMERSON AV S INTERSECTS  
 ---FREMONT AV S INTERSECTS  
 ---GIRARD AV S INTERSECTS  
 1412 HUGH CHARLES D • 922-9151  
 1416 GOUZE FRANK A • 920-4759  
 ---HUMBOLDT AV S INTERSECTS  
 1500 NORDEEN HAROLD E • 922-8917  
 1506 OLSEN ROBT J • 929-3419  
 1510 KOSMAS PANY W • 926-4179  
 ---ZIP CODE 55410 155  
 ---OLIVER AV S INTERSECTS  
 2221 LINDGREN DOROTHY M MRS • 927-9238  
 2301 TURNUQUIST WAYNE L • 929-9907  
 ---QUEEN AV S INTERSECTS  
 ---RICHMOND CURVE INTERSECTS  
 2521 L'FOURIST LLOYD H • 926-9490  
 ---CUMBERLAND RD INTERSECTS  
 2604 MC GLENNEN HOWARD B • 926-7819  
 2607 DRAKE ELIZ • 920-1151  
 2608 NIELSEN GEO L • 926-5240  
 2612 MARUSHIN JOSEPH M • 926-9698  
 2616 FRIEBER JOHN E • 922-8023  
 2620 ERICKSON VEIKKO • 926-8996  
 2700 HALLBERG LUVERNE D • 922-8467  
 2706 BLOOMQUIST ETHEL M MRS • 926-3880  
 2710 BERTAN FRANK • 926-5310  
 2711 JACK MICHL K • 929-5365  
 ---UPTON AV S INTERSECTS  
 2800 ANDERSON RICHM A • 926-7884  
 2804 ANDERSON JEROME A • 922-1897  
 2808 GLEASON ROBT D • 926-8421

2812 BOOTH MARY E • 926-1750  
 2816 HOPPER KENNETH B • 922-1390  
 2822 VAN TASSEL JAMES W • 920-5669  
 2826 INCDONALD PETER • 922-2174  
 ---VINCENT AV S INTERSECTS  
 ---WASHBURN AV S INTERSECTS  
 ---XERXES AV S INTERSECTS  
 ---ZIP CODE 55419  
 56TH ST E -FROM NICOLLET AV EAST, 1 SOUTH OF DIAMOND LAKE RD  
 ---ZIP CODE 55419  
 15 HANSEN ROBT G JR 869-2338  
 ---1ST AV S INTERSECTS  
 104 CRANE ANNY C MRS • 822-1821  
 ---STEVENS AV INTERSECTS  
 ---2D AV S INTERSECTS 196  
 ---2106 CODE 55417  
 ---CLINTON AV INTERSECTS  
 ---PORTLAND AV INTERSECTS  
 ---PARK AV INTERSECTS  
 708 INDUSTRIAL MACHINERY SERVICE ERECTORS 823-7767  
 WACHLAR FRED J • 823-7767  
 ---COLUMBUS AV INTERSECTS  
 ---CHICAGO AV INTERSECTS 108  
 809 MONTREVIL LARRY REALTORS  
 811 EXQUISITE CLEANERS 823-2066  
 815 PARK TERRACE BARBER SHOP 822-1898  
 PARK TERRACE BEAUTY SHOP 822-1898  
 ---ELLIOT AV INTERSECTS  
 ---11TH AV S INTERSECTS  
 ---12TH AV S INTERSECTS  
 ---13TH AV S INTERSECTS  
 ---14TH AV S INTERSECTS  
 ---15TH AV S INTERSECTS  
 1512 MOERHE ALMA D MRS • 823-0197  
 1520 SWABB JAMES P • 824-7372  
 1524 SMITH EVELYN H MRS • 823-4102  
 ---BLODMINGTON AV INTERSECTS  
 ---WOODLAWN BLVD INTERSECTS 168  
 ---21ST AV S INTERSECTS  
 2117 DINGER CLARENCE S • 724-5928  
 ---22D AV S INTERSECTS  
 2220 HANSON DOUGLAS A • 729-4928  
 2238 ANDERSON WELLS F • 729-6547  
 2242 BELLEFETER JOSEPH P • 721-6880  
 RICHARDSON FRED J JR • 722-1075  
 2246 PETERSON RALPH H MRS • 722-1075  
 ---STANLEY AV INTERSECTS  
 ---SHOREVIEW AV ENDS  
 ---23D AV S INTERSECTS  
 ---24TH AV S INTERSECTS  
 ---25TH AV S INTERSECTS 120  
 ---26TH AV S INTERSECTS  
 ---27TH AV S INTERSECTS  
 ---28TH AV S INTERSECTS  
 2804 BRADSHOTT W J 724-3093  
 2806 NO RETURN  
 ---29TH AV S INTERSECTS  
 ---30TH AV S INTERSECTS 169  
 ---NOKOMIS AV INTERSECTS  
 ---31ST AV S INTERSECTS  
 ---32D AV S INTERSECTS  
 ---33D AV S INTERSECTS  
 ---34TH AV S INTERSECTS 173  
 ---35TH AV S INTERSECTS  
 ---36TH AV S INTERSECTS  
 3604 BRYANT FLOYD I • 722-5513  
 ---37TH AV S INTERSECTS  
 ---38TH AV S INTERSECTS  
 3810 MORRIS PARK SCHOOL 721-5027  
 4000 MORRIS PARK PLAYGROUNDS 724-3133  
 56TH ST W -FROM NICOLLET AV WEST  
 ---ZIP CODE 55419  
 ---BLAISDELL AV INTERSECTS  
 114 LEVOIR RALPH I • 824-2727  
 ---BENTWORTH AV INTERSECTS  
 128 OLDRIDGE GARLYN A • 822-6870  
 131 ANDERSON WALLACE L • 866-8296  
 136 GLEASON RAYMOND A • 824-6444  
 137 STEWART GERALD R • 869-1721  
 ---PILLSBURY AV INTERSECTS  
 201 CARR GEO • 866-1006  
 203 SIVERTHORNE REGINAL G • 869-6506  
 214 SWANSON DONALD T • 827-4128  
 ---PLEASANT AV INTERSECTS  
 ---GRAND AV INTERSECTS 158  
 420 DUFFY RAYMOND T • 823-8618  
 ---HARRIET AV INTERSECTS  
 ---LYNDALE AV S INTERSECTS 157  
 ---ALDRICH AV S INTERSECTS  
 818 FEIGEL MARIE M MRS • 823-3607  
 820 FEIGEL HAROLD W • 823-3607  
 ---BRYANT AV S INTERSECTS  
 ---GIRARD AV S INTERSECTS  
 1500 SKILBECK RICHM F • 920-2522  
 1506 STOLLER MORRIS A • 920-7580  
 ---IRVING AV S INTERSECTS 155  
 ---JAMES AV S INTERSECTS  
 1701 NELSON PAUL W • 926-7839  
 ---KNOX AV S INTERSECTS  
 ---LOGAN AV S INTERSECTS  
 ---MORGAN AV S INTERSECTS  
 ---NEWTOWN AV S INTERSECTS  
 ---OLIVER AV S INTERSECTS  
 2204 YANACEK RUTH E MRS • 926-9752



RIVERVIEW RD 1970

AV UN.

(S. LOUIS PARK)

RIVER RD W-Contd
3900 DOWLING SCHOOL FOR
CRITICALLY ILL CHILDREN
721-6433
4006 BERNSTEIN IRVING C
721-4006
---FDLWY ENDS
---NORTHROP DR ENDS

---E 420 ST INTERSECTS 130
4200 BRECK SCHOOL 721-3325
4330 SHELTERING ARMS THE SCH
721-6603
---E 44TH ST ENDS
---E 45TH ST ENDS
---GODFREY RD ENDS

---20TH AV S INTERSECTS 144
---S 5TH ST INTERSECTS
2000 HYDRAULIC SPECIALTY CO
PUMP REPR 338-7641

---ZIP CODE 55414
1 EAST RIVER PARK APARTMENTS
101 STEWART RON 332-3634
102 PRESTWICK ROGER
335-7035
103 SWANSON SANDRA L
335-4006
104 WATSON CATH E 336-5431
105 MAKI LES W 335-4406
106 SILBERMAN SHIRLEY
338-7942

201 BARRETT LAWRENCE M JR
336-6125
202 GRUBER C LOUISE
332-0777
203 MOEN MARY K 338-4910
204 VACANT
205 JOHNSON DALE L 335-0773
206 VACANT

2 EAST RIVER PARK APARTMENTS
101 RITTER G H 338-3470
102 HASEN ROBT V 338-2331
103 VACANT
104 ALTHOLZ JOSEF L
335-8092
105 OSTROUSKA GEO 335-4718
106 MULLEN PHYLLIS
201 WOLD ALBERT T
202 CROWDER ROZELLE L MRS
336-4866
203 HEGGERNESS HAROLD C
332-1009
204 WEISEL BETTY F 335-1752
205 TOWNSEND FREDK A
338-5346
206 ALBRIGHT JUDY

11 EAST RIVER PARK APARTMENTS
101 RAJPAI SHIVA G 335-2741
102 ROSE WARREN R 336-6948
103 NO RETURN
104 LABONTE ANTON E
333-6880
105 SCHLAUDERPAFF PAUL A
333-6880
106 VACANT
201 RODETS ORDIS L 332-2894
202 EICHENHOLZ LYDIA L MRS
335-4750
203 STUHLMANN CONSTANCE
336-9720
204 HANSEN L G 338-6170
205 NO RETURN
206 KEWLEY LORINE 338-0159

12 EAST RIVER PARK APARTMENTS
101 DOESCHER E B 339-6587
102 KNAPP BRYAN L 338-0237
103 HORAZDOVSKY J A
104 FIGENSHAW JAMES G
339-1990
105 SMITH KATH M MRS
339-5231
106 POULIN EDMUND J
339-2127
201 KERN L 332-1631
202 ADAMS DAVID B 338-4909
203 COLBURN D
204 LOVE FINETTE L MRS
339-3213
205 KROISS ELAINE B MRS
335-2118
206 BORCHERT JAMES E
339-1736

21 STREET CONTINUED
21 SCHLENTZ ROBT 338-2806
22 KRIESEL MARIE E MRS 338-4813
23 GRUNINGER ROBT P 336-8456
24 OLSTEAD ART W 338-5285
25 ROSEN SYLVIA W MRS 339-2629
26 MULLETT KEITH R 336-8137
27 VACANT
28 MORRIS EVELYN M MRS 338-2859
29 RICHARDSON W P
30 WATKINS PAUL R 335-5938
31 PETROU PHILIP P
32 COSIO MANUEL 338-3966
33 GLEASON DONALD S 335-7407
34 RES ZANNIS 338-6563
35 SHAFER REX 338-0915
36 BACHMANN SIGRID 338-0862

---RIVERSIDE AV -FROM S 4TH ST
SOUTHEAST 110
---ZIP CODE 55404
1808 VACANT
1812 VACANT
1821 VACANT
VACANT UPPER
1822 TRIANGLE ENTERPRISES INC
TAVEN 332-9780

1823 VACANT
1825 APARTMENTS
1 CHINSHIAN SUN 339-5179
2 NG NORMAN Y 339-6717
3 JUANG CHYONG-YAU 336-3990
4 VACANT
1827 MAMA ROSA ITALIAN
RESTAURANT 338-9453
1829 VIKING BAR 333-9751
VACANT
---19TH AV S INTERSECTS
1900 CATHERINE APARTMENTS
28 DUNCAN JAMES W 339-3134
1 GIBSON KATH L 339-5131
2 VACANT

3 ANDERSON IRENE L MRS
338-8368
4 MONRAD PHILIP C 335-2504
5 SWANSON LAURA V MRS
336-3093
6 ONKKA PAUL W 338-7981
7 PEITSO ROBT L 338-7169
8 HAYNES GEO
STREET CONTINUED
1902 VACANT
1904 GIANT WASH LAUNDRY
332-9426

CHARLES APARTMENTS
BSMT SLOUGHT IRVING
1 GEBER GAYLE M 335-0835
2 BLACK MARY M
3 DEMUTH CAROL 338-4285
4 NELSON JAKE
1919 MEDVECS SERVICE STATION
332-9433

---20TH AV S INTERSECTS
---S 5TH ST INTERSECTS
2000 HYDRAULIC SPECIALTY CO
PUMP REPR 338-7641
2001 TRINITY LUTHERAN
CONGREGATION 333-2561
UNIVERSITY OF MINN STATE
ORGANIZATION SERV
373-3170
2015 HOUSE OF HORSEPOWER
MOTORCYCLES 339-1294

2021 HALLGREN FRANK W
2029 DON'S TAVERN 338-9976
2031 BALDWIN LYDIA W
2013 OLSON LAWANA M 332-5990
2037 HOFF & HOFF OFFSET
PRINTERS 335-0514
---21ST AV S INTERSECTS
2100 JUDD JOYCE M 336-5271
2102 VACANT
2112 VACANT
2122 FAMILY PROBLEM SOLVING
LABY (U OF M) 373-0116
SMALL GROUP RESEARCH LABY
(U OF M) 373-0177

---S 6TH ST INTERSECTS
2124 HENDLER
203 ALESHMERNI MANSOOR
335-5324
2127 OSMAN GARY R 335-5426
2129 VACANT
---22D AV S INTERSECTS
2200 VACANT 263
2201 VACANT
2204 VACANT
2205 VACANT
2206 RIVERSIDE SELF SERVICE
LAUNDRY

2206K APARTMENTS
1 NELSON K L 333-5637
2 SUSS AN M 335-3346
3 PEDERSEN MARY A 333-5637
LOWER VACANT
2207 STESIN ALAN J 339-5058
DORSTAD ROGER R 338-1414
2208 FAIRVIEW HOSPITAL (PK LDT)
2217 NICHOLS DONALD H 336-4484
VOLZ PAULETTA A 338-4592
2221 VACANT
2223 JOHNSON MARIE B MRS
335-1955
2227 HENKE RICHD 336-4518
2231 VACANT
2233 VACANT

---S 7TH ST INTERSECTS
---23D AV S INTERSECTS
---ZIP CODE 55406
2311 VACANT
WEISS DAVID W
2405 ROY S BRAGE 332-9021
2406 SAINT MARY'S HOSPITAL
(STGE)
2409 AUGSBURG COLLEGE (MTC
DEPT)
2411 AUGSBURG COLLEGE (MTC
DEPT)
2413 AUGSBURG COLLEGE (MTC
DEPT)
2415 AUGSBURG COLLEGE LITTLE
THEATRE 332-5181

2429 VACANT
2431 PRESTON FRANK S JR PHYS
336-6368
2433 RIVERSIDE FLORISTS
---S 8TH ST INTERSECTS
---25TH AV S INTERSECTS
2500 PIONEER'S CORNER GIFT &
GREENING CARD SHOP
332-9385
SHAKER'S BARBER SHOP
SHAKER WM 332-7656
2506 DEPT OF FIELD COM
PHOTOGS 339-6061
2508 KUNZ EUG S COML ARTIST
2510 RIVERSIDE FOOD MARKET
339-3749

APARTMENTS
1 WOODRIDGE KURLISS
2 HALE MARY ANN
3 SUSS ANITA
2517 FAIRMAR INC GAS STA
333-9390
---26TH AV S INTERSECTS
---27TH S INTERSECTS
---S 9TH ST INTERSECTS
---28TH AV S INTERSECTS
2817 LENA'S STANDARD SERVICE
332-9369
---29TH AV S INTERSECTS
---FRANKLIN AV E INTERSECTS

---RIVERVIEW RD -FROM E 53D ST
SOUTH, 1 EAST OF HIWATHA AV 134
---ZIP CODE 55417
5303 PULLESSON THOS K
5307 HOIVIK BERENT J 729-8992
5311 KRATZ ALVIN 721-2121
5315 EVANS CLIFFORD 722-5811
5319 SKARSTEN HARRY H
724-5845
5323 SEEFELDT WILBERT T REV
5324 JOHNSON FRANCES M MRS
724-9412

5327 EHRHARDT W B 729-9577
5331 HERKAL VIRGINIA M MRS
722-3803
5332 PAPA GEZA 722-3215
5335 FOSLIN RICHD A 729-4212
5336 WINT 724-7304
5339 LARSON ROBT P 721-1554
5340 LARSON BRONS 729-7664
5343 EDEN OLE A 722-1372
5344 O'BRIEN EUG C 729-7754
5347 ANDERSON HELEN MRS
724-7255
5348 OLSON VICTOR E 724-0989
5351 WOOD OTTO L 729-1905
5352 HURSH PHILIP W 722-5056
5355 HILGEMAN PHILIP H
724-2778
5356 CRAIGHEAD HERMAN W
724-4685
5359 KNUDSEN MARTHA I MRS
729-3777

5360 CUERNMAN BART S 729-5985
5363 STANSBURY CLARICE J MRS
729-1016
5364 EDLIEE THERESA MRS
724-1694
5368 BENSON GEO A 729-8959
5372 BJERKNESSE BENJ F
724-2976
5376 SOLVIE CLAIRE G MRS
724-2976
5380 BLAKE HAROLD E 724-3432
5384 SMITH JAMES W 724-7497
---CITY LIMITS

---ZIP CODE 55410
2505 GERDE MABEL F MRS
922-7367
2506 HALLBERG THEO G 926-9472
2507 HANDEL ELMER 922-2348
2510 GRISWOLD RUTH J MRS
926-0914
2514 RICHARDS MYRTLE R MRS
922-1113
2518 HALL CLIFFORD C 922-5282
2600 HADLEY CHARLES D JR
722-9216
2601 MOORE MORIS E 922-5756
2605 BULEN WILLIS L 922-6126
2606 ELLER ROGER F
2609 GOULET DIANE M MRS
922-1453
2610 GIBBON ALEX M 926-8703
2612 LUNDOQUIST AMOS REV
922-1453
2615 NEWQUIST LEONARD C
922-2444
2616 HEINSCH MARGT L 922-1032
2619 SPANNAUS WARREN R
926-5597
2620 NELSON ROLAND W 922-4702
2623 NO RETURN
2624 KAMRIM JAMES A JR 920-3062
2701 HORNER JAMES W JR
922-9456
2705 GARNER KAREN MRS
922-3315
2710 SCHILLING WALTER G
926-8291
2711 HANSING JAMES 920-0228
2714 SYKORAV JAVEN F 926-7743
2715 BANCROFT KENNETH M
926-1405

---UPTON AV S INTERSECTS
2800 KANDOR LYDIA S MRS
926-3281
2801 BELANGER DOUGLAS E
922-3145
2804 MELDOFF KEITH L 927-9055
2807 KANDOR LYDIA S MRS
926-5296
2809 LYNCH ROBT L 922-2427
2810 KUNITZ GED R 922-3154
2812 BURCH ADRIAN H 922-8135
2813 POTVIN AGNES C MRS
926-7032
2816 BERRY JOHN R
2817 LENDER WM H 926-0189
2820 SPERLING HESTER B MRS
927-6247
2823 WIMLEY MARTHA MRS
926-9213
2824 GOWER RALPH W 926-3689
2827 NO RETURN
---VINCENT AV S INTERSECTS

---17TH AV SE INTERSECTS
113
RCLLINS AV -FROM 929 14TH AV SE
EAST, 2 SOUTH OF COMD AV SE
---ZIP CODE 55414
1420 HARRIS BOAT & TOWING INC
331-5244
---15TH AV SE INTERSECTS
1505 RANEY CHARLIE G 331-1958
1509 FREITAG DEAN R 331-5385
1519 JOHNSON VALEPIE D 378-0752
1523 HIRD ETHEL MRS
926-5112
1716 STANDAAL ROGER J 331-1501
1717 GAFFNEY JAMES H 331-5562
1720 OLSON PAUL L 331-1030
1721 LANGRISH H 331-3772
1724 APARTMENTS
1 WILSON ALICE O 331-2429
2 HAMMERSTRON EMMA J MRS
331-9403
3 MEAD PHILIP H 331-2663
4 SAM JAVED S 331-4427
5 STEUER ROBT R 331-4815
6 THOMPSON MARY K 331-8322
7 BERGEN PORTER CO PLMB
CONTRS 333-1515
1732 APARTMENTS
1 ANDERSON CRAIG J 331-8357
2 MEYER C J
3 HIRAI DI S FUMIHISA
378-1322
4 KRINKE BARBARA L 331-7900
5 BOSWORTH KENNETH C
378-0695
6 MALONEY C R 331-2946
7 BETTERMAN LARRY L
378-0837

ROOSEVELT ST NE -FROM NE
TRAFFIC ST NORTH, 1 EAST OF
NE STINSON BLVD
---ZIP CODE 55413
325 VASCO SPRINKLER CO FIRE
331-9427
VIKING AUTOMATIC SPRINKLER
CO INSTALL SPRINKLER
SYSTEMS 331-9427
422 GOPHER PATTERN WORKS INC
331-5555
---NE KENNEDY ST INTERSECTS
---(NOT OPENED BETWEEN NE
KENNEDY &
---E 22D AV NE)

---ZIP CODE 55418 184
---22D AV NE INTERSECTS
2200 KUBES DONALD 781-1382
2201 MALEK JAMES R 789-2146
2206 GALLAGHER HUGH J
781-6206
2207 BINTNER MINNIE J MRS
781-7549
2210 ZACCARI NICK 781-8694
2211 ORODS DAVID G 781-4735
2214 NO RETURN
2215 LIBERKOWSKI THEO E JR
789-0190
2218 VOLNA WM M 781-4273
2219 LARSON DOUGLAS E
781-4549
2222 COLEMAN JOHN G 789-0756
2223 OSLAN JAMES V 789-3659
2227 PLAGMAN GEO F 789-6015
2228 OPSAHL MARY E MRS
789-1228

2231 GARDIN ROGER F
2232 KUCHARSKI BERNARD T
789-5722
2235 HARSTRIT JEROME C
789-6278
2236 SWIERKOWSKI STANLEY W
789-0678
2239 HOLM W O 789-7851
2240 DEE DENIS 789-2335
2243 GERBER PHILIP 789-1736
---30 AV NE INTERSECTS
2300 RIDGE WM G 789-4570
2301 DASCALOS JAMES M
789-9359
2306 DIEDERICK FRED B 789-5663
2307 BUCHWALD LIDWINA S MRS
781-7540
2310 HOLSTEN ROY W 781-9369
2311 SHERIDAN JUSSON D
781-8731
2314 BALSTAD GERHARD O
789-7153
2315 RIMMICH CHESTER L
789-2028
2318 JACOBSON DAVID C
781-2233
2319 GRIMSHAW ULMONT L
789-7010
2323 RZESUTKE HELEN M MRS
781-1519
2324 BORGSTROM DAVID E
789-7997
2327 NELSON EUNICE J 789-5170
2330 SWANSON CARL F 789-7003
2331 ADRACHT OUTDOOR
ADVERTISING CO 781-1896
HAUTALA PAUL H 781-1896
2334 HESJAK THEO J 789-0091
2335 BUDNICK HENRY A 781-7733
2338 KINGEN DONALD C 789-5148
2339 GALLUS NORMAN O 789-4431
VANDERGRIFT LINDA 789-4242
2342 AHLQUIST DONALD T
781-8453
2343 KARA JOSEPH A 789-8328
2346 SHUDA FRANK W JR
789-0518
---LOWRY AV NE INTERSECTS

---ZIP CODE 55419 70
ROSLYN PL -FROM 5925 CLINTON AV
EAST
---ZIP CODE 55419
336 APSLEY MAZEL M
337 DE FIELD STEPH L 866-2749
340 LINDBERG CLARA M MRS
866-4128
343 OLSON NORMAN C 866-6663
346 KEHR JEROME G 866-9258
347 BUTTSHA WERNON L
866-5112
352 JONES ROGER J 866-2242
353 JOHNSON RICHD E 866-7947
358 HARLIN RUTH J MRS
866-5112
364 PETERSEN EFFIE A 866-8840
370 BRUNET LUCIAN L 869-8729
375 WILLIAMS ORVILLE E
866-8320
380 LIEBERG CARVEL L 866-9132
388 NOONAN FLORENCE J MRS
869-5544
---CHESTER ST INTERSECTS

---ZIP CODE 55405 15
ROYALSTON AV -FROM GLENWOOD AV
AND N 12TH NORTHWEST
---ZIP CODE 55405 2
MICO INDEPENDENT OIL 333-9189
7 VACANT
201 VACANT
---HOLDEN ST INTERSECTS
301 FAMOUS FOODS BROKERS
338-3831
315 BELDEN PORTER CO PLMB
CONTRS 333-1515
401 GOPHER NEWS CO 336-4611
SAINT MARIES GOPHER NEWS
CO SUBSCRIPTION AGCY
336-4611
415 K & P MFG CO LUBRICATING
EQUIP 336-5811
---HIGHLAND AV BEGINS
---5TH AV N INTERSECTS
501 VACANT

HIAWATHA AVE 1970

326

HENNEPIN AV--Contd  
Hennepin Aristocrat Apts--Contd

209 LANOON JOYCE A 823-2573  
210 LAWBERT SHERIDAN 822-269  
301 JAMISON PAUL A 825-6139  
302 PALLEY JOHN  
303 VACANT  
304 GOLONER JACK M 823-2709  
305 CHRISTOFFERSON LINDA  
306 THOMPSON ARLYS  
307 KNICKREHN MARVIN O 822-9494  
308 MARTIN MICHELLE S  
309 PEYTRDSKA WM D 825-5336  
310 STENE BARBARA A 823-1330  
3335 NJ RETURN  
3336 WESTAFER REALTY 827-3865  
3338 WILLIAMS JOE CATERING CO INC 827-4631  
3341 APARTMENTS  
1 SLOMBY EDWIN A 822-5639  
2 PRIETE LARRY L 824-6586  
3 GEVING GEO 822-0041  
4 WEGLEY BONNIE L MRS 825-2151  
3342 BATES BOB CO CARPET CLN 825-7425  
3344 BECKSTROM EMIL J CJ INT DEC 827-3739  
3345 TENWOLD SUSIE MRS 825-0956  
CAMPBELL NETTIE MRS 825-1258  
3346 VITTON REALTY CO 822-5120  
JENSEN JDANN MRS 824-8334  
MARX MELVIN F 822-9817  
3348 VON'S SUPERETTE 822-8919  
---W 34TH ST INTERSECTS  
3400 ARLINGTON EDW N  
3401 FINLEY STELLA MRS 822-2917  
3404 FUGALA HERBERT 822-8589  
3405 GONYEA WM G 824-6602  
3408 LAUGHLIN CLAYTON A 823-2197  
3411 APARTMENTS  
1 CUTLER MARGT M 822-4865  
3 BISHOP ELEANOR A 824-4498  
5 LAGGES HELEN B MRS 825-7801  
7 RISTROM GEO F 822-6981  
9 PALLA EMMA M 822-8064  
10 FARNHAM CATH 823-2922  
11 MAUNSELL FRANCES 827-1851  
13 KELLEY MICHL E 824-6721  
3412 VACANT  
3413 APARTMENTS  
2 PERRAULT ROBT E 827-1316  
4 SIMONICH SOPHIE J 827-1845  
6 VACANT  
8 REML ESTHER A MRS 824-6038  
10 FARNHAM KATH M 823-2922  
12 LARSON HAZEL R 825-8526  
3416 SCHLAFFER HARWOOD H 825-5777  
3417 YOUNG JOHN J 824-1890  
3420 MC KINNEY LUTHER C 824-3840  
3421 APARTMENTS  
1 SWANSON MAE C MRS 825-2295  
3 NO RETURN  
5 VACANT  
3423 APARTMENTS  
2 GIEDRAS PETER W 825-8797  
4 POETSCH JANICE M 824-3059  
5 SNOBCK JANICE E 824-3059  
3424 LARSON VERNIE W 825-8519  
ARNOTT RUTH E MRS 823-3446  
3425 BOYES MARGT R MRS 824-6914  
3428 MACILLAN ELIZ MRS 825-6114  
RIFKIN SAML 824-7625  
3429 SPERDOPOULOS MARY MRS 825-9764  
3432 PETERSON ARTH W 825-9764  
3435 TOBERMAN HALEY J 822-7366  
3436 EASTERDAY RUTH J 823-6443  
JOHNSON MYRON W 825-7423  
3439 ROBINSON KENNETH T 825-1631  
HALL ANDRE H 824-7439  
3440 WEBER GENE D 827-1180  
CRAWHALL ELIZ MRS 823-1881  
3443 QUINN ESTHER E MRS 825-1737  
3444 STEINMETZ JENNIE C 827-2921  
Dwyer Bonnie MRS 825-2921  
3445 MC GINNIE JACK L NIELSON NORMA M MRS 827-2165  
3448 GELLMAN HARRY S 824-7548  
DAHLSTEN PAUL L 823-7463  
3449 MC CARTHY THOS G III 822-0630  
3453 LANE CORNEILUS R 824-4503  
---W 35TH ST INTERSECTS  
3501 CORONET CO STORM DOORS AND WINDOWS 827-5551  
GARLDCK-FRENCH ROOFING CO CONTR 823-8266  
3505 VACANT  
3513 APARTMENTS  
201 EDMARK JEAN N  
202 JACOBSON BETTY L 822-0379  
203 VACANT  
204 SCHUBERT GERALDINE R 822-4763  
205 WITMER JOHN M 824-9826  
3514 APARTMENTS  
1 HANSON RONALD D 825-7689  
3 WILLIAMS PATRICIA A 824-0429  
4 KEEGAN RJBT J 824-6552  
101 SCHELLBERG JOHN G 824-9992  
102 NEWSOME BARBARA J MRS 825-4868  
103 DMAN DAL G  
104 TIEGS M J

201 CROXFORD RUTH E 824-4250  
202 MARSH GEO N 822-2602  
203 HOFFMAN JOPLIEN P 825-9922  
204 CALLAS VIOLET G MRS 825-2686  
3515 ELLIOTT BUSINESS MACH (BR) SLS 6 53V 827-2583  
3517 BUILDERS SUPPLY CO GENL CONTR 827-5831  
ROOS GUST INC PAINTING CONTR 827-4731  
VIKING PUMP CO 827-5759  
3523 SAUME KENNETH L 825-0268  
3524 CITY CIV DEFENSE TRAINING CENTER 823-5204  
COUNTY CIV DEFENSE DISASTER PLANNING 824-0807  
3525 LANGE SANDRA J 827-2721  
3529 BOGLE LEE M CD MONUMENTAL WK 825-4471  
3539 ATTORNEY'S NATIONAL CLEARING HOUSE CO THE 824-0525  
3544 YOUNG'S FLOWERS OF DIST INCTION 827-3653  
3553 CITY OF MINNEAPOLIS EDUCATION ASSN TCMRS ASSN 827-4081  
HENNEPIN DIVISION JF THE MINNESOTA EDUCATION ASSN TCMRS ASSN 827-4081  
CITY OF MINNEAPOLIS EDUCATION ASSN CREDIT UNION 827-4081  
---W 36TH ST INTERSECTS  
3600 LAKEWOOD CEMETERY ASSN INC 822-2171  
HIAWATHA AV -FROM S 8TH ST AND 15TH AV S SOUTHEAST, 1 WEST OF CEDAR AV  
---ZIP CODE 55404  
1907 KEELOX MFG CO (PANAMA BEAVER DIV) CARBON PAPER MFRS 333-7125  
1915 MAILADVERTISING INC LETTER SHOP 338-5687  
MORGAN PRINTING CO 338-5687  
---E 24TH ST INTERSECTS 94  
2420 VACANT  
2424 VACANT  
2523 LEAD SUPPLIES INC (WHSE)  
---E 25 1/2 ST ENDS  
2542 VACANT  
---E 26TH ST INTERSECTS 165  
---ZIP CODE 55407  
---E 26TH ST INTERSECTS YD  
2600 MIL RD (SOUTHTOWN YD) 724-3702  
---C M ST P & R Y CROSSSES  
---E 29TH ST INTERSECTS 96  
2901 LEDER BROTHER SCRAP IRON & METAL CO JUNK DLR 721-6244  
---E LAKE ST INTERSECTS  
---E 31ST ST INTERSECTS 203  
---Z182CODE 55406  
3105 GYPSUM GEORGE BLDG MATLS 729-2309  
3109 ACCENT PROMOTIONS ADV DIST R 721-7125  
NAEVE ANGELINE MRS  
3117 B F AGENCY ADV AGCY 722-2254  
3121 ECONOMY FURNITURE CO INC 721-5347  
3142 PROKSCH CHARLES R 721-4032  
3146 DAIRY QUEEN N S P CD (SUB STA)  
3161 ACME FOUNDRY CO INC 721-6667  
---E 32D ST INTERSECTS  
3240 GENERAL PARTS CO (BR) WHOL AUTO PARTS 721-5054  
3245 DONALDSON'S (DISTR CENTER) 721-6221  
---E 33D ST INTERSECTS 235  
---26TH AV S INTERSECTS  
3301 IMPERIAL REFINERIES OF MINNESOTA GAS STA 724-9988  
3324 ELECTRAMATIC INC ELECTRONIC EQUIP MFRS 721-5074  
3355 CAPP HOMES INC BLDG CONTRS 721-5581  
---E 34TH ST INTERSECTS  
3401 NATIONAL VITAMIN PRODUCTS CO ANIMAL FEEDS MFRS 722-6681  
STANCHFIELD A L INC WHOL FEED 721-2454  
3420 HOLLYWOOD DRIVE IN RESTR 724-0217  
---27TH AV S INTERSECTS  
---E 35TH ST INTERSECTS  
3501 APCHER-DANIELS-MIDLAND CO (ELEV) 729-8381  
---28TH AV S INTERSECTS 213  
---E 36TH ST INTERSECTS  
3601 DONALDSON'S (WHSE)  
3616 VACANT  
3636 VACANT  
3640 VACANT  
---E 37TH ST INTERSECTS  
3745 ARCHER-DANIELS-MIDLAND CO (MILL) 729-2302  
---E 36TH ST INTERSECTS 126  
3815 WALSTON PURINA CO =EED MFRS 722-9581

---E 39TH ST INTERSECTS  
---31ST AV S INTERSECTS  
3915 MUHN A MANUFACTURING CO MACHY MFRS 729-1515  
3936 HISS GRILL INC 729-9697  
3940 VACANT  
3950 MITCHELL-LIPTAK LABORATORIES INC DRUG MFRS 721-6288  
3961 N S P CD (SUB STA)  
---E 40TH ST INTERSECTS  
4001 BELLIS PAPER CO WHJL 721-4885  
BELKIN JOSEPH ACCT 721-6689  
4041 CENTRAL CONTAINER CORP CORRUGATED BOX MFRS 721-6224  
4049 CRONSTRONS MFG INC (WHSE)  
---E 41ST ST INTERSECTS  
4106 LANDSCAPING SERVICES 729-4057  
4121 MC DONALD'S RESTR 729-4417  
---33D AV S INTERSECTS  
4130 CENTRAL EQUIPMENT CO CONSTN EQUIP 721-2434  
INDUSTRIAL & TRUCK PARTS INC 722-6607  
4151 CENTRAL EQUIP CO (STGE)  
4155 VACANT  
4163 REAR-A-TRAILER SYSTEM 822-2184  
---E 42D ST INTERSECTS  
4201 FLANERY BROS MOBIL SERVICE 729-9805  
4202 KERKON RODNEY L 721-1488  
4210 WILKINSON ROY H  
4225 CRONSTRONS MFG INC MTL  
4251 CHARLES A & W DRIVE IN 729-3694  
---E 43D ST INTERSECTS 130  
4325 PRINTING INC COML PRNTRS 722-6655  
---E 44TH ST INTERSECTS  
4411 OLSON EQUIPMENT CO CONTR MFRS 333-7834  
4439 SEVEN UP BOTTLING CO INC (ADV DEPT)  
4443 SEVEN UP BOTTLING CO INC ENDING DEPT  
4447 VACANT  
4451 VACANT  
---E 45TH ST INTERSECTS  
4501 MILSCO ENGINEERING OSTR LWN SPRINKLER&FOUNTAIN SUP 724-3655  
4525 FULLER BRUSH CO THE 721-4483  
4539 BRISSMAN-KENNEDY INC JAN SUP 722-1641  
4547 FROSTMAN SUPER MARKET 721-3090  
P & A BAKERY RET 729-4939  
---E 46TH ST INTERSECTS  
4601 MC NEW-NELSON STANDARO SERVICE STATION 724-9943  
4641 CAPP HOMES INC 721-5581  
---E 47TH ST INTERSECTS  
4719 PARKWAY SERVICE INC HOTEL 729-8314  
4734 PEARSON'S PAUL DINER & DRIVE IN 722-7013  
4757 PARKWAY MOTDR HOTEL 729-8314  
PARKWAY RESTAURANT 132  
724-4683  
---NAWADAMA BLVD INTERSECTS  
---E MINNEAPOLIS PKWY INTERSECTS  
---I CODE 55417  
---E 49TH ST INTERSECTS  
4912 ANDERSON BERTHA MRS 521-4351  
4916 BEAVER MARY O 722-7744  
4918 BULSER CHRISTIAN E 825-9764  
4920 GERDIN ELMER 722-6258  
4922 MC GUIRE D W 722-4225  
WIGH JAC B 825-9764  
4926 FORDLAND VERNON L 722-1240  
4930 HELICK FRANK 825-3345  
4934 HANAGAN DIANNE 825-7984  
---E 50TH ST INTERSECTS  
5000 JOHNNIE'S GULF SERVICE 729-0740  
502B WOODRUVEN G 522-1734  
5040 BOVEN HARVEY H 824-6658  
5046 FRAZWA S W  
5050 HOLMBERG VERNON D 729-6872  
5106 SORENSEN STANLEY C 724-4373  
5108 KRBBRECHAK JEAN A 5110 NO RETURN  
5112 HOWANEC MARY K 724-0108  
5114 SAUNDERS MAVIS L MRS 722-4211  
---E 51ST ST INTERSECTS  
5120 NEW G Y 729-7273  
5122 LEONARD DAVID A 729-4539  
5136 APARTMENTS  
1 FREDJANI FRANK G 729-1969  
2 FORD R H 721-4246  
3 VACANT  
4 SUTFIN VANCE E 724-0456  
5 ORICK WM E 722-6731  
6 VACANT  
5140 ACCUTT LEWIS E 824-0209  
5152 ASSOCIATED AIR FREIGHT 721-6395  
---E 52ST ENDS 134  
---E 53D ST INTERSECTS  
5300 BACKMAN KLEMENS A 722-5016  
5301 GRAFTAAS HAZEL I MRS 722-5016  
5306 ABRAHMSON JAMES A 729-4129  
5309 FISHER WM F 724-8481  
5310 SANDOR A 729-9570  
5314 STICKFORD DELOPES R 729-1306  
5315 MATSON GARY S 722-4292  
STANGE ANDREW J 722-4292  
5320 SJNDIN AMY E MRS 724-7310

5321 WHEELER WILMA MRS 822-1806  
5324 WESTBY LUCILLE C MRS 822-1806  
5325 SAULSEN HARRY A 722-1270  
5328 BARRERS ARTH F 722-4344  
5329 YOUSO WALTER P 724-7723  
5332 ESTES SHELTON 724-2387  
5333 ANDERSON EDWIN E 722-5453  
5336 GOAR LOUIS E JR 724-3595  
5339 BECK MARY A MRS 724-4269  
5340 SEEGER WM L 724-2109  
5343 DUPONT CARNET D 722-3605  
5344 HULLERMAN CATH M 724-8364  
5347 WORKMAN RUTH F MRS 724-2395  
5348 DREW RONALD J 724-6254  
5350 RUNDGREN RICH D 721-7268  
5351 BONIN FLORENCE M MRS 724-2515  
---E 54TH ST INTERSECTS  
HIGH ST -FROM HENNEPIN AV EAST, 3 NORTH OF WASHINGTON AV S  
---ZIP CODE 55401  
---2D AV S INTERSECTS  
HIGHLAND PL -FROM BORDER AV EAST  
---ZIP CODE 55421  
HIGHVIEW PL -FROM PROSPECT AV SOUTH IN A CIR BETWEEN GLADSTONE AV AND HARRIET AV  
---ZIP CODE 53419  
27 QUEST CHARLES F 824-0992  
35 KUNIAN MYRON D 823-8876  
HILLSIDE AV -FROM IRVING AV N AND 21ST AV N NORTHWEST, 1 NORTH OF W BROADWAY ST  
---ZIP CODE 55411  
1509 CARY JOHN P 825-2511  
1513 JOHNSON RICHARD FINCH BERNARD 529-9420  
1514 MARTINSON DOROTHY SHERARD GRACE MRS 522-0511  
KLOWITTER OLGA MRS 529-4291  
MOLINE ERICK A 529-1266  
1517 KOVALICK MICHL 521-3456  
1521 ACKERMANN JAMES  
1522 APARTMENTS  
1 CARLING LINDA 522-2570  
2 FLEISCHERSSER MARJORIE L 522-1775  
3 SWANSON CORA M MRS 529-8307  
4 COPUS ERWOOD C 521-0655  
5 PETRANGELO GERALD T 529-4858  
6 SWALTYF  
7 SWALSTROM GERALD J 529-8462  
8 VACANT  
STREET CONTINUED  
1525 BALEW MICHL A 522-5324  
1529 LUCKE WILFORD 521-7431  
1530 WORKING HARRIET E MRS 529-2772  
DORWARD GARY 521-3136  
1533 WHITEFORD ROBT 529-7224  
WADDICK JULIA A MRS 521-4351  
1534 PENIZ JAMES J 529-5471  
1537 FECHTNER EDWIN M 521-7210  
1538 NORTON ROBT E 521-0468  
ANDERSON ARLO E 522-9008  
1541 PETERS ALVIN J 529-7061  
STOFFEL DONALD P 522-7043  
1542 DONDLER JOHN A 529-0766  
1545 ANDERSON ELAINE R 522-5123  
1546 JASPER ADELAIDE M MRS 522-1734  
1547 CUTLER ROBT D 529-4358  
1550 BETLAND CHARLES O 529-2390  
1551 MC DONALD HARRY S 529-2886  
1555 LUNDGREN BURNELL A 522-5611  
1558 STITT SEVERIN V 522-7173  
1559 MC INTOSH JOHN R 529-2886  
1564 NOE RUDOLPH F JR 521-3839  
1565 BREDSON MABEL A MRS 521-5014  
THOMAS KENT A 521-2159  
1600 ROBERTS FREDK 521-6141  
1601 MEYER ELLEN E MRS 522-6340  
1606 PODLASEK EUG R 521-5191  
1607 MC CLELLAN MAY F MRS 521-8034  
MORROW LAVERNE H 521-3074  
1608 SMITH ROY W 522-8845  
1611 DEVERY LAURA M MRS 529-8629  
MERCER DOROTHY A MRS 529-2886  
1613 STABENOW LORRAINE M MRS 521-3422  
LARSON MAYME  
GILMORE GAIL B 529-5704  
1618 GRUMLKE HENRY H 522-3162  
BROWN E WYRTLE 522-2131  
BRAWLEY ELIZ  
1621 BURNS WM F 521-9169  
1622 WORKMAN VERNON O 521-5469  
KRANITZ IONE 529-7073  
CLARENCE ESTHER 522-4673  
BERG KATHY 522-1854  
1626 GORDON ELAINE B MRS 529-2032



E 54TH ST 1966

Sixth and Marquette Member Federal Deposit Insurance Corporation 339-2515 For Savings - Home Loans

HEATING - VENTILATING and AIR CONDITIONING EQUIPMENT Tel. 377-9750

- 53D E-Contd
1600 Forsy Mers M @ 729-1116
1609 Stolt H Josephine Mrs @ 729-6630
Nokomis av intersects
Woodlawn blvd intersects 120
31st av intersects
3100 Smedstad Pearl E Mrs @ 721-1588
3111 Carlson Arlon A @ 722-2481
3114 Almadest Richd @ 729-2849
3115 Shobe John C @ 721-1719
3120 McMillan Donald J @ 724-3005
3121 Utecht Selma M Mrs @ 722-2598
3125 Kampf Douglas W @ 722-8531
3131 Hanson Hazel M Mrs @ 729-4183
Hanson Arth H Roofing Co 729-4183
3135 Vacant
3143 Dam Walter @
32d av intersects
3200 Heese Morte T @ 722-7137
3205 Weinka David A @ 729-0236
3208 Hagen Harold E @ 729-6369
3211 Lawson Isabel Mrs @ 724-1160
3212 Wrayge Roland C
3214 Vacant
3217 Tucker Donald E @ 724-7148
3221 Earl Milton @ 724-7804
3228 Gjesvold Irene M Mrs 722-2828
33d av intersects
3301 Peterson Bert @ 722-1808
3307 Hallanger Arnold @ 722-8921
3315 Flanery Patk W @ 722-2866
3403 Merrick Jos D @ 722-0309
40th and 41st avs intersects
4109 Walling Howard D @ 729-2152
4th av intersects
4900 Friend Edwin L @ 729-9005
4904 Butel Donald E @ 721-1396
4908 Fjellman Milton E @ 724-8962
53D WEST-From Harriet av west, 1 south of Minnehaha plwy
500 Roth Donald L @ 824-3502
501 Troost McClelland @ 827-5078
505 Dytmer Chas C @ 825-8696
506 Chas E @ 827-8882
506 Walsh Matthew A @ 824-3485
512 Mrackch Kenneth J 823-5831
bsmt Vacant
McPherson Wm @ 822-1871
515 Savoie David P @ 822-7391
516 Wexler Sidora Mrs @ 825-8588
518 Nelson Paul C @ 824-3884
520 Moran Jas T @ 824-7487
521 Smith Lucille M Mrs @ 824-7629
524 Long Aurelia M @ 822-8302
Garfield av intersects
600 Neltze Eug C @ 824-8849
615 Kleen Shoppe The cins 824-2088
624 Heinen Co Inc the contr 827-3821
826 M & I Beauty Salon 823-4858
828 Blvd Barber Shop 823-0531
Lyndale av intersects
Lindemann Chas E phys 823-5225
Brettenbacher Robt B phys 823-5225
Strong Douglas J 827-1803
720 Pluk Anthony L 824-9237
724 Pearson Bertel E @ 825-4868
725 Jarzyna John A @ 827-1144
Aldrich av intersects
800 Higwell Roger R @ 825-7927
801 Berggren Wayne
Murphy Marjorie
805 Larkin Lucille M Mrs @ 825-7073
808 Gilbert Eug L @ 824-1620
809 Hansen Alice @ 822-3580
810 Brundage Myrtle H Mrs @ 824-3323
814 Snee Emmet P @ 824-1311
815 Kenney Norbert C @ 824-2351
818 Bruer Josephine M Mrs @ 822-0028
819 McLaughlin David L @ 827-1060
825 Brooks Jay C @ 827-1495
826 Brant av intersects
900 Wisamiller Vernon D @ 825-9877
906 Phipps Guy F @ 824-0505
910 Allen Floyd H @ 822-0973
914 Roth Herman N @ 823-2906
918 Townsend Harry S @ 824-8844
920 Mockenbaump Robt R @ 824-9348
924 Abraham Andree R @ 824-0101
Colfax av intersects

- 1000 Simondet Jerome B @ 824-7212
1001 Langseth Lillie A Mrs @ 822-7823
1007 Melcher Anthony M @ 825-1756
1010 Pauly John W @ 822-4879
Pauly John W Co real est 822-4879
011 Traun Herbert A @ 825-0342
1014 Fitzmaurice W Jas @ 827-1229
1015 Bennton Richd S @ 823-8433
1018 Henschke Mabel Mrs @ 822-8018
1020 LaGrandeur Philip H @ 823-5078
1024 Nordbye Rodger L @ 822-7332
Dupont av intersects
1100 Ore C Milton @ 824-2186
1101 Sutton Marcel @ 824-8564
1108 Nelson Robt K @ 825-7034
1107 Cooley Kenneth W @ 823-3598
1110 Carr Andrew E @ 825-8052
1111 Gallagher Urban V @ 824-8423
1114 Henry Ronald W @ data processing serv
1115 Schumacher Ruth J Mrs @ 823-1586
1118 Johnson Maurice A @ 825-2747
1119 O'Toole Edw M @ 824-7832
1122 Hayward Robt V @ 824-9423
1123 Shelley Maude M Mrs 824-4186
Downing Gerald T 824-1350
Emerson av intersects
1200 Larson Larry D @ 824-7114
1202 Lindahl John R @ 823-8489
1206 Oakes Arth S @ 822-1342
1208 Vest Lee H @ 823-4629
1210 Wellnitz Edw M @ Park Co Realtors 825-4621
1214 Hoffman Milton A @ 825-1104
1215 Durrrell Dorothy J Mrs @ 823-7621
1218 Ross Floyd H @ 823-4438
1219 Nelson Geo A @ 823-3527
1222 Bonnarens Clemens A @ 822-7552
1223 Wheeler Arthur R @ 822-7552
1226 Johnson Duane A @ 824-0295
Fremont av intersects
1300 Schueller Anna L Mrs @ 822-5475
1310 Flynn Leonard T @ mfrs agt 822-9076
1517 Cross Moseley M @ 927-5554
Girard av intersects
Humboldt av intersects
Erving av intersects
Knox av intersects
Logan av intersects
Morgan av intersects
1800 Bunker Martin A @ 920-3410
1905 Vacant
1919 Paquette Lawrence W jr @ 922-4343
2000 Wires Wm H @ 926-0262
Fisher X-Ray Co 926-0262
2005 Vacant
2010 Sjostrom Blanche Mrs @ 926-2491
2014 Madsen Dwight W @ 927-6481
2015 Eliason Ronald M @ 922-9487
2022 Johnson Wallace H @ 928-4942
Newton av intersects
2100 Borgh Clifford G @ contr 822-5154
2102 Nelson Clifford A @ 926-0908
2104 Barker Wm W @ 927-7216
2110 Fontaine Ronald W @ 920-2737
2114 Winkur Melvin H mfrs agt 927-6047
Oliver av intersects
2200 Richards Jas M @ 922-4413
2206 Grouse S Thos @ 926-2281
2212 Farley Harold E @ 926-9551
2215 Olsen Kramer W 926-3370
2217 Rotsch Herbert O @ 926-8133
2218 Adams Josephine V @ 926-5831
2300 Wetmer Archie H @ 922-4338
2309 Brecount Philip A @
2311 Frank Jos L @ 928-9225
2314 Stiegler Farrell S @ 928-1784
2317 Forfar Donald M @ 922-1601
2321 Cole Marjorie L @ 923-8045
2322 Amdahl Douglas K Hon @ 922-2153
Penn av intersects
2400 Vacant
Upton av intersects
2815 Nathanson Jos S @ 926-5448
2818 Rochko William A @ 920-4080
Vincent av intersects
2915 Anderson Alice S Mrs @ Washburn av intersects
2914 Roth Herman N @ 823-2906
York av intersects
Zenith av intersects
Abbott av intersects
Beard av intersects

- Chowen av intersects
Drew av intersects
3712 Cundy Ruth E Mrs @ 926-9944
Erving av intersects
France av intersects
54TH EAST-From 5341 Nicollet av east
17 Keller Myrtle A 824-2922
19 Johnson Adeline V 822-8338
21 Rusch Andrey C Mrs 824-2861
23 Payne Frances P 827-2385
25 Mosher Pearl Mrs 824-7820
27 Serrill Marie E 824-4719
Karmel apt
1 Stephenson Blanche Mrs 822-7735
2 Selin Paul M @ 825-0255
3 Peterson Gunnar W 823-4754
4 Birder Cecil 824-1335
5 Vacant
6 Bogle LaVerne E Mrs 824-0314
7 Cota C Margt Mrs 822-3527
8 Anderson Lydia E Mrs 825-0588
9 Knudson Grace 822-2273
10 Tornell Hanna Mrs 822-2498
11 Rechygl Emma K Mrs 827-4264
12 Gustafson Esther
13 Wagner Erna M Mrs 825-9670
14 Jobe Joyce L 823-9908
15 Shores John L dentist 824-4211
16 Kvigns Olga E Mrs 822-1476
1st av intersects
101 Smith Jackson E Rev 825-9841
Stevens av intersects
2d and 3d avs intersects
Clinton av intersects
4th intersects
Portland av intersects
824 Kylio Jerome E @ 825-1317
Chicago av intersects
740 Edgewater Beauty Shop 823-6626
742 Fried Louis A phys 822-9632
811 Showed John L dentist 824-4211
Schroeder Roger K dentist 824-8957
Elliot av intersects
10th to 12th av intersects
1201 Burlington Floyd A @ 823-2288
1207 Dierke Richd C @ 822-3364
1215 Allin Willard S Rev 822-3810
1232 Hale Nathan Sch 827-4689
1233 Welner Henry J @ 824-2869
13th av intersects
1307 Bodien Gordon E @ 822-2758
1315 Klein Danl J @ 824-7336
1323 Gravem Paul L @ 823-6328
14th av intersects
1400 Compton Marie M Mrs @ 824-5570
1408 No Return
15th av intersects
Bloomington av intersects
1526 Peterson Robt L @ 722-4632
1530 Allen Elton L @ 729-7634
Sorenson Nora E Mrs 722-1815
1534 Ocean Edw R @ 721-3892
1538 Goodrich Harry L @ 729-1221
1542 Skurdalsvold Marge @ 722-2102
Woodlawn blvd intersects
2705 Peterson Russell H @ 721-3240
30th av intersects
Nokomis av intersects
3100 Fuehrer Rachel E Mrs @ 724-0194
3106 Fuehrer Odella M Mrs @ 724-8070
3112 Dale Robt C @ 722-3164
3118 Strom Richd C @ 722-2395
3122 Marinus Thos A @ 722-8116
3130 Running Stone O @ 722-0695
3210 Wellhausen Harold E @ 729-7882
3218 Lee Gordon E @ 729-1409
3300 Schave Ivan H @ 722-8611
3306 Schulstad Albert E @ 722-7511
3310 Dupont Shirley Mrs @ 724-3484
3318 Airport Shoe Shop
3320 Airport Cins 724-2928
3321 Jack's Airport Barber Shop
3324 Waller Elsie L Mrs 721-4665
34th av intersects
3405 Kolb Ronald C 724-8925
3411 Paulson Geo A @ 724-9352
3417 Tomford Raymond M 724-4116
3421 Kolb Clinton C @ 722-2095
Master Tank Serv 722-2095
3425 Powers Marion Mrs @ 722-8062
35th av intersects
3501 McKinley Doris I Mrs @ 729-6192
3505 Karos Donald M @ 721-1586
3508 Anderson Erwin C @ 729-8629
3517 Welssnburger John H @ 724-1938

- 3521 Noble Frances Mrs @ 729-5570
3525 Ness John H @ 729-0748
3527 Vitins Karlis @ 724-4693
36th av intersects
3601 Mayland Edmund R @ 722-7412
3607 Strickstock Markus J @ 729-8856
3611 Syversen Sigurd N @ 729-5556
3615 Hardy Horace E @ 724-2868
3617 Jacobsen Carl E @ 722-8239
3619 Born Paul R @ 724-2517
37th av intersects
3701 Laskey Anthony P @ 722-8041
3705 Denisjuk Nikolai 721-5400
3707 Espersen Geo R @ 724-8541
3708 Padgett Chas H @ 721-1043
3715 Cross Jerry E @ 722-2925
3723 Moritz Harvey @ 729-6882
3728 Chilton Donovan C 724-4615
Sally's Dairy Store 724-4615
38th av intersects
3811 Vacant
3815 Anderson Walter F @ 724-9437
3815 Anderson Donald T piano tuner
3817 Anderson Marie L Mrs @ 724-0113
3821 Christopherson Kenneth L @ 722-8231
39th av intersects
3901 Ray's Sharp-All Serv lawn mower 722-6929
Witmier Raymond J @ 722-6928
3903 Berger Victor A @ 721-5815
3907 Berg Sigurd I @ 722-9406
3911 Beach C Kenneth @ 724-8847
3921 Almqvist Virgil L @ 722-0101
3925 Trute Wm H 724-4480
40th av intersects
4001 Frondell Leonard C 722-1206
4005 Johnson David E @ 722-0480
4011 Hodge Golden G @ 721-2093
4017 Forcier Fred G @ 721-2093
4021 Anderson Hugo L @ 722-3235
4025 Pedersen Peter M @ 721-1227
Davidson Per A @ 721-1227
4029 Switlala Roman A @ 724-7380
41st av intersects
4101 Jesme Thos R @ 724-5014
4111 Ball Robt G @ 722-3479
4115 Solte Melvin E @ 729-3571
4118 Muller-German Greta Mrs @ 722-1929
4119 Schroeder Raymond A dentist 722-5111
4120 Christianson Chas R 729-7036
42d av intersects
4200 Vacant
4201 Houser Pharm 721-3371
4203 Hanson Meats 721-6419
4205 Strandy's Mrs Bakery Inc ret 724-6053
4207 Steve's Barber Shop
4209 Ray-Del Radio & TV Serv repr 724-4754
Raisanen Sulo E @ 724-4754
4220 Martin John @ 722-2781
43d av intersects
4301 Vigrestad Hardware 724-8234
4303 Smith's Gift & Confectionery Shop 729-9851
4305 Ken-Marts Washer & Dryer Serv Sis 724-4330
4307 Gene's Barber Shop
4308 Rokke's Tailor Shop 722-1747
4313 Sam's Fairway Food Store 729-2700
44th to 49th avs intersects
4704 Korkowski Joan C @ 721-1415
4812 Holt Lois Mrs 729-0801
50th av intersects
5000 Nelson Edwin G @ 721-3972
5008 Wilcox Robt H @ 724-8344
5012 Loza John @ 722-8344
5016 Love Ray E @ 722-0580
51st av intersects
5100 Beaty Warren H @ 724-0135
5106 Dongoske Leonard @ 722-9934
5110 Boe Robt A @ 721-4087
5114 Westerheim Stanley D @ 724-4086
5118 Larson Ruth J Mrs @ 729-3418
54TH WEST-From Harriet av west
Harriet av intersects
414 Plummer Lucy Mrs @ 822-3930
500 Maley Anna T Mrs @ 824-3775
501 Annunciation Church 824-0278
506 Zepp Mary E @ 822-3794
508 Colbert Paul A Rev 824-0787
510 Curtin Erwin J 822-4701
Curtin Rly 822-4701
520 Hammang Joe @ religious articles 822-0530
524 Carlson Lawrence H @ 824-9447
525 Annunciation Church auditorium 824-7844
Annunciation Sch 823-4394
Garfield av intersects

UNITED PROPERTIES INCORPORATED SALE AND RENTAL OF COMMERCIAL AND INDUSTRIAL PROPERTY 230 HAMM BLDG. TEL. 224-4303

RIVERVIEW RD 1966

Sixth and Marquette Member Federal Deposit Insurance Corporation 339-2515 For Savings - Home Loans

RIVER RD W - Contd

- 2816 Vacant
2818 Randall Wm C 721-4640
2820 Redlund Clinton W 729-0974
2822 Keeley Clem P @ 729-2988
2826 Sigford John W @ 722-8612
2832 Wangenstein Owen H @ 729-3884
2836 Kreevoy Maurice M @ 724-7908
2840 Nelson Clifford M @
2848 Assad Emil J @ 722-1682
2858 Jung Joe W @ 724-6831
2860 Landers Lora 729-1407
2868 Smith Lowery J @ 722-3339
29th ends
2904 Eagle David W @ 724-6152
2916 Meyers Joseph E @ 724-9518
2926 Bjornaraa Dreng @ 722-4903
2936 Fraser Wm K @ 724-4862
2940 Allen Roland L @ 721-5883
2946 Blatherwick Allan A @ 721-1225
2950 Hoppe Eug W @ 721-2809
2956 Meyers Jos @ 722-5114
2962 Bury John E @ 724-8441
2966 Kittelson H Medora 722-8072
2968 Faunce Richd W 729-8011
2972 Carlson Einar C 721-5618
2974 Thiede Warren A 722-5673

Lake ends

- 3010 Skahan M Eulalia Mrs @ Skahan Thos R @ 729-1777
3014 Vacant
3030 Danebo Home for the Aged 729-3317
Nielsen Astrid E Mrs 724-0658
Betak Hans E 724-5503
Hansen Gerda S Mrs 729-9532
Hansen John W 722-4112
Holen Mary 724-3110
Miller Peter 724-3416
Nielsen Astrid E Mrs 724-0658
Peterson Keta 724-3385
Schiermer Clara 721-4601
Johnson Laura Mrs 721-4202

34th intersects

- E 38th intersects
3900 Dowling Sch for Crippled Children 721-6433
4006 Bernstein Irving C @ 721-4006

E 42d intersects

- 4200 Breck School 721-3325

E 43d intersects

- 4330 Sheltering Arms The sch 722-6603

45th ends

- Godfrey rd ends

RIVER TERRACE CT - From 1 south of St Anthony av north

- 1 East River Park Apartments
101 Spriggs Lucile 336-7369
102 Chally Cecil H 336-0896
103 Fang Suen 333-5606
104 Podolske Theo A 333-8587
105 Barrett Inez Mrs 332-1617
106 Pierce James C 333-4753
201 Stone Arth A 335-2643
202 Kaster Robt L 333-6639
203 Hawkins Denise L 335-5859
204 Underhill Ralph 335-8358
205 Johnson Dale L 335-0778
206 Gruber C Louise 332-6977
2 East River Park Apartments
101 Heyman Timothy P
102 Hassen Robt V 338-2331
103 Merry Ora M 336-4951
104 Powell Bonnie 333-4973
105 Tracey Stoner 332-3774
106 Kuha Donald R
201 Muller Noel P 336-4503
202 Crowder Rozelle L Mrs 336-4866
203 Heggerness Harold C 332-1009
204 Weisel Betty E 335-1752
205 Nicholson M Ed 336-6509
206 Poggie John J jr 336-6571
11 East River Park Apartments
101 Brower Leslie F 335-2849
102 Rose Warren R 336-6948
103 Gilbert Barry K 332-5768
104 LaBonte Anton E 335-8464
105 Johnson Robt W 332-4805
106 Kaus Leone E
201 Felizer Joseph H 335-5880
202 Miners Denis R 332-5716
203 Stuhlmann Constance 336-9720
204 Hanson Leland G 335-5945
205 Gruminger Robt F 333-8458
206 Peterson David 336-4986
12 East River Park Apartments
101 Mullens Royce W
102 Kelley Robt 332-7685
103 Thorne Steven G 332-2617

- 104 Cranney Jon R 336-2204
105 Smith Kath H Mrs 339-5237
106 Rogers Linda 336-6655
201 Griffin Wm F 335-7032
202 Arond Naomi 333-1838
203 Bachmann Sigrid A 338-0862
204 Love Finette L Mrs 339-3213
205 Bahnmeyer Richd
206 Schrueth Connie J 333-7975

Street continued

- 21 Bleyle Carl 332-4018
22 Kriesel Marie E Mrs 338-4813
23 Rogstad David K 336-2111
24 Hakim Ali A 333-7320
25 Griffith Carol 332-2073
26 Vidal Ramon 336-9085
27 Argento Dominick 335-5870
28 Gore Annette R Mrs 338-3769
29 Fischer Wm J 338-5795
30 Subarsky Zachariah 336-6186
31 McFee Arth S 333-8431
32 Bull Alvah S 338-5576
33 Hall Harry C 339-2834
34 Hewel Chas A 338-2476
35 Hall A D Mrs 336-1226
36 Torbett David S 338-3527

RIVERSIDE AV - From Cedar av and S 4th southeast

- 1808 Refrigeration Guarantee Corp refrigeration 333-2377
1812 Riverside Liquor Store 335-2007
4th intersects
1821-23 Egeberg's Harley Davidson Sales motorcycles dir 332-3689
1822 Triangle Enterprises Inc tavern 332-9780
1823 Vacant
1825 Apartments
1 Sampson Beverly J
2 Williams Kenneth C 335-5602
3 Vacant
4 Tostenrud Diane
1827 Mama Rosa Italian Restr 338-8453
1829 Viking Bar tavern 333-9751
Wilson Wilbert R 338-2127

10th av intersects

- 1800 Catherine Apartments bsmt Gabrio Joel L
1 Perkins Edna M 332-3687
2 Kelly Laabelle Mrs 335-7320
3 Anderson Victor H
4 Larson Shirley
5 Swanson Melvin J 336-3093
6 Reitz Steph 335-7492
7 Brustuen Peter
8 No Return
1902 Vacant
1904 Giant Wash Lndry 332-9387

Apartments

- 1 Spurgin John
2 Aga James
3 Wright Steven
4 Moore Paul 338-0419
1919 Medvec's Serv Sta gas sta 332-9463
1926 Hollywood Fixture Works Inc whol drapery rods 335-2362
1930 Vacant
1932 Vacant
1934 Midwest Biscuit Co Inc 336-9233

20th av intersects

- 2000 Clutch & U Joint Service mach dirs 339-6417

5th intersects

- 2001 Blesi-Evans Co mfrs agt 339-7019
Snyder Victor A & Co ins adj 333-1555
2015 Swede's Used Cars 336-7211
2021 Hallgren Frank W @
2022 Vacant Lower
2026-28 Andersen Andrew Store gro 332-9384
Davis Brad

Apartments

- 1 Casner Violet I Mrs 335-5296
2 Kritzek Minnie Mrs 339-1504
3 Hoyme Larry T
4 Holte Caroline Mrs 336-0024
2028 Don's Tavern 338-9976
2031 Bylund Robt J
Baldwin Lydia
Brandt Marvin
2037 Hopf & Hoff Offset Printers 335-8513

21st av intersects

- 2100 Judd Joyce M 336-5271
Sorenson Ann M 333-8051
Ansa Call Inc tel answering serv 339-9884
2102 Ansa Call Inc (sub ofc)

- 2112 Sanders Clement H @ 332-2706
2120 Augsburg College (sub ofc)
2122 Augsburg College development ofc 338-0501

6th intersects

- 2124 A & D Hardware 333-5708
2126 Jet-O-Matic Engineering Inc mach 338-0571
2127 Bailey Marilyn D Mrs 336-4293
2129 Larson's Fairway Gro 336-2994
22d av intersects
2200 Smiley's Point restr 338-2926
Coffee Hse Extempore non profit organization 332-9632

2201 Vacant

- 2204 Vacant
2205 Vacant
2206 Riverside Self Serv Laundry
2206 Abramovitz Lila 338-5718
Carter James J 338-6291
Warrington Jay C 338-4304

2207

- Litz Robt B 332-1680
Orozco Isabel A 336-8788
Vacant Upper Left

2208-10 Fairview Hosp stge

- 2217 Seerheim Adolph 336-0493
Ogumamanam Cletus C 333-8392

2221 Vacant

- 2223 Johnsons Marie B Mrs 335-1955
Shore Cora A Mrs 338-2102
2227 Johannes Terry M 339-4036
2231 Roy's Garage auto repr 332-9021 332-9021

2233 Vacant

7th intersects

- 23d av intersects
2310 Vacant
2311 Nordin Paul E 338-3041
Molder Aug Studio artist

2312 Vacant

- 2405 Teiger's Automatic Trans-mission Serv auto repr 336-8623

2406 StMary's Hosp stge

- 2409 Vacant
2411-13 Vacant
2412 Vacant
2415 Augsburg College Little Theatre 338-4374

2418 Neslund Electric Co The contrs

- 338-2541

2420 Vacant

- 2424 Vacant
2428 Vacant
2427 Bob's Barber Shop
2428 VeNell Lettering Co monograms 336-1082

2429 Hage Alan O Art Studio free lance artist 339-1012

2430 Riverside Cafe 332-9106

No Return

- 2431 Preston Frank S jr phys 336-6368
Bloom Robt P 336-0710
Warrnke Robt E 338-4120

2433 Farmers Ins Group 333-4265

8th intersects

- 2500 Shaker's Barber & Beauty Shop 332-9885
Sally's Gift Shop 333-0938
Shaker Wm @ 332-7656

2501 Vacant

- 2503 No Return
2505 Cruz Carola L Mrs 335-4366
Gleason Margaret L Mrs 336-1940

2506 Les Eleves gift and art shop 339-1317

2507 Vacant Lower

- Vacant Upper
2508 Hendricks Douglas E sculptor
2509 Best-Maid Cookie Co 333-8683
2510 Riverside Food Markets gro 339-3742
Jones Kimble E 332-6608
Stewart Saml 338-4518
Helgerson Sandra

2513 Vacant

- 2515 Welch Marion A 339-5156
2517 Struthers Lewis E 338-2418
2519 Minneapolis Building Repair Co contrs 336-9746

26th av intersects

- 27th av intersects
8th intersects
2701 ABC Antiques & Books 333-1683
Jensen Robt J @ 333-1983
2703 Anderson Pattern Works 335-8067
Andersen Bernhard 335-2931

2705 Vacant Lower

- Vacant Upper
2707 Stolaker Mary Mrs
2709 Gensmer Oscar B @ barber 335-4646

- 2716 Mitch's Real Estate 338-0488
Petrovich Real Estate Sales 338-0455
Petrovich Mitchell F
2724 Vacant

28th intersects

- 2800 Erickson Caroline Mrs @ 336-4249
Hall Trygve W @
Jones Exteriors contrs 336-2429

2804 Bolden Oscar

- 2817 Len's Stand Serv gas sta 332-9369
2818 Booth Frank W 339-4184
Vacant Upper
2820 Gerschwitz Paul R
Hanson Sandra G 338-0265

2824 Vacant

- 2826 Ray's Body Shop
20th av intersects
Franklin av intersects

RIVERVIEW RD - From E 53d south, east of Hiawatha av

- 5303 Gugisberg Lester C @ 729-2704
bsmt Johnston Arth J 724-1996
5307 Holvik Berent J @ 729-8992
5311 Kratz Alvin @ 721-2121
5315 Evans Clifford @ 722-5811
5319 Skarsten Harry I @ 724-5845
5323 Seefeldt Wilbert T Rev @
5324 Johnson Leigh E @ 724-9412
5327 Hursh Richard J @ 722-7093
5331 Herkal Fred J jr @ 722-3803
5332 Schubert Lawrence H @ 722-8775
5335 Johnson Rachel P Mrs @ 729-3678

5336 Wilson Webster C @ 722-1483

- 5339 Larson Robt P @ 721-1554
5340 Larson Brons @ 729-7664
5343 Carlson Anna K Mrs @ 729-1035
5344 O'Brien Eug C @ 729-7754
5347 Anderson Lloyd C @ 724-7255
5348 Olson Victor E @ 724-0989
5351 Weld Otto L @ 729-1905
5352 Hersh Philip W @ 722-5055
5355 Hilgeman Philip H @ 724-2978
5356 Craighead Herman W @ 724-4685

5359 Knudsen Kermit L @ 729-7234

- Triangle Construction Co contrs 729-7234

5360 Larson Edwin W @ 729-2890

- 5363 Stansbury Clarice J Mrs @ 729-1016

5364 Billie Theresa

- 5367 Doris Phillip @ 724-2461
5368 Benson Geo A @ 729-8958
5371 Kennedy Chas D @ 721-4694
5372 Bjerkness Benj F @ 724-7852
5375 Rich Jas @ 729-9073
5378 Solvie Claire G Mrs @ 724-2976

5379 Hilton Donald E 724-4588

- 5380 Nordskog Gordon H @ 729-7894
5383 Grygelko Anton G @ 729-5409
5384 Hanson Lee J @ 721-5105
5387 Pierce Michl J 724-9106
5391 Lambertson Donald W @ 729-7173

5395 Gordon Leo P 724-8394

ROBBINS - From Cumberland rd west, 1 north of 54th

- 2505 Vacant
2506 Hallberg Theo G @ 926-9472
2509 Clark Elmer R @ 922-2348
2510 Griswold Earl A @ 926-0914
2514 Richards Myrtle L Mrs @ 922-4153
2518 Hall Clifford C @ 922-5282
Thomas av intersects
2600 Hadley Chas D jr @ 922-9216
2601 Moore Morris E @ 922-6756
2605 Eliason Ole J @ 922-6529
2606 Walsh Thos A @ 920-3346
2609 Goulett Harlan M @ 922-1453
2610 Gibbon Alex M @ 926-8703
2612 Asplund Bennett A @ 926-4539
2615 Mott Robt V @ 922-0826
2616 Heinisch Marg L @ 922-1032
2619 Bonello Julius F @ 927-6140
2620 Nelson Roland W @ 922-4702
2623 Billingsley Esther E Mrs @ 922-4134
2700 Kennedy Cornelia M @ 926-0567
2701 Horner Jas W jr @ 922-9456
2705 Garner Karen Mrs @ 922-7059
2710 Schilling Walter G @ 926-8291
2711 Crail Lulu M Mrs @ 922-0681
2714 Sykora Lavern F @ 926-7743
2715 Bancroft Kenneth M @ 926-1405
Upton av intersects
2800 Ross Saml S @ 926-3281

HARRIS BROTHERS PLUMBING CO. CONTRACTORS

HIAWATHA AVE 1966

Sixth and Marquette

Member Federal Deposit Insurance Corporation

339-2515

For Savings — Home Loans

MEMBERS OF NEW YORK STOCK EXCHANGE AND OTHER PRINCIPAL EXCHANGES  
851 Marquette Av.  
130 Fosbury Tower  
Tel. 827-4741  
3111 Nicollet Av.  
Tel. 339-0561

**HIAWATHA AV—Contd**  
 5324 Westby Lucille C Mrs @ 722-1806  
 5325 Sauleen Harry A @ 722-1270  
 5328 Bowers Arth P @ 722-4344  
 5329 Youso Walter P @ 724-7723  
 5332 Dale Clayton M @ 724-1428  
 5333 Anderson Edwin E @ 722-5453  
 5336 Goar Louis E @  
 5339 Beck Mary A Mrs @ 724-4269  
 5340 Ulstrom David R @ 728-1513  
 5343 Halby Arlan P @ 729-2138  
 5344 Hullner Cath M @ 724-8364  
 5347 Workman Ruth F Mrs @ 724-2395  
 5348 Goodsell Wm J Jr @ 722-0469  
 5350 No Return  
 5351 Bonin Florence M Mrs @ 724-2515

**54th av intersects**

**HIGH—From Bridge Square south, 1 west of the river Marquette av begins**  
 Cor REA Express vehicle term 332-2244

**HIGHLAND AV—From Royalston av N northward**

**HIGHLAND PL—From Border av east, 2 north of Glenwood av**

**HIGHVIEW PL—From Prospect av east, 2 north of Minnesota pkwy**  
 27 Quest C Fred @ 824-0922  
 35 Kunit Myron D @ 823-8876

**HILLCREST DR—From 1 north of E 58th south, 2 east of 31st av S**

**HILLSIDE AV—From Irving av north and 21st av northwest**  
 1509 Armstrong Harry T @ 529-6597  
 1513 Anderson Elaine R 522-5123  
 Sullivan Florence M 522-3713  
 1514 Holmquist Alice 529-2259  
 Vacant upper front  
 Swanson Doris Mrs @ 521-1792  
 Greenwell Jas 522-3878  
 1517 Smith Donald M @ 522-8508  
 1521 Anderson Carmen Mrs  
 1522 Apartments  
 1 Young Vincent C 529-7879  
 2 Vacant  
 3 Cain Della M Mrs 529-0044  
 4 No Return  
 5 No Return  
 6 Newville Harold 521-2155  
 7 DeFoe Donald G  
 8 Heuring Lydia 529-0109  
 1525 Mann Rose I Mrs @ 522-7387  
 1528 Lucke Wilford @ 521-2460  
 Quinn State Improvement Co contr 521-2480

1530 Working Harriet E Mrs 529-2772  
 Whiteford Patricia A 529-8331  
 1533 Whiteford Robt @ 529-7224  
 Vacant Upper  
 Waddick Patk M 521-4350  
 1534 Middlemist Anna Mrs @ 522-0308  
 1537 Cary Fred @ 529-2097  
 1538 Norton Robt E @ 521-0468  
 Anderson Arnold E 522-9008

1541 Peters Alvin J @ 529-7061  
 Smalkoski Richd A 521-0552  
 1542 Dondlinger John A @ 529-0786  
 1545 Jarvi Melvin N @ 522-7796  
 Persons Thos H 529-8280  
 1546 Jasper Frank R @ 522-1734  
 1547 Wetterlund Richd L 521-7122  
 Neibur Michl  
 Sherard Grace Mrs @ 522-0511  
 1550 Reinking Regina Mrs @ 529-2626  
 1551 Shively Viola E @ 529-0852  
 1554 Sausele Emma M Mrs @ 521-5014  
 1555 Lundgren Burnell A 522-5611  
 1558 Stitt Severin V @ 522-7173  
 1559 McIntosh John R @  
 1564 Noel Rudolph F Jr @ 521-3836  
 1565 Close Lillian L Mrs 529-6775  
 Bredeson Mabel H Mrs @ 521-5014  
 1600 Nystrom Norman E @ 529-7165  
 1601 Meyer Ellen E Mrs @ 522-6340  
 1606 Podlasek Eug R @ 521-5191  
 1607 McClellan May F Mrs @ 521-8034

1608 Modrow Laverne H @ 521-3074  
 Schlorer Edw  
 Vacant Lower  
 1611 Devery Laura M Mrs @ 529-8629  
 Mercer Norman E 529-2886  
 1613 Stabrowsk Lorraine M Mrs @ 521-3422  
 Larson Mayme  
 1617 Gilmore Gail B @  
 Groen Dennis  
 Hozer Chas 522-4924  
 1618 Brown E Myrtle 522-2131  
 Grubke Henry H @ 522-3162  
 Gouds Eliz 529-0030  
 1621 Burns Wm F @ 521-4421  
 1622 Nelson Augusta C Mrs 521-7242  
 Crow Ruth E 522-7788  
 Burke Elsie Mrs 521-5469  
 Johnson Viola Mrs 522-3452

1626 Gordon Elaine Mrs 529-2032  
 1628 Young Kathleen L Mrs 521-8583  
 Anderson David C @ 529-7285  
 bsmt Swanberg John  
 1634 Turnquist Alice F Mrs @ 522-6332  
 Sarris Evelyn V Mrs 521-4070  
 1636 Zane Melvina C Mrs 521-2808  
 Norman Elsa L Mrs 529-2074

**Hlon av intersects**

1700 Skordahl Alvin A @ 521-5898  
 Hage Patricia 529-8362  
 Kneupfle Ruth Mrs  
 1706 Johnson Norman H @ 521-6438  
 1707 Dunlap Helen M Mrs @ 521-9128  
 1708 Hart John H @ 529-4093  
 1711 Bevacco Chas E @ 521-7562  
 1712 Crane Gerald H @ 521-6482  
 1714 Zachow Metron W @ 521-4422  
 1715 Krueger Russell J @ 522-0363

**James av intersects**

1814 Vacant Upper  
 Young Lloyd E  
 1815 Burke Wm T 521-3815  
 Vacant Upper  
 1818 Vacant  
 1820 Elgers Ruby Mrs @ 521-5511

**Lagan av intersects**

1910 Kozar Clarence F 529-5604  
 1912 Bolte Wm H @ 522-6276  
 1914 Whitten Ernest A @  
 Vacant Upper  
 1916 Bystedt Lloyd M 521-0933  
 Campbell Thos J 521-9204

1923 Vacant Lower  
 Vacant Upper  
 1925 Syverson Antonie Mrs 521-8250  
 1928 Winsor Oliver F @ 529-8679  
 1933 Duffy Hugh T 521-3326  
 1935 Jeub Delbert G @ 521-1375  
 1939 Morse Marvin W @

**Newton av intersects**

2003 Krueger Gordon L @ 522-3871  
 2005 Wong Mary 521-5335  
 Vacant Upper  
 2011 Pelto Myrtle S Mrs 529-1728  
 Jacques Gary F 529-0646  
 2013 Girouard Jas L @ 528-1865  
 McIntosh Marie E Mrs  
 2017 Whalen Thos M @ 529-5432  
 2023 Schwarz Alice Mrs @ 529-5695  
 Holm Melvin P 529-1561

**HOAG AV—From Holden north, 3 east of Lyndale av N**  
 6th av intersects  
 610-14 Mpls Terminal Warehouse Co garage  
 620 Vacant  
 7th av intersects

**HOLDEN—From N 9th west, 1 north of Glenwood**  
 10th intersects  
 11th intersects  
 12th intersects  
 29 Downtown Plywood Mart 335-2287  
 35 Aldy Laby chem mfrs 335-7787  
 Aldy Graphic Sup 335-7787  
 D M Drapery Co mfrs 338-4626

**Royalston av intersects**

**HOLLYWOOD AVENUE—From 3650 Johnson northeast**  
 1800 Vanderbilt Wm E @ 789-6265  
 1801 Anderson Jerome R @ 781-3250  
 1806 Kuchinski Jos J @ 781-1573  
 1807 Sychala Jos @ 789-7073  
 1812 Sexton Leo A @ 781-1571  
 1813 Hagen Mark J @ 781-2209

1618 Bredison Gordon E @ 781-9166  
 1619 Schroeder Al C @ 781-4980  
 1624 Mizen Carlton A @ 781-8907  
 1625 Sheldon Jas L @ 789-2121  
 1630 Alzank Thos F @ 781-1351  
 1631 Callender Wayne C @ 789-2767  
 1636 VanGorden Jas L @ 789-8149  
 1637 Holloway Anson E @ 781-9219  
 1642 Mahoney Walter F @ 789-3962  
 1643 Quaal Edith E Mrs @ 781-9649  
 1648 Tracy LeRoy D @ 789-6049  
 1649 Hedberg John @ 789-1138  
 1654 Andrajack Frank A @ 789-7040

**NE Hayes intersects**

1700 Loppow Helen M Mrs @ 781-2318  
 1701 Goodsell Jas M @ 789-5530  
 1706 Koch Chester @ 789-0225  
 1707 Heck Russell J @ 781-8593  
 1712 Sabre Hollis L @ 789-8387  
 1713 Strangis Pasquale J @ 781-7769  
 1718 Eastman Kenneth W @ 789-0642  
 1719 Hasselbring Russell W @ 781-2580  
 1724 Korus John P @ 789-7058  
 1730 Lenart Stanley @ 789-2689  
 1735 Olson Lots G Mrs @ 781-9477  
 1742 Dickerson Patk H 781-2015  
 1745 West Milburn L @ 781-9464  
 1754 Olson Allen T 789-1744  
 1760 Villella Victor 781-4970  
 1766 Bourdeaux Mildred E Mrs 789-5206

**HOLMES AV—From The Mall south, 1 west of Hennepin av**  
 2870 Lagoon Apts  
 B Allen Bess Mrs 825-4827  
 101 Livingston Betty C 825-4597  
 102 Mohacs Jos 823-3262  
 103 Kraft Lela B 824-3387  
 104 Morrison Mabel O Mrs 825-4980  
 105 Morkunas John 822-6898  
 106 Mamis Christ 825-7650  
 107 Lomen Martha C 822-1094  
 108 Calhoun Alice M Mrs 824-1612  
 201 Ford Irene S 823-6035  
 202 Smith Ethel H 824-5297  
 203 Dalby Bernard L 825-5561  
 204 O'Hearn May F 822-2927  
 205 Kurtz Louise M 824-4694  
 206 Roelfs Harriette 825-4302  
 207 Turner Wm H 825-1056  
 208 Martin Norma E 825-0688  
 301 Yerxa Mack H 824-4795  
 302 Wirtz Linda E Mrs 825-3629  
 303 Loewen Betty 822-8222  
 304 Ruesman Jan D Mrs 822-1333  
 305 Rubinger Linda 825-7808  
 306 Filipek Albert T 825-4587  
 307 Ryan Mary 823-0521  
 308 Lujan Marvel K 822-8449  
 2873 Lagoon Apts  
 bsmt Dare Hazel Mrs 822-2523  
 1 Seiberlich Minnie Mrs 822-4518  
 2 Cms Harold C 823-3843  
 3 Stenwick Pauline R 823-1456  
 4 Lemvig Esther Mrs 822-4349  
 5 Trengbley Bernice 823-4687  
 6 Ernst Jay  
 7 Rogness Bonnie L 825-3817  
 8 Zaenker Ottavia E Mrs 822-6220  
 9 Baylor Mrs 823-8152  
 10 No Return  
 11 Reis Margt E 823-2309  
 12 Smith Evelyn A Mrs 825-1190

2877 Lagoon Apts  
 bsmt Ronning Florence L Mrs 824-4072  
 1 King Wm A 825-8539  
 2 Purdy Lillian R Mrs 825-9703  
 3 Anderson Carl L 822-8383  
 4 Hardie Wesley E 822-8454  
 5 Sommer Dorothy 824-6083  
 6 Fleming Sally  
 7 Gage Daphne Mrs 825-3717  
 8 Vacant  
 9 Cheney Elie Mrs 827-4297  
 10 Horton Jean C 825-1657  
 11 Kinde may Joseph 827-1209  
 12 Hueseld Esther 822-6295

2879 Lagoon Apartments  
 bsmt Vacant  
 1 Porter Wm H 825-2533  
 2 Pratt Allison 824-6196  
 3 Hutchinson Robert J 825-8091  
 4 Cooper Margt L 823-9152  
 5 Bancroft Gertrude M 822-9098  
 6 Putnam Hazel R Mrs 822-7481  
 7 Wheatstone Archie F 824-4117  
 8 Grotte Jennie Mrs 825-3931  
 9 Thompson Evelyn T 825-4839  
 10 Thomas Martin E 823-1016  
 11 Tarnowski Chas R 825-7317  
 12 Koerscher Goswin 825-8598

**2883 Lagoon Apts**  
 bsmt Dunne Vincent R 824-7823  
 1 Filgelman Ethel E Mrs 825-3907  
 2 Fawcett Richd 822-8301  
 3 Eckardt Josephine E Mrs 824-0127  
 4 Harris Raymond C 825-9374  
 5 Riley May H 825-5404  
 6 Waller Margt L Mrs 822-3717  
 7 Sims Ina M Mrs 827-3118  
 8 Strong Mildred M 827-3060  
 9 Tupper Josephine Mrs 824-1987  
 10 Moulton Frank V 825-1953  
 11 Schumacher Lauretta 827-1412  
 12 Vacant

**Lagoon av intersects**  
 2910 Apartments  
 1 Black Jean 824-4288  
 2 Walewick Marion Mrs 824-5418  
 3 Hese Joyce M 822-1497  
 4 Johnson Fred M 822-1441

**Lake intersects**  
 3005 Porteous Geo C dentist 825-1005  
 Westman Lloyd V dentist 823-0995  
 Mogck Alan D dentist 825-1005  
 3009 Staber's for Beauty 825-1835  
 Krynal Gary  
 3013 Adams G Harlan @ 825-5890  
 3014 Antoinette Apts  
 2 Hulras Florence C 825-3420  
 3 Wahlberg Sophie H Mrs 825-4768  
 4 Harvey Eleanor M Mrs 825-4080  
 5 Heshbro Ida O 823-6000  
 6 Riley Rose L 823-8582  
 7 Kennis Wm D @ 825-2994  
 8 Peterson Alpha G 825-9149  
 9 Dagnon John J @ 823-2310  
 10 Talty Carol W Mrs 823-5009  
 3028 Adis Paul L @ 822-3958  
 3029 Apartments  
 1 Vacant  
 2 Nelson Lucille E 823-7154  
 3 Johnson Sally A 822-5283  
 4 Krasean Gary 823-5942  
 5 Vacant  
 6 Vacant  
 3030 Harrison Howard N @ 825-4088  
 3032 Scanlon Blanche M 825-5784  
 3034 Adams Kenneth L 824-8053  
 3036 Vacant  
 3037 Apartments  
 1 Sullivan Therese G 827-1184  
 2 McComb Raymond A 824-1684  
 3 Bindliff Myrtle J Mrs 825-9685  
 4 Bergstedt Hazel J 823-1814  
 5 Hiltner Linda M 821-1844  
 6 Gilbertson Ordella 824-8637  
 7 Keegan Nancy A Mrs 824-6302  
 8 Jensen W Craig 823-2835  
 9 Hickman Carl J 822-0055  
 10 McCaully Kirby

3040 Jordan J Philip @ 825-3571  
 Schardin Roger 824-7393

**3041 Apartments**  
 1 Nord Magda 823-5676  
 2 Lovejoy Rose Mrs 823-7785  
 3 Irvine Mabel Mrs 825-1898  
 4 Ronbeck Alice Mrs 824-6638  
 5 Sanns Ruth M 823-4320  
 6 Johnston Edna 823-3488  
 3044 Neimann Ann C 825-6715

**31st intersects**  
 3100 No Return  
 3104 Mueller Ervin B @ 825-8549  
 Taylor Edith L Mrs  
 3108 Beach Kathryn F Mrs @ 824-9562  
 3109 Price Jerald K 823-5796  
 Lathrom Elmer 824-3357  
 3111 Schultz Donald 823-8573  
 Shepherd Roland J @ 822-0001  
 3112 Hoese Harold E @ condr 824-5511  
 3113 Christensen Melvin G @ auto repr 825-5608  
 Kosec Mary L 823-0198  
 Johnson Dennis 823-6898  
 3116 Amluxen Geo E @ 827-4761  
 3117 Philbrook Grace Mrs @ 824-1202  
 Michie Evalyn Mrs 825-7454  
 3120 Hopfensperger Hazel S Mrs @ 823-4969  
 3124 Nolan Robt V piano tuner 824-6672  
 Hoy Gerald W 825-4629

3125 Yorkshire Apts  
 B1 Quale Eliza Mrs 824-8555  
 B2 Abington Edna O Mrs 824-6109  
 B3 Heintz Jack E 824-9720  
 B4 Sheffer Harriet E 823-0790  
 101 Smith Kathryn E 822-3962  
 102 Swanson Victoria 822-5191  
 103 Btky Florence A 824-3132  
 104 Johnson Helen M 822-8694  
 105 Pierce Hazel J 824-0164

**RADIO 1500 KC**      **KSTP**      **TELEVISION Channel 5**  
 3415 UNIVERSITY AV. S.E.

54TH E 1960

1389 UNIVERSITY AV.

(Across From Wards, St. Paul)

Midway 6-2561

**54TH E—Contd**  
 3617ΔJacobson Carl E  
 3619 Koskela Richard E  
 37th av intersects  
 3701ΔLuskey Anthony P  
 3705ΔPaterbaugh Elsie H  
 Mrs  
 3707ΔEspersen Geo R  
 3709ΔPadgett Chas H  
 3715 Vacant  
 3723ΔFitzgerald Lamond T  
 3729ΔBlackbird Grocery  
 38th av intersects  
 3811ΔSlabey Mathilda Mrs  
 3815ΔAnderson Walter F  
 ΔAnderson Donald T  
 piano tuner  
 3817ΔAnderson F W  
 3821ΔChristopherson Kenneth L  
 39th av intersects  
 3901ΔWitmer Raymond J  
 gifts  
 3903ΔArmstrong Nicholas J  
 3907ΔWard Annie Mrs  
 3911ΔBeach C Kenneth  
 3921ΔAlmqvist Virgil L  
 3925ΔMcMullen Lee R  
 40th av intersects  
 4001ΔFrondel Leonard C  
 4005ΔJohnson David E  
 4011ΔHodge Golden G  
 4017ΔDanielson Francis C  
 4021ΔAnderson Hugo L  
 4025ΔPedersen Peter M  
 Davidson Per A  
 4029ΔSwitala Roman  
 41st av intersects  
 4101ΔTrux Oliver D  
 rearΔShober Gary G  
 4111ΔCroft Earl J  
 4115ΔSolne Mrs B  
 4118ΔSuhb Richd H  
 4119ΔSchroeder Raymond A  
 dentist  
 4120ΔSchultz Russell T  
 42nd av intersects  
 4200ΔNelson's Serv Sta  
 4201ΔHouser Drugs  
 4203ΔHanson Meats  
 4205ΔStrandy's Mrs Bakeries  
 Inc  
 4207 Steve's Barber Shop  
 4209ΔRay-Del Radio & TV  
 Service repr  
 ΔRaisanen Sulo E  
 4220ΔMartin John  
 43rd av intersects  
 4301ΔVigrestad Hardware  
 4303ΔSmith's Gift & Con-  
 fectionery Shop  
 4305ΔZins-Master Upholstery  
 4307ΔGary's Barber Shop  
 4309ΔLaHaise Albert  
 LaHaise & Rökke  
 tailors  
 4313ΔRatall's Red & White  
 Store gro  
 44th and 50th av intersects  
 ΔUS Veterans Admn  
 Hosp  
 4912ΔHolt Arth O  
 5000ΔNelson Edwin G  
 5006ΔBlesener Helen L Mrs  
 5012ΔLoza John  
 5016ΔLove Ray E  
 5100ΔBealy J M  
 5106 No return  
 5114ΔWesterheim Stanley D  
 5118ΔLarson Louis

**51**  
**54TH W — From Harriet av**  
 west to limits  
 Harriet av intersects  
 414ΔPlummer Lucy T Mrs  
 500ΔMaley Anna T Mrs  
 506ΔZopp Mary E  
 509ΔByrnes Jas A Rev  
 510ΔCurtin Erwin A  
 real est  
 520ΔHamman Jos  
 religious articles  
 524ΔCarlson Lawrence H  
 525ΔAnnunciation Church  
 ΔAnnunciation School  
 Garfield av intersects  
 612ΔGift Nook The  
 614ΔEliason Clarence T  
 contr  
 616ΔJim's Barber Shop  
 624ΔCarlson Robt O dentist  
 ΔSchroenleiben Leland  
 ΔHussman Investment  
 Co  
 626ΔFields House of Beauty  
 Lindale av intersects  
 715ΔDean Robt A  
 719ΔDean Robt A  
 Aldrich av intersects  
 821ΔMoll Jos M Jr  
 Bryant av intersects  
 Celina av intersects  
 Dupont av intersects  
 1010ΔCarlson Chas O  
 1405ΔPidgeon Sidney D  
 United Stoker Sales  
 heating equip distr

1501 First Church of the  
 Nazarene  
 1800ΔEillis John A  
 1900ΔJungers Clarence N  
 Logan av intersects  
 1906ΔPhillips Earl H  
 1912ΔJohnson corner J  
 1918ΔDoherty Jas J  
 1922ΔMichel C Ray  
 Mergan av intersects  
 2000ΔNorris Lillian E Mrs  
 2006ΔKamaly Francis J  
 2010ΔCarter Harrison G  
 2016ΔCain Donald H  
 2020ΔSwanson Esther F  
 2211ΔWeiss Barber Shop  
 ΔWeiss Wm L  
 2213ΔSisters' Beauty Salon  
 Penn av intersects  
 Newton av intersects  
 2312ΔKulstad Lauritz S  
 2316ΔDerby Lewis E  
 2322ΔSaam Selma L  
 2326ΔButts Clinton M  
 Queen av intersects  
 2400ΔAnderson Emery J  
 2406ΔCarroll Gerald T  
 2410ΔBylund Clarence W  
 2414ΔJacob Edw F  
 2420ΔArmagost Mabel W  
 Mrs  
 Russell av intersects  
 Sheridan av intersects  
 2500 No return  
 2506ΔFaltico Frank J  
 2509ΔDavis John E  
 2515ΔColehour Warren I  
 Thomas av intersects  
 2517ΔCaplan Leslie  
 2521ΔWallinder Ernest T  
 2600ΔMayer Edw H  
 2601ΔWittler Rudolph G  
 2602ΔLifton Nathan  
 H Mrs  
 2615ΔLewis Edwin H  
 2619ΔSisterman Thos J  
 2700ΔVanEvery Harold  
 2713ΔHealy John J  
 2813ΔJacobson Douglas K  
 2817ΔAnderson Willard C  
 2821ΔAnderson Ann Mrs  
 2829ΔGruebele Raymond A  
 Vincent av intersects  
 2901ΔLuhm Anthony J  
 2905ΔSaw Margt O Mrs  
 2911ΔFagrellus Carl A  
 2917ΔLieb Robt E  
 2921ΔEiehhorn Arth F  
 Washburn av intersects  
 3005 Hole Guy  
 3009ΔRindal Earl D  
 3015ΔJohnson Paul N  
 89  
 Upton av intersects  
 2700ΔVanEvery Harold  
 2713ΔHealy John J  
 Chosen av intersects

**108**  
**55TH E—From 5459 Chicago**  
 av e to Edgewater Blvd  
 and from Shore View av e  
 to limits  
 1404ΔRustad Arnold L  
 1420ΔBannochie Norvel J  
 23d av intersects  
 2308ΔChristensen Janis K  
 Mrs  
 2310ΔSeabloom Hulda  
 baby sitter  
 2314ΔVarhol Jos  
 2723ΔBerggren Gust E  
 2900ΔHoiler Harris W  
 34th av intersects  
 3412ΔPomroy Francis E Jr  
 3416ΔKnisely Richd L  
 3420ΔVot Barbara  
 35th av intersects  
 3500ΔHedner Ann M  
 massage  
 3502ΔOesen Gida Mrs  
 3508ΔSteenon Kenneth V  
 3512ΔBain Harold C  
 3516 Vacant  
 3520ΔFredrickson Majalisa  
 3524ΔEllingson Oliver  
 36th to 38th av intersects  
 3600ΔBassamore Eugene W  
 3604ΔHammergren Eunice  
 M  
 3608ΔBeattis John E  
 3612ΔO'Day Michl  
 3616ΔJackson F Clayton  
 land surveyor  
 3620ΔSelk Raymond H  
 3624ΔLindahl Elmer J  
 3700ΔNewlin Henry E  
 3704ΔNorton Criville J  
 3708ΔSorg P M  
 3712ΔDille Earl H  
 3716ΔKrebsbach Alois  
 J  
 3720ΔStanley Chas W

3800ΔWest Wryte H  
 3804ΔLundahl Milo  
 3808ΔBorris Jos  
 3812ΔFriborg Carl  
 3816ΔPavel Jan Rev  
 3820ΔColl Robt O  
 3825ΔAnderson Donald E  
 acct  
 39th av intersects  
 3902ΔEstes Vivian C Mrs  
 3904ΔSjostrom Herman F  
 3908ΔBloomer Wm T  
 3912ΔNash Robt W  
 3914ΔHoger Hilbert  
 3916ΔDvorak Thos R  
 3920ΔAnderson Paul M  
 40th av intersects  
 4000ΔSokiers Jos E  
 4004ΔRichey Jerome A  
 4008ΔElli Jerome A  
 4016ΔLudwigson Donald E  
 4020ΔKimmel Clarence M  
 4024ΔFernstrom Lloyd E  
 41st av intersects  
 4100ΔConlon Louis E  
 4102ΔBratrud Olaf O  
 4104ΔGustafson Walter R  
 4114ΔJohnson Olaf  
 4122ΔTyrrell Thos A  
 42d to 45th av intersects  
 46th av intersects

**83**  
**55TH W—From 5448 Pleas-**  
 ant av west to limits  
 Grand av intersects  
 Harriet av intersects  
 Garfield av intersects  
 Lyndale av intersects  
 600ΔWoodward Edw M  
 contr  
 704ΔWhittle Clayton D  
 ΔDelwin Transfer Co  
 710ΔNelson Wayne  
 Aldrich av intersects  
 Bryant av intersects  
 920ΔPearson Carl M  
 925ΔSimons Alex H  
 Colfax av intersects  
 Dupont av intersects  
 1100ΔLuren Minnie C Mrs  
 1112ΔCheney Kenneth F  
 1122ΔLoftquist Lloyd H  
 1204ΔLeonard Robt E  
 1207ΔWilliams Forrest E  
 2608ΔNielsen Geo L  
 2612ΔMarushin Jos M  
 2616ΔFriborg John E  
 2620ΔSmiley Eug R  
 2700ΔCarlson Clarence G  
 2706ΔBloomquist Ethel M  
 Mrs  
 2710ΔBertan Frank  
 2714ΔDonaghue Alf A  
 Upton av intersects  
 2800ΔPeterson Clarice A Mrs  
 2804ΔLarieux LeRoy C  
 2808ΔGleason Robt D  
 2812ΔTurner Teresa A  
 2816ΔBrem Eunice M Mrs  
 2822ΔFoster Lawren P  
 2826ΔMacdonald Peter  
 70

**56TH E—From 5553 Nicollet**  
 av east to limits  
 15ΔAnderson Thos G  
 1st av intersects  
 Stevens av intersects  
 104ΔCrane Leroy  
 145 Vacant  
 2d av intersects  
 Clinton av intersects  
 Portland av intersects  
 708ΔWachlarowics Fred  
 ΔIndustrial Machinery  
 Serv  
 720ΔMassoth Frank C  
 108  
 Chicago av intersects  
 811ΔEdgewater Fairway  
 Food Mkt gro  
 815 Park Terrace Barber  
 Shop  
 ΔPark Terrace Beauty  
 Shop  
 15th av intersects  
 1512ΔMoehrer Henry A  
 1520ΔWilson Howard J  
 1524ΔSmith Lail K  
 Bloomington av intersects  
 2117ΔStuterille John H  
 22 1/2 av intersects  
 2220ΔBreeman Archie C  
 2242ΔBroffie Bruce L  
 ΔQuality TV  
 2246ΔHanson Conrad M  
 23d av intersects  
 3604ΔMcClellan Virginia  
 134

**83**  
**56TH W—From 554 Nicollet**  
 av west to limits  
 Blaisdell av intersects  
 114ΔLeVotr Ralph I  
 128ΔBrown Edmund R  
 131ΔAnderson Wallace L

136ΔGleason Raymond A  
 137ΔStewart Gerald R  
 420ΔDuffy Raymond T  
 Pillsbury av intersects  
 818ΔFelgel Herman W  
 820ΔFelgel Harold W  
 Girard av intersects  
 1500ΔFord Jas C  
 1506ΔGustafson Dorothy L  
 Mrs  
 1701ΔNelson Paul W  
 2212 Under construction  
 2215ΔFleisher H Nell  
 mfrs  
 2216 Under construction

**70**  
**57TH E—From 5661 Nicollet**  
 av east to limits  
 1st av intersects  
 Stevens av intersects  
 2d av intersects  
 611ΔBogen Arne G  
 623ΔWright C Lee  
 627ΔSorenson Fred P  
 631ΔKosons Theron E  
 635ΔZang Robt E  
 639ΔMick Kerwin L  
 643ΔHaesecke Herbert C  
 701ΔJohnson Trygve J  
 705ΔNagell Einar  
 709ΔLewis Saml L  
 715ΔOberg Clarence P  
 717ΔDybert Robt W  
 721ΔLotz Herbert A  
 725ΔWhitehead Thos F

**108**  
 Chicago av intersects  
 Elliot av intersects  
 10th to 15th av inter-  
 sects  
 1521ΔWagner Louis H  
 Bloomington av intersects  
 1605ΔWestrum Kenneth P  
 1611ΔDavid Melbourne E  
 1616ΔAmosen Stanley H  
 1617ΔTietz Harold W  
 1620ΔFerrell Clarence D  
 1623ΔLund Reuel I  
 1624ΔHill Eug M  
 1627ΔOlson Harry M  
 1628ΔErickson Willis F Rev  
 1631ΔNelson Andrew  
 17th av intersects  
 1700ΔSabaka John  
 1701ΔBjorklund Don  
 1704ΔLeonard Robt E  
 1705ΔFinne Fredk  
 1708ΔAnding Moritz R  
 1712ΔNelson Alvin M  
 1715ΔHolmberg Worthie E

1716 Vacant  
 1720ΔWebster Wm J  
 19th av intersects  
 20th av intersects  
 22 1/2 av intersects

**83**  
**57TH W—From 5600 Nicol-**  
 let av west to limits  
 10 Bethel Assemblies of  
 God  
 119ΔOustard Ralph O  
 Newton av intersects  
 800ΔClark Jos M  
 808ΔMorgan Kathryn R Mrs  
 815ΔGlennon Geo M  
 816ΔJorgensen Jack J  
 817ΔGlennon Belle S Mrs  
 822ΔJohnson Leslie V  
 828ΔFiedler Dani J  
 831ΔLeahuis Andrew J  
 2101ΔGale Lawrence T  
 ins  
 2105ΔBeers Ernest  
 2109ΔBly Helge P  
 2120ΔHarvath Albert  
 Oliver av intersects  
 2620ΔMortary James F  
 3021ΔVeilleux Geo T  
 3023ΔJauregui Luis

**70**  
**58TH E—From 5779 Nicol-**  
 let av east to limits  
 6ΔDom's Conoco Serv  
 gas sta  
 11ΔPalsance Raymond A  
 Vend-O-Matic Sales Inc  
 vending machs  
 ΔMedhus Nelle  
 15ΔClendening John L  
 19ΔSprute Henrietta A Mrs  
 1st av intersects  
 101ΔMostu Arth  
 105ΔZacharias Ben  
 108ΔChubb Wm E  
 115ΔLindell Carl G  
 contr  
 121ΔPerson Anton E  
 125ΔHall Colette Mrs  
 Stevens av intersects  
 131ΔOman Clifton J  
 139 Nolting Wm F  
 2d av intersects  
 201ΔRishavy Jerry P  
 203ΔAnderson Bennett E  
 209ΔKlatte Rudolph  
 214ΔAlmen Eric G

**58TH E—Contd**  
 215ΔGiesing Arne  
 218ΔSkaug Anna M Mrs  
 219ΔThompson Ruth W Mrs  
 221 Olson Norman O  
 222ΔHeidenreich Elsworth  
 W  
 Clinton av intersects  
 301ΔRobt Hartz C  
 305ΔSmith Stella A Mrs  
 Portland av intersects  
 610ΔSchier Earl C  
 614ΔBaker Burton C  
 618ΔStelker Lloyd A  
 626ΔJohnson Clarence W  
 630ΔDoty Howard H  
 634ΔVasiro Raymond J  
 638ΔLundquist Paul E  
 700ΔHagen Howard E  
 704ΔWiner Alexander  
 708ΔPeterson Russell W  
 712ΔSchneider Helen B Mrs  
 716ΔDeMong Ethel A Mrs  
 720ΔNielsen Lena T Mrs  
 724ΔFries Howard H  
 728ΔHalron Merrill W  
 734ΔScholljegerdes Florence  
 M  
 735ΔPasenke Warren L  
 800ΔAnderson Anna E  
 Mrs

**120**  
 1420ΔBenson Wm C  
 1546ΔReininger Earl L  
 1546ΔHalcin Edw J  
 1612ΔJohnson Geo W  
 1616ΔLitzky Gerald M  
 1618ΔLundgren Roger D  
 1620ΔSorenson Harold E  
 1624ΔLundquist Harold M  
 1628ΔDitlevsen Glen  
 1630ΔBrunn Harlan A  
 1700ΔBerquist Arthur W  
 1702ΔCallaway Thos W  
 1704ΔCarothers Earl K  
 1708ΔLagerbaer Lawrence  
 H

1712ΔNelson Milton A  
 1716ΔKrause Gene W  
 1718ΔCondie John H  
 1720ΔAllen Marian E Mrs  
 1722ΔJones Vernon C  
 Cedar av intersects  
 Longfellow av intersects  
 19th av intersects  
 1925 Louth John A  
 20th av intersects  
 2104ΔMorseth Ruth M  
 2106ΔAAA Blacktopping Co  
 ΔKrohn Melvin C

**134**  
 2215ΔLeighton Wm E  
 2223ΔKoehler Phillip  
 2231ΔGolden Robt E  
 2700ΔReese Monte T  
 34th av intersects  
 3416ΔCarlson John F  
 35th av intersects  
 3706ΔOltre Arnold  
 3708 Purcell Ervt C  
 40th av S intersects  
 US Naval Air Sta  
 4120ΔSchluck Frank R

**83**  
**58TH W—From 5758 Nico-**  
 lett av west to limits  
 10ΔOman C L Co  
 11ΔNelson Elmer Auto-  
 motive Service garage  
 12ΔClother Stan Co mfrs  
 agt  
 Blaisdell av intersects  
 Wentworth av intersects  
 corΔSouthview Seventh Day  
 Adventist Church  
 135ΔPerlich Amelia A Mrs  
 140ΔRichfield Lutheran  
 Church  
 147ΔMartin Raymond  
 149ΔLlustron Albert  
 Pillsbury av intersects  
 Pleasant av intersects  
 315 Vacant  
 329ΔRussell Ralph S  
 333ΔHenry Russell J  
 Grand av intersects  
 Fremont av intersects  
 701 Ellingson Skelly Ser-  
 vice gas sta  
 1301ΔGeibel Homer C  
 1306ΔLaFontaine Nicholas R  
 1315ΔRoehning Gerald E  
 1321ΔKavoukjian A M  
 1321ΔKavoukjian Antranik  
 M Jr  
 1327ΔCederstrand Marshall  
 A  
 1338ΔLunde Gustaf E  
 1806ΔGould Howard R  
 1720ΔMoser Ervt J  
 Sunrise dr begin  
 2000ΔNorling Oscar S  
 Mumboldt av intersects  
 Irving av intersects  
 James av intersects

RIVER VIEW RD 1960

RIVER TER CT—Contd
32ABull A S
33AHall Harry C
34Cunn Wm W
35 Vacant
36ATorbert David S
130
RIVERSIDE AV—From Cedar
and S 4th to Frank-
lin av
1808AThermo Products Inc
air conditioning equip
Marx M B Service
1812ARiverside Liquor Store
428 interests
1821-23Harley-Davidson
Motorcycles
A Egeberg Caroline Mrs
1822ATriangle Bar Tavern
1825AFufahl Helen M Mrs
Roman Charles A
AMosany Mononobeh
A Shaugnessy Finance Co
1827AWesterner Inc restr
1829AViking Wm J Tavern
AWilson Wilbert R
1900-02 Frank's Carmel
Products Co Confec-
tioners
1900 Apartments
bsmtAChaffield Oral E
1 Perkins Edna M
2AKelly Isabella Mrs
3Anderson Victor H
4Choo Kwunne
5Swanson Melvin J
6Wong Philip C
7 Bruston Peter
Street continued
1904 No return
1906ANyhlen Gottfried
APedder Patricia E
Mrs
1914AShaver Charles R
1916AHolscher Leo A
ASwanan Ralph
1919AMedec's Texaco
Service gas sta
1920 Vacant
1922 Christiansen Russell M
1924AMartina Steven
Paquette Peter
1930 Vacant
1932 Apartments
1 Elmquist Donald
2 Lemke John
3 Vacant
4 Westman Otto W
5 Vacant
6ANDriem Luella Mrs
7 Solberg LaDonna
8 Vacant
9 Vacant
10 Vacant
11Borgen Lillian L Mrs
12 Vacant
14 Carlson Geo
17 Vacant
1934AMidwest Biscuit Co Inc
20th av interests
5th interests
2000AClutch & U Joint
Service mach dtrs
2015ASwede's Auto Repair
2016ASignalized Displays stlk
screen printing
2021 Hallgren Frank
2022 Vacant
2025AMitchell Rachel A Mrs
O
2026 J S Sales furn ret
2028ANDersen Andrew Store
gro
2028-28 Apartments
1ACasner Violet I
2ANorlander Carl E
3AKritschk Milton L Mrs
4Holtz Caroline Mrs
Street continued
2029ADon's Tavern
2031 No return
2035-37AHopf & Hopf Offset
Printers
21st av interests
2100ASedle Mike
ARiverside Litho
2102AFerna-Stone Twin Cit-
ies Inc
2112ASanders Clement H
2114 Vacant
2120-22 Lutheran Free
Church Headquarters
AMessenger Press The
prnters
ALutheran Messenger
The publication
AStewardship Office The
Lutheran Board of Mis-
sions
ALutheran Board of
Home Missions
ALutheran Bd of Pension
ALutheran Bd of Admn
ALutheran League Fed-
eration
ALutheran Women's Mis-
sionary Federation
ALutheran Free Church
Headquarters
2124AA & D Hardware
AIlstrup Frances Mrs
AIlstrup Melvin O
2126J&O-Matic Engineering
Co mach
2127 Vacant
2129ALarson's Fairway
Grocery
ASoldat Rich Meats
22d av interests
2200ASmiley's Point cont
Heyman Robt
2201 Briggs Emm M Mrs
2204 Vacant
2205 Frank's Barber Shop
2208ARiverside Soft Service
2206VA Stelzer Vincent L
2207AReid Geo R
2208 Vacant
2210ATwin City Tea Co
2213 Vacant

2217AKallage Kenneth B
ASeebels Adolph A
2220AJohnson Marie B Mrs
2227AGeese Chester H
2231ARoys Garage auto restr
2233ARiverside Hatch restr
7th interests
23d av interests
2310 Vacant
2311AScholten Harold B
ASout Jacob
Ackerman Kenneth L
2312AScott Thos H
2317 Vacant
2405ATeiger's Automatic
Transmission Service
auto repair
2406AMarion L & Co auto
dtrs
2409 Star Iron shop
2411-13AStar Iron Works
2412 Vacant
2413 No return
2415Augsburg College Lit-
er & Neulund Elec-
tric Co contra
2418ABHix Theatres
2420AThomas Air Condition-
ing Co
2424ATwenty Four Twenty
Four Club tavern
2428 Vacant
2429ABarber Shop
2428ASKarnes How Co
2429ABjornlie Wallace M
real est
2430ARiverdale Cafe
A Perron Marshall J
2431AHarris Norman J
2432AHolmberg Vernon J
Lindberg Stella
2433 Vacant
25th av interests
2500ABhaker Restur Shop
AMarton's Card & Gift
Shop
2501 Lil Ole's restr
2503 Vacant
2505AChavez Pedro
Pittelkow Rodney D
2506AVelander Gen Athletic
Goods Co
Ave Nel Lettering Co
2507ADavis Newton
ALovey Chas W
2508ABillerman Wm A
Meats
2509AHost-Maid Cookie Co
2510ARiverside Food Market
gro
AFishbeck Dale W
ASimpson Geo
AMacwell W Hall
2513AReadmond David
2515 Elliot Norman
2517ABanker Ruth W Mrs
2519-21AMiamapolis Building
Repair Co contra
2523AVedeen Metalcraft
machinists
26th av interests
2634 Vacant
2636 Vacant
27th av interests
2701ABC Antiques & Books
AJameson Robt J
2703ANDersen Pattern Works
2705ANDerson Carl J
AKnowler James
2707AWheeler Anna C Mrs
O
Stotzek Mary Mrs
2709AGensmer Oscar B
barber
2713ATreunes Hillman
Boden Edw M
2715AErickson Ellen M
ALaVine Christine B
Mrs
2718 Jenness Adeline Mrs
O
2720 Werdlar Erick V
inventor
2721AOstby Jas H
2722AHelm Anna E
2729AAnderson Gerald J
Blair Carl L
2733ABohlin Lillian O Mrs
O
28th av interests
2800AErickson Caroline Mrs
O
A Hal Trevne W
2801ATwin City Rock Crystal
Glass Shop cut glass
2803ABlent Erans Co mtrs
agts
2804ANDelson Morris R
AMartinez Pasciano
2807AStraber Ralph
Lindstrom Roy
2817-19AEarl's Standard
Service gas sta
2818ACarlson Ingvar S
ALarsen Jennie Mrs
2820AMelby Olga L Mrs
AMelby Walds R
2824 Vacant
2828 Vacant
20th av interests
Franklin av interests
RIVER VIEW ROAD — 130
E 33d s 1 block, 1 e of
Minwata av
8305AGuglberg Lester C
3307AHoltz Bert J
5311AKratz Alvin O
5315AEvans Clifford O
5316ASKarsten Harry I
5323ANyberg Olga M Mrs
5324AJohnson Leigh E
5327AHurley Henry J
5331ADunn Ronald D
5332ASchubert Lawrence H
5335AJohnson Albert E
5336 Wilson Webster C
5339ALarson Robt P
5340ALarson Bronn
5343ACarlson Anna Mrs
5344AO'Brien Eug C
5347ANDerson Lloyd C
5348AOlson Victor E
5351AWood Otto L
5352AHarris Philip W

5355ADongoake Leonard
5356ACraighead Herman W
O painting contra
5358AKnauden Merritt L
5360ALarson Edwin W
5363ASchubert Clarence J
7th interests
5364ABillec Randall W
5367ADoris Philip O
5368ABenson Geo A
5371AKennedy Chas D
5372ABierkes Benj F
5373AJack J
5376ASolvie Adolph B
5379 Vacant
5380ANorskog Gordon H
5381AGrygcko Anton
5384AMcLean J Burnett
5387ASeefeldt Wilfred Rev
5391ALambert Donald W
5392AWhite Thomas F
ROBBINS — From Cumber-
land rd w to Vincent av, 1
s of 54th
2505ATomlinson Royal G
2506AHubber Thomas G
2509ANelson Vincent F
2510AGriswold Earl A
2514ARichards Myrtle L Mrs
2518AHall Clifford C
2519AThomas av interests
2600ABurns Harriet P Mrs
2601AMoore Morris E
2605ASkoog John O
2606AHeffernan John
2610AGibson Alex M
2612ASpindt Bennett A
2613AMatt Robt V
2616AHenrich Merril L
2619AJerrard John R
2620ANelson Roland W
2624ARobinson Gordon B
2700AKennedy Cornelia M
2701AHorner Jas W
2702AGarner Ernest A
2711ASchilling Walter G
2711ACrall Lulu M Mrs
2714ASyora Larsen F
2715ABancroft Kenneth
Upton av interests
2800ARoss Saml S
2801AShannon Edw J
2804ANDrielsen Geo A
2807AKane Loyola S Mrs
2808ALynch Robt L
2811AKunitz Geo R
2812AGantert Olmar B
2813APovin Agnes C Mrs
2816ABerry John R
2817ALender Wm H
2820AByers Edwin K
2821AManley Martha Mrs
2824AGower Ralph W
2827ANDerson Arth W
contr
28th av interests
2805AHarris Addison B
rearAHarris Boat & Towing
Co
18th av interests
1505ARaney Charles G
1509ACourtes Lawrence T
1519 Clark John D
1523AHird Carl H
17th av interests
1716AStandal Roger J
AKurash Ronald
1720AOlson Paul L
1721ALang MRK H
1724 Apartments
1AEasler Gary E
1Baker Mark
3ABuchanan Stanley R
4Krusse Robt
5ARice David
6Almquist Amaryllis
7Olson Dale W
1732 Apartments
1AChristensen Kenneth
2ARollif Calvin O
3AStultberg Kenneth
4ABreckin John F
5AWie Gert av
6 Kukuwina Max
7ACounlain James J
44
ROOSEVELT — From Traffic
to Lowry av NE (not
open from Kennedy to 22d
av), N east of Stinson blvd
325AViking Automatic
Sprinkler Co
422ALangford Elce Corp
contra
Kennedy interests
(not open to 22d)
2200AKujawa Adam
2201ANDerson Lawrence A
2208AGondek John T
2207ABintner Minnie J
2210ALind Marshall D
2211ADrage J Selmer
2214AMeyer Fredro S
2215ALiberkowski Theo
2218AVolva N Douglas E
2219ALarson Douglas E
2222AMcCabe Asa W
2223ABisaut Jos T
2227APlagman Geo F
2228AOpshali Harold B
2231AJaromir Frank J
2232AKuharski Bernard T
2235AHabitritt Jerme C
2236ASwercowski Stanley W
2238AHolm Wm O
2240ADE Dennis
2243AGerber P
2240AHirt Harold C
2241ASassolotti Ter O
2246ADiedrick Fred B
2247ASusk Lidwina K
2301AMaslowski John S
2311ADykes Neat
2314ABalsted Gerhard O

2315ARimarcik Chester L
2318ANDelson Mildred A
O
2319AGrimshaw Ulmont L
2323ARzeszutek Stanley H
2324ABorgstrom David E
2327ANDelson Herman S
2330ASwanson Carl F
2331AHautala Paul H
2334AMesjak Thos J
2335ABudnick Henry A
2336AKingest Donald C
2339ACommers John A
2342AAbiquist Donald T
2343AKara Jos A
2346AGlander Chas A
70
ROSLYN PLACE — From 6925
Clinton av s to 4th av S,
2 n of 16th
336 Apple Hazel M
337A Peterson Stephen L
340ALindberg Clara M Mrs
343ADelton Rudolph B
346ANicholsen Richd M
347ARobinson Harold E
353ASullivan Jas R
353AGustafson Geo L
354ALester Oscar E
364APeterson Minnie M
370ABrunet Lucian L
375AWilliams Orville E
380ALeiber Chas E
388ANoonan Florence Mrs
Hoiden interests
4Kemp Ice Cream Co
Highland av begins
5th av interests
45
RUSSELL AV N — From
Chestnut av W n to limits,
10 w of Humboldt av
GENTRY crosses
2d av interests
323ARoggen Elias Mrs
AZacharias Sabina Mrs
324AFowler Jas J
325AKoponen Mrs
328ARingwelski Peter F
333ABruckelmyer Edw G
400ANeedle John T
403AEngel Barbara J Mrs
406ALund Melvin O
410A Peterson Oscar M
408AKnowles Robt C
410ABenson Alma Mrs
411ANDerson Harold W
414ABerkley Harold A
415ABrost Wm E
418AEdstrom John O
422AGostick Bessie E Mrs
423AWood Floyd J
426AKivi Charles M
427AThompson Peter J
428AMarkson Stanley H
432ASepthorn Elmo A
435ANess Kenneth
5th av interests
500AKeeffe Jas H
503A Osterman Lizzie Mrs
503 Chase Allen G
AWoletz Willard A
506Aerin Wm R
514AWeiss Alf
ASchuler Bertha A Mrs
APeters Leonard J
518AForsare Mrs
519AOlson Laura Y Mrs
Hay Wayne J
525AHammel Anthony J
526AdeKorke Standa H Harry W
AIdelkope Ned
528AFrosler Clifford H
AZwartz Elmer B Jr
Wuornos Gene H
ANelson Shirlay J Mrs
531AGeyer Harold W
538ABoyd Alton Saxon Luth-
eran Church
539AWikman Harry R
6th av interests
614AGoodman Harry C
615AParo Jack L
617ABerg Carl F
618AGarelick Ben O
622AEdelstein Ethel Mrs
622AStratman Saml
623AIrving Harold
625ARobinson Earl A
627 Vacant
702AHenderson Naomi L Mrs
706ARio Edmond V
707AHanson Arth B
710AGranroth Albert A
711ACharles E Martin
713AWilson Lois
714ABizusky Semen
715AStone Beulah Mrs
716AMoran John J
719APritchett Walter R
722ABerman Marcis L Mrs
ANelson Gordon
723ASlaughter Glenwood
726AMitchell Jos E
727AJones Harry E
727AJones Harry E
8th av interests
805ASain Marshall R
801AMaki Margt
809ALitterick Alice F Mrs
810AMiller Leonard
Land Alice M Mrs
Baitley Carolyn E
811AStrae Melinda H Jr
812ABilkuska Wesley E
814AGray Howard D
AKoris Herman E
818AFelton Neat
819AMondsen Norman W

RUSSELL AV N—Contd
821AShilly Richd J
823AVacant
823ABergerson Justette B
824ARvi Russell
825AShwar Kath Mrs
O
826Elsie Mrs
900A Lauer Wm B
901AMiller Earl W
906ARobbins Adele Mrs
906AWeinberg Louis H
ALevi Harry L
910AJacobs Fred
ABuckwald Arth
914AChapman Ruth Mrs
ASmith Harry
915AKauffman Theo R
918ABerthlaume Robt M
918AStrauss Wolf O
922AZilmer Walter A
923AYoung Gwen Mrs
925AFischer Irving
928ASchwartz Sam J
927ATeiger Jerome H
928ASchwartz Harry
Oak Park interests
1000AJohannsen Clarence
1001ABenowitz Geo
1008AFischel Theo J
1009ATroies Isadore
1014ABudney Esther Mrs
1015APolitz Burton J
1018AWaisman Saml
AWeisman Gerald M
1019ABindman Benj
1024Waisman Saml
1027AZiff Louis
1101A Black Geo
1102AGoldberg Adolph
1107A Peterson Thos
1108ARosenzweig Nathan
1111ASilver Irving
1114ALeader Sol
1121ABell Ethel Mrs
12th av interests
1200ABlindman Frank S
1205AChas J
1206ASanders M Joa
1211AMoscoe Arth W
1212AGraham Thos S
1215AHarris Stanley
1218AGoldstein Beril C
1221A Becklman Morris
1224ABeck Harry L
1227ADouglas Myer
1230AFeldman Harry
1233AHeilman Helen Mrs
1235AWerner Saml
1239AWerner Wm M real
est
1240AGoldman Morris
1243ABarenbaum Tony A
1244AMoses Hyman
1247AColman Hugo L
1255AKagan Ida Mrs
1251AOstrow Julius L
1254AGoldstein Mirzi L Mrs
1258ALeisenberg Harry
1256AToies Abe
13th av interests
1311AFelner Melvin H
1312A Eisenberg Harry
1314ANDelson Gladys E Mrs
1317AFeldman Michl A
ABeck Eunice G Mrs
1320AKahn Nathan
AWinnig Robt R
1321ACooke Agnes M Mrs
1323AMartin Roy J piano
tuner
ARhoe Geo E
1324AMorris Larry C
ALunde Lee D
1328AWinkoff Ellis
A Osterman Lizzie Mrs
1329ARosson Doris Mrs
1332A Odessa Emma M Mrs
1333AKline Viola Mrs
1333AGrossman Sam
1336AGubman Phillip
1340A Oenmcke Henry C
1341APeterson Edin Mrs
1344ASchleeter John F
1345AEdelstein Morris
1346AdeKorke Standa H Harry W
1349A Cohen Morris H
1350 Vacant
1353AKaufman Paul W
14th av interests
1400A Levin Adeline L
1401A Haight Lawrence
1404A Holt Saxon Ulmer W
1407AKHffer Max
1408ABerg Fannie Mrs
1410AFelchik Oscar G
1411 Vacant
1415ABearman Sewell N
1416A Reich Ned O
1418AKleinbaum Malou
ABoiman Aron
1420AHaten Mark
1424ARubenstein Sam
Bloom Richd
1425A Irwin Harlow
1500AWolk Zaida M Mrs
1501ARatnick Homer
1502ARutman Milton
1504AAnzel Lazar
1505ASather Rasmus K
1508ARichter Sherman
1511AFinkelshten Hymn
1512ABadiner Sarah Mrs
1516AMcGinnis Ellis W
1517AWolf Saml
1521APettiford Earl
1522A Orow Alex
1527AGarin Edw D Jr
1530A Russell Av Luth Ch
1531A Braaten Carl E Rev
16th av interests
1601Friedman Nma Mrs
1605ABenjamin Harold
1611AKent Leonard B
1615ABerezovsky Saml
1619APallete Sam O
1631ASackels Leonard M
ASwanson Elliott M
1639ADraikes Eva Mrs
AKarpel Maurice
1645ABerlin Samuel M
1647ASiegel Arnold E
1649ASchmittzer Julius J
AKroonman Bruce W
1651 Vacant
1659ADiamond Orlando O





W 54TH ST 1957

Day or Night



SOUTHDALE

S61

52D AV N (Crystal)—Contd  
6729ΔBurke John D ⊙

Idaho av inter-  
sects

6805 No Return  
6811ΔLee Wm Hans ⊙  
6817ΔConway Richd T ⊙  
6823ΔBuckholz John H ⊙

Jersey av N inter-  
sects

6901ΔVoight Willard L ⊙  
6907ΔKirks Donald D jr ⊙  
6913ΔTruchinski Edw ⊙  
6919ΔSommers Harold L ⊙

Kentucky av N inter-  
sects

7005ΔAdams Firman E ⊙  
7011ΔOgilvie David A ⊙  
7017ΔSnyder Robsen L ⊙  
7023ΔReynolds Robt C ⊙

Louisiana av N  
intersects

7105ΔShelley Richd W ⊙  
7113ΔMiller Thos E ⊙  
7121ΔOlson Ronald S ⊙  
7122ΔLewis Leonard D ⊙  
7127ΔNolan R Emmet ⊙  
7133ΔCochran Gaun B ⊙

Maryland av N  
intersects

7205ΔHart Gerald E ⊙  
7213ΔKessler Raymond F ⊙  
7225ΔAbast Donald R ⊙

53D W (Edina)—From  
Brookside av west to  
Wooddale av

53D AV N (Brooklyn Cen-  
ter)—From 3000 block  
Lyndale av N, w to  
France av N, forming  
south boundary between  
Minneapolis and  
Brooklyn Center, from  
Lyndale av N to Xerxes  
av N

304ΔCyr Paul J ⊙  
N 4th intersects  
512ΔTaylor Gerald T ⊙  
516ΔJordal Herbert R ⊙  
600ΔAnderson Victor G ⊙  
Camden av N inter-  
sects

702ΔKnutson Elmer O ⊙  
706ΔRandolph Paul J ⊙  
710ΔSwanson Geo D ⊙  
714ΔRykyto Henry J ⊙  
trucking  
718ΔKrebs Melvin F ⊙  
722ΔRuone John H ⊙  
802ΔJensen Niles W ⊙  
806ΔJohnson Gordon R ⊙  
810 Vacant  
814ΔCliplef Lloyd C ⊙  
sign pntr

818ΔDuos Arnold E ⊙  
822ΔOppedahl John T ⊙  
Bryant av N inter-  
sects

902ΔPurity Dairy & Food  
Store  
904ΔHeftter Clarence S ⊙  
922ΔLyons Grace H ⊙

Colfax av N inter-  
sects

Dupont av N inter-  
sects

Emerson av N inter-  
sects

2000ΔBartush Wm J ⊙  
2800ΔDahl Arnold M ⊙  
2806ΔEaken Henry W ⊙  
2814ΔBull Kenneth E ⊙  
2820ΔMomont Michl C ⊙  
2826ΔRocheford Lloyd L ⊙  
Washburn av N  
intersects

2906ΔDovenberg Edw A ⊙  
2914ΔKnutson Carlton M ⊙  
2920ΔJohnson Raymond A ⊙  
2926ΔDickison Chas A ⊙  
Xerxes av N inter-  
sects

3000ΔWeller Michl ⊙  
3006ΔCarland Godfrey J ⊙  
3306ΔMurray Cecelia Mrs ⊙  
3401ΔAckerson N Edwin ⊙  
3500ΔGrinstead Donald ⊙  
3506 Under Constn  
3512ΔBirch Wm C ⊙  
3518ΔHolupchinski Ray-  
mond D ⊙  
3524ΔErickson John A ⊙  
3530ΔPaci Albert J ⊙  
3600ΔMalone Fern S Mrs ⊙  
3606ΔJenson John C ⊙  
3612ΔHawes Wm H ⊙  
3618ΔRaycroft Jas W ⊙  
Ewing av N inter-  
sects

3700ΔKarister Jos A ⊙  
3706ΔOlson Gustaf A A ⊙  
3712ΔTorp Robt G ⊙  
France av N inter-  
sects

3700ΔKarister Jos A ⊙  
3706ΔOlson Gustaf A A ⊙  
3712ΔTorp Robt G ⊙  
France av N inter-  
sects

3700ΔKarister Jos A ⊙  
3706ΔOlson Gustaf A A ⊙  
3712ΔTorp Robt G ⊙  
France av N inter-  
sects

53D AV N (Crystal)—  
From 4500 Quail av N  
west to Douglas av  
(not open from Dou-  
glas av e to Vera Cruz  
av, from Vera Cruz av  
e to Quail av), 1 n of  
Soo Line tracts

4901 Nelson Carter L  
4906ΔThomas Robt C ⊙  
4912ΔSpille E A ⊙  
4918ΔSmith Milton B ⊙  
4942ΔRiley Thos R ⊙  
5002ΔSmith Matthew ⊙  
5003ΔHolthaus Geo J ⊙  
5008ΔHofstad Earle J ⊙  
5009ΔBloomquist Eug S ⊙  
5015ΔCulp Joseph R ⊙  
5016ΔMitchell John C ⊙  
5021ΔKlingman Darwin B ⊙  
5022ΔLundeen Earl F ⊙  
5029ΔMcClurg Robt G ⊙  
5102ΔLampe Wm C ⊙  
5103ΔSkow Alf J jr ⊙  
5108ΔHill James R ⊙  
5109ΔGronlund Carl A ⊙  
5115ΔMarfiz Albert C ⊙  
5116ΔCarroll Richd D ⊙  
5121ΔMcKenzie Donald P ⊙  
5122ΔLang Lester L ⊙

5128ΔDietael Lenn E ⊙  
Quail intersects

5302ΔGagnon Donald L ⊙  
5308ΔFitzgerald John J ⊙  
5315ΔMarkgraf Ronald E ⊙

5316ΔOlson Everett V ⊙  
5322ΔWadtke Wallace S ⊙  
5328ΔForslund Eug ⊙  
5402ΔPommier Robt R ⊙  
5403ΔWieker Martin J ⊙  
5408ΔMarks Donald C ⊙  
5409ΔBoeser Floyd R ⊙  
5415ΔLimanen Melvin W ⊙

5416ΔApplequist LeRoy V ⊙  
5421ΔForslund Neil A ⊙  
5422ΔTaylor John E ⊙  
5427ΔNelson Richd J ⊙  
5428ΔFay Helen P ⊙  
5433ΔErickson Loring E ⊙  
5434ΔCloutier Fredk C ⊙

53D AV NE (Fridley)—  
From west limits to  
NE Main, 2 south of  
Hwy 100

100ΔReynolds Wayne L ⊙  
112ΔCondiff Chas jr ⊙  
117ΔSyversen Shelvin B ⊙

133 Under Constn  
147 Under Constn  
159 Loye Donald D ⊙  
160ΔFreeberg Russell A ⊙  
172ΔJohnson Rita A Mrs ⊙  
183ΔVossler Wesley P ⊙  
184 Vacant  
195ΔOlberg Fritz W ⊙

172ΔJohnson Rita A Mrs ⊙  
183ΔVossler Wesley P ⊙  
184 Vacant  
195ΔOlberg Fritz W ⊙

172ΔJohnson Rita A Mrs ⊙  
183ΔVossler Wesley P ⊙  
184 Vacant  
195ΔOlberg Fritz W ⊙

NE Horizon dr  
intersects  
200ΔFelegy James R ⊙

53D PLACE N (Brooklyn  
Center)—From 300  
Northport dr w to  
France av N, 1 n of  
53d av N

3501ΔSullivan Jas E ⊙  
3507ΔBalfany Marvin C ⊙  
contr

3513ΔAnderson Clarence G ⊙  
3519ΔNelson Neal H ⊙  
3600ΔSpillers H H ⊙  
3601ΔJohnson Lawrence F ⊙

3607ΔRehor Lewis J ⊙  
3612ΔMunson Vernon A ⊙  
3613ΔTitus Harry B ⊙  
3618ΔVan Steenwyk D F ⊙  
3619ΔJex John S ⊙  
3624 Berres Wm J ⊙  
3625ΔNygaard Roland E ⊙  
3700ΔAnderson John H ⊙  
3701ΔWachsmuth Eug F ⊙  
3706ΔLange Ralph W ⊙  
3707ΔLundberg John E ⊙  
3712 Rehbein Eleanor M Mrs ⊙  
3713 Ackerson Bernard A

54TH W (Edina)—From  
France av west to  
Wooddale av

Zenith av inter-  
sects  
3301ΔLarson Bruce R ⊙  
Abbott pl inter-  
sects

Beard av inter-  
sects  
3501ΔMcClellans Grocery  
ΔMcClellan Leo A ⊙  
3509ΔSherwood Donald D  
3513ΔAldridge Harry B ⊙  
3517ΔHuettle Jas E ⊙  
3525ΔAnderson Glenn D Rev

3529ΔNeumann Emanuel K ⊙  
Chowen av inter-  
sects

3605ΔLindberg Andrew ⊙  
3609ΔBrauer Merle O ⊙  
3613ΔMing Saml P ⊙  
3617ΔLewis Alice K Mrs ⊙  
3621ΔSettle Jas F  
3625ΔBressler Donald E ⊙  
Drew av inter-  
sects

3701ΔOlstad Donald N ⊙  
3709ΔLindstrom Harold E ⊙  
3713ΔSchweigert Harold F Rev  
3721ΔRitter Heinz C ⊙  
3725ΔNorris Leslie ⊙  
3729ΔGarrison Allan W ⊙  
contr

Ewing av inter-  
sects  
3801ΔTychsen Carl A ⊙  
3805ΔMurray Donald E ⊙  
3809ΔRolf Gilbert E contr ⊙  
France av inter-  
sects

3907ΔCorrell's Dairy Store  
grocery  
Correll Chas F ⊙  
3908ΔKrake May Mrs  
Chase Ada B  
ΔShakespeare Bettina Mrs ⊙  
2ΔKemper Beatrice B Mrs  
4ΔBerg Alvin H  
3909ΔBurdick Glenn A ⊙  
3910 No Return  
Hallfax av inter-  
sects

4015ΔWilliams Edw J ⊙  
5109ΔKeller Paul F Rev  
4113ΔEdina Community  
Lutheran Church

54TH AV N (Brooklyn  
Center)—From 700  
Dupont av N, w to 1  
w of Queen av N (not  
open to Sailor la),  
from Sailor lane w to  
France av N

1113ΔGilchrist Clemence A  
Morgan av N inter-  
sects

1113ΔGilchrist Clemence A  
Morgan av N inter-  
sects

1113ΔGilchrist Clemence A  
Morgan av N inter-  
sects

1113ΔGilchrist Clemence A  
Morgan av N inter-  
sects

1113ΔGilchrist Clemence A  
Morgan av N inter-  
sects

1113ΔGilchrist Clemence A  
Morgan av N inter-  
sects

1113ΔGilchrist Clemence A  
Morgan av N inter-  
sects

1113ΔGilchrist Clemence A  
Morgan av N inter-  
sects

1113ΔGilchrist Clemence A  
Morgan av N inter-  
sects

1113ΔGilchrist Clemence A  
Morgan av N inter-  
sects

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SECOND  
SOUTH

CHANNEL 4

54TH E 1955

1955 54TH E ST. PAUL

Fifth and Portland

52D W—Contd
232AWhelan Harlan M
233ARoss Gust K
Gladstone av intersects
300AHesil Phillip T
306ATipping Wm M
308AOlson Carl S
310ABarrett Florence V
312AHardy Ray S
Minnehaha pkwy intersects
81 Humboldt av intersects
Irving av intersects
James av intersects
Knox av intersects
Logan av intersects
Morgan av intersects
Newman av intersects

2111ATatum Willard A
2115ABonello Steve B
2121AWaldo Mary L Mrs
Oliver av intersects
2201AWatson Fred O
2205ADavid Evelyn M Mrs
2211AVickie Marie A
2221AGustavson Sheldon A
Penn av intersects
2305AHumes Edwin W
Queen av intersects
2306AMcGovern Jeanne M
2308ARich Ernest A
2323ASmith Lee I
2401AGrossman Norman
2409AHoward Chas B
2425AMcDonald Robt E
2515APowers Russell C
2516ADieple Jos W
2517ARees John
Sheridan av intersects
2601AGlanos Theo C
2605ABall Wm C
2609AAmundson Helmer T
2612ADunlop J acct
2615APerlin Everett C
2618APowell Robt A
2621AConrad A Earl
2701AHolstad Leonard S
Thomas av intersects

Upton av intersects
2815ARisch Warren A
2819AMcLaughlin Isabel M
Vincent av intersects
Washburn av intersects
3015AOwens Margt E
Xerxes av intersects
York av intersects
Zenith av intersects
Abbott av intersects
Beard av intersects
3410AKnebel Marilyne A
3500ASwanson Luverne C
3506AHankin Alf J
3510AArmstrong Florence I Mrs
3514AJudkins Earl
3517AHedin Hans
3518AWallentyne Wm J
Chowen av intersects
3600AAurassa Carl
3604ALevy Robt E
3614AHuemann Adolph
3622AGrimes Florence T
Draw av intersects
Ewing av intersects
3800ATisdale Harmon W
3804AGarner Dewey G
3808ANelson Florence I Mrs
3810AWoodbury Richd B
3812AByers Raymond L
3814ABourgerie Richd B
3818AColburn E Ross
France av intersects

27 53D AV N (north boundary of limits)—From the river w to Xerxes av
Miss dr intersects
217ASchalo Wm L
227AFeehan John J
305AHeathbeck Vernon L
309 Szaib John L
313ACarlson Rodal T
419 Under construction
5th intersects
Camden av intersects
811ASkow John N
Bryant av intersects

70 53D E—From 5255 1st av S e to Nokomis Blvd and from Woodlawn Blvd e to Minnehaha av
Stevens av intersects
2d and 3d av intersect
331ASchulz Clarence P
335APodas Chas R
345AJordan Wesley A
349AMcGowan Saml F
Ciliata av intersects
4th av intersects
Pearl Lake intersects
Portland av intersects
Park av intersects
Columbus av intersects
Chicago av intersects
805AVic's Barber Shop
Elliot av intersects
Chourteau pl intersects
1539ARoss Raymond J
1542AMaxwell O Earl
1547ABrien Raymond J
1551ADeWerd Christine
16th av intersects

1600AEklund Edith Mrs
1609ASlott Andrew W
Nokomis Blvd intersects
Woodlawn Blvd intersects
31st av intersects
3100 Smestad Melvin B
3104ADorak Robt R
3106ATuters Edw G
3107AWallin Alf H
3111ABoosler Elvira A Mrs
3114AMack Geo W
3115AShobe John C
3120APrice Ray G
3121AUlechu Frank E
3125AMcMillan Donald J
3131AThernell Henry E
ADam Walter F
3143AWaller Otto J
32nd av intersects
3200AEmerson Arth H Jr
3201AGoranson Severn O
3205ABerg Jenny Mrs
3208AHagen Harold E
3211ALawson Edw L
3212AJanson Ella M
3214ARichards Wesley A
3217ATucker Donald E
3221AErdal Milton A
3226AGjesvold Garfield
33d av intersects
3301APeterson Bert H
3307AKupcho Frank T
3315ATheyson Wm E
3403AMerrick Jos D
40th and 41st av intersect
4109AWalling Howard N
Walling Edith N Mrs
49th av intersects
4900AFriend Edw G
4904AKripp C Jr
4908AOldre GOrlyb
81 53D W—From Harriet av w to limits, 1 s of Minnehaha pkwy
500ARoth Donald L
501COlshness G Arvl
505AFelner Harry A
506 Vacant
509AWalsh Matthew A
512ATrestman Irv
Alulick Albert L
515ALou G Cery M
516AWexler Sidora Mrs
519ADemeules Julia M Mrs
520AHoran Jas T
521ASmith Arth J
524ALong Aurelia M Mrs
524ALong Garfield av intersects
615 Kleen Shoppe The dnrs
624 Vacant
626ADEGonda Beauty Salon
628 Boulevard Barber Shop
Lyndale av intersects
716AMankay Jas C phys
720AUnderwood Nathan
724 Vacant
725AEckes Warren F
725AEckes Warren F
Lyndale av intersects
800AFranceschina Michl R
801AChristiansen Amanda V Mrs
805AGoodwin John B
808AGilbert Eug L
809AHansen Wm E
810ABrundage Myrtle M Mrs
814AAnderson A Clifford
815AKennedy Norbert C
818ABruer Harry J
819AChoms Frank A
825ADove Thos B
Bryant av intersects
900AWissmiller Vernon D
906APhipps Guy F
910AAllen Floyd H
914AHusbands Jos D
915ATownsend Harry S
920AChase Helene M Mrs
924AAbraham Maude E Mrs
Colfax av intersects
1000ARieger Julia Mrs
Haugen Josephine A Mrs
1001AGron Dahl Hugo T
1007AMelcher Anthony M
1010APaul John W
1011ATraun Herbert A
1014AHanson Robt L
1015ACal M Mary C Mrs
1019AChrysler Mabel L Mrs
1020AMcBurney Lloyd L
1024AFlanders Cletus M
Dupont av intersects
1100AOrt G Milton
1101ASutton Marcel
1106AJohansen Harry C
1107APerkins Edgar W
1110ACory Harry H
1111AGallagher Urban V
1114AJohnson Erwin H
1115ASchumacher Erwin H
1118AGreenwood Chas L
1119AOTool Edw M
1122AHayward Robt W
1123AProvost Gertrude M
Shelley Jos M
Emerson av intersects
1200AUpham Lionel R
1202AWinston Jas M

1206AKralsten John O
1209AVest Lee H
1210AWellmits Edw M
1214AHoffman Milton A
1215ADurrell Dorothy J Mrs
1218AO'Brien Frank C
1219AKelly Laurence W
1222APhillips Andrew L
1223AWheeler Edwin R
1226ABrown Ners G Mrs
Framont av intersects
1300ASchueler Anna L Mrs
1310AFlynn Leonard T
1517ALarson Richd
Girard av intersects
Humboldt av intersects
Irving av intersects
James av intersects
Knox av intersects
Logan av intersects
Morgan av intersects
2000AWires Wm H
2010ASjostrum Blanche Mrs
2014ADover Carl B
2018ABlaise Robt M
2022AJohnson Wallace H
Newton av intersects
2100ABorgh Clifford G
2102AHoward Murray D
2104ABarker Merila M
2110ASlms Saml M
2114APearcy Grant W
Oliver av intersects
2200ADugan Rals F
2206AGrouse S Thos
2212AFeney Jas J
2215AHoak Thos C
2217ARotsch Herbert O
2218AMcGuinn Wm J
Penn av intersects
2400AWicklund Rudolph E
Upton av intersects
2815ANathanson Jos S
2821AMyers Wm G
2915AHuspenl Jos G
Washburn av intersects
Xerxes av intersects
York av intersects
Zenith av intersects
Abbott av intersects
Beard av intersects
Chowen av intersects
Drew av intersects
3712ACundy Matthew B
Ewing av intersects
France av intersects

53 1/2—Changed to Mondamin
54TH E—From 5341 Nicollet av e to Nokomis Blvd and from Woodlawn Blvd to the river
17AOTness Paul E
19AKoons Jane Mrs
21AFreeman Nell D
23AMooney Wm J
25AWelch Robt E
27AEngelhard Rose L Mrs
99ASein Paul M
1st av intersects
101ACrook Carl E
Stevens av intersects
2d and 3d av intersect
Clinton av intersects
4th av intersects
Portland av intersects
624 Vacant
Chicago av intersects
740AEdgewater Beauty Shop
742AFried Louis A phys
Elliot av intersects
1201AMeyer Robt W
1207AMcBride Olive S Mrs
1215ALaw Wm G Rev
1223AVeiner Henry J
13th av intersects
1307ABodden Gordon E
1315AHarris Robt E
1323AMorris Clark H
14th av intersects
1400ACompton Roy G
1408AOlson Neils E
Bloomington av intersects
1526APeterson Robt L
1530AAllen Elton L
ASorenson Nora Mrs
1534AOram Edw R
1538AGoodrich Harry L
1542ASundalvold Magne D
Nokomis Blvd intersects
Woodlawn Blvd intersects
120 30th av intersects
Nokomis Blvd intersects
31st av intersects
3100AFuehrer Jos L
3106AFuehrer Howard L
3112APatch Eug M
3118AStrom Richd C
3122AMarinos Thos A G
3130AAnderson Eug A
32nd and 33d av intersect
3210AWellhausen Harold E
3218ACarlson Harry A

3300ASchave Ivan H
3306ASchulstad Albert E
3310ADupont Richd P
3318ANelson Martin A
Airport Shoe Repair
3320AAirport Cleaners
Abraham Jay G
3321 Airport Barber Shop
3324 No return
34th av intersects
3405ASowles Ceell H
Sowle's Trim Shop auto repr
3411AAcker Edwin J
3417 Vacant
3421AKob Chinton C
3425AHuotte Margt Mrs
35th av intersects
3501AMcKinley Doris I Mrs
3505AKaros Donald M
3509AAnderson Ervin C
3517AEspe Jerome C
3521ANoble Hartzel L
3525AWhitney Chas E
3527AWood Harry C
36th av intersects
3601AMayland Edmund R
3607ACarson Wm L
3613ASverson Sigard N
3615AAnderson Kenneth C
3617ARelchenbach Ray W
3619APaulson Richd V
37th av intersects
3701APerala Shirley A
3705 No return
3707AEspersen Geo R
3709ABogenreif John O
3715AGustafson Carl
3723AFitzgerald Lamold T
3729AOverkamp Tracy M Mrs
Overkamp's Grocery
38th av intersects
3811ASlabey Matilda Mrs
3815AAnderson Walter F
3817AAnderson E W
3821AChristopherson Kenneth L
39th av intersects
3901AMockrid Herman
Herman's Grocery
3903ALarsen Asbjorn H
3911AHaugen Alma Mrs
3912ABeach C Kenneth
3921AElling Adrian A
3925AMcMullen Lee R
40th av intersects
4001AFrondell Leonard C
4005ASternquist Ivan W
4011AHodge Golden G
4017ADanielson Francis C
4021AAnderson Hugo A
4025ADavidson Per A
4029ASwitlala Roman A
41st av intersects
4101AHollstrom Carl O
4111 Vacant
4115ASolne Melvin B
4119ASchroeder Raymond A
dentist
42d av intersects
4201AHouser Drugs
4203ARemick's Grocery
4205AStrandy's Mrs Bakeries Inc
4207ASteve's Barber Shop
4209ARay-De Radio & TV Service
43d av intersects
4301AVigrestad's Hardware
4303 Smith's Gift & Confectionery Shop
4305ALEverantz H E shoe repair
4307AWagner Dale A
Dale's Barber Shop
4309 Brown's Tailor Shop
4313ARatcliff's Red & White Store gros
44th and 50th av intersect
5000ANelson Edwln G
US Veterans Admin Hosp
US Veterans Admin Regional Office
5006ABlesener Helen L Mrs
5012ALozz John
5016ALove Ray E
51st av intersects
5100ABeaty Warren H
5106ABenham Cyrus S
5114APeterson Geo J
5115ALarson Lulu
5200ARislov Edna J Mrs

54TH W—From Harriet av west to limits
Harriet av intersects
414APlummer Lucy T Mrs
500AMaley Anna T Mrs
506AZepp Mary E
509ABrynes Jas A Rev
510AKelly Jas F
520AHamman Jos
524ACarlson Lawrence H
525 Church of the Annunciation
Annunciation School
Garfield av intersects
612 Postal Station No 10
AGift Nook The

81 55TH E—From 5459 Chicago av e to Edgewater Blvd and from Shore View av e to limits
1420ABannoehle Norvel J
23d av intersects
2308AWalstrom Herbert A
2310ASieblom Hulda E Mrs
Alwin Elton B
2314APedersen Gordon A
34th av intersects
3412APomroy Francis E Jr
3416AKnlesly Richd L
3420 Smestad Bertha Mrs
35th av intersects
3500ABollum
3502AOslen Alf O
3508AStenson Kenneth V
3512AHofstad Mildred F Mrs
3516AHoffmann Chas N
3520AFrickson Maja L Mrs
3524AEllingson Oliver A
36th to 38th av intersect
3600AHEll Evelyn D Mrs
3604ALePage Myron L
3608APeterson Rudolph A
3612AThompson Maurice O
3616AJackson F Clayton
3620ASelk Raymond H
3624ALindahl Elmer J
3700ANewlin Henry E
3704AKaluznick Walter
3708ATjernlund Rodney E
3712ADille Earl H
3713AKrebsbach Alaja U
3720ASelk Chas W
3800AYest Wylate H
3804ALundahl Mlio
3808ABorin Jos
3812AFriberg Carl
3816ASchroeder Raymond A
3820AColl Robt O
3825AHodge Nathan T
39th av intersects
3902AEstes Vivian
3904ASjostrum Herman F
3908ABloomer Wm T
3912ANash Robt W
3916ADvorak Thos B
3920ANickey Wm M
40th av intersects
4000ABlackard Ernest C
4004ARostratter Robt C
4008AHEll Jerry A
4016AHEll Geo C
4020AMartin Donald M

81 55TH E—From 5459 Chicago av e to Edgewater Blvd and from Shore View av e to limits
1420ABannoehle Norvel J
23d av intersects
2308AWalstrom Herbert A
2310ASieblom Hulda E Mrs
Alwin Elton B
2314APedersen Gordon A
34th av intersects
3412APomroy Francis E Jr
3416AKnlesly Richd L
3420 Smestad Bertha Mrs
35th av intersects
3500ABollum
3502AOslen Alf O
3508AStenson Kenneth V
3512AHofstad Mildred F Mrs
3516AHoffmann Chas N
3520AFrickson Maja L Mrs
3524AEllingson Oliver A
36th to 38th av intersect
3600AHEll Evelyn D Mrs
3604ALePage Myron L
3608APeterson Rudolph A
3612AThompson Maurice O
3616AJackson F Clayton
3620ASelk Raymond H
3624ALindahl Elmer J
3700ANewlin Henry E
3704AKaluznick Walter
3708ATjernlund Rodney E
3712ADille Earl H
3713AKrebsbach Alaja U
3720ASelk Chas W
3800AYest Wylate H
3804ALundahl Mlio
3808ABorin Jos
3812AFriberg Carl
3816ASchroeder Raymond A
3820AColl Robt O
3825AHodge Nathan T
39th av intersects
3902AEstes Vivian
3904ASjostrum Herman F
3908ABloomer Wm T
3912ANash Robt W
3916ADvorak Thos B
3920ANickey Wm M
40th av intersects
4000ABlackard Ernest C
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4020AMartin Donald M

81 55TH E—From 5459 Chicago av e to Edgewater Blvd and from Shore View av e to limits
1420ABannoehle Norvel J
23d av intersects
2308AWalstrom Herbert A
2310ASieblom Hulda E Mrs
Alwin Elton B
2314APedersen Gordon A
34th av intersects
3412APomroy Francis E Jr
3416AKnlesly Richd L
3420 Smestad Bertha Mrs
35th av intersects
3500ABollum
3502AOslen Alf O
3508AStenson Kenneth V
3512AHofstad Mildred F Mrs
3516AHoffmann Chas N
3520AFrickson Maja L Mrs
3524AEllingson Oliver A
36th to 38th av intersect
3600AHEll Evelyn D Mrs
3604ALePage Myron L
3608APeterson Rudolph A
3612AThompson Maurice O
3616AJackson F Clayton
3620ASelk Raymond H
3624ALindahl Elmer J
3700ANewlin Henry E
3704AKaluznick Walter
3708ATjernlund Rodney E
3712ADille Earl H
3713AKrebsbach Alaja U
3720ASelk Chas W
3800AYest Wylate H
3804ALundahl Mlio
3808ABorin Jos
3812AFriberg Carl
3816ASchroeder Raymond A
3820AColl Robt O
3825AHodge Nathan T
39th av intersects
3902AEstes Vivian
3904ASjostrum Herman F
3908ABloomer Wm T
3912ANash Robt W
3916ADvorak Thos B
3920ANickey Wm M
40th av intersects
4000ABlackard Ernest C
4004ARostratter Robt C
4008AHEll Jerry A
4016AHEll Geo C
4020AMartin Donald M

81 55TH E—From 5459 Chicago av e to Edgewater Blvd and from Shore View av e to limits
1420ABannoehle Norvel J
23d av intersects
2308AWalstrom Herbert A
2310ASieblom Hulda E Mrs
Alwin Elton B
2314APedersen Gordon A
34th av intersects
3412APomroy Francis E Jr
3416AKnlesly Richd L
3420 Smestad Bertha Mrs
35th av intersects
3500ABollum
3502AOslen Alf O
3508AStenson Kenneth V
3512AHofstad Mildred F Mrs
3516AHoffmann Chas N
3520AFrickson Maja L Mrs
3524AEllingson Oliver A
36th to 38th av intersect
3600AHEll Evelyn D Mrs
3604ALePage Myron L
3608APeterson Rudolph A
3612AThompson Maurice O
3616AJackson F Clayton
3620ASelk Raymond H
3624ALindahl Elmer J
3700ANewlin Henry E
3704AKaluznick Walter
3708ATjernlund Rodney E
3712ADille Earl H
3713AKrebsbach Alaja U
3720ASelk Chas W
3800AYest Wylate H
3804ALundahl Mlio
3808ABorin Jos
3812AFriberg Carl
3816ASchroeder Raymond A
3820AColl Robt O
3825AHodge Nathan T
39th av intersects
3902AEstes Vivian
3904ASjostrum Herman F
3908ABloomer Wm T
3912ANash Robt W
3916ADvorak Thos B
3920ANickey Wm M
40th av intersects
4000ABlackard Ernest C
4004ARostratter Robt C
4008AHEll Jerry A
4016AHEll Geo C
4020AMartin Donald M



RIVERVIEW RD 1955

RIVERSIDE AV—Contd
2515A Hollstadt Lawrence A
2516A Star Tea Co
2517A Deane's Minneapolis Building
2519A Minneapolis Building
Repair Co contd
2521 Ferris' Menzies & Gift Shop
2601-03 Joyce Bert C gas sta
2602A Racette Emil J
2604A Vanderloop Martin J
2609 Nail Food Stores (br) gro
2610 Heggs Danl F
2612 Vacant
2613 Leje Dommil J
2616 Bruggie Lila M Mrs
2620A Ericson Edwin
2620A Crane Ernest B
2624 Apartments
2624A Nenzitz Daniel L
2624A Juckett Frank
2624A Perron Maurice A
2624A Brannwell Thos A
2625A Moslmann Chas E gas sta
2626A Peterson LeRoy V
Peterson Caroline Mrs
2634 Vacant
2636 Vacant
2700A Benson Leander S gro
2701A ABC Antiques & Books
Jameson Robt J
2702A Hulla Thorvald M
2703A Cox Richd
2704A Schlader's Meat Mkt
2705A Gustafson Emil
2706A Peterson Edwin
2707A Wheeler Anna C Mrs
2708A Milesworth Petalita
2709A Geisner Oscar B barber
2713A Wagstrom Lily Mrs
2715A Erickson Ellen M
2716A Devine Christine Mrs
2718 Jensen Adeline
2720A Schmidt Ed R
2720A One Stop Beverage House tavern
2721A Onby Jas H
2727A Humm Carl
2729A Byrffe Carl
2730A Johnson Eldon R
2733A Bealla Wm T
2800A Erickson Caroline Mrs
2801A Twin City Rock Crystal Glass Shop cut glass
2802A Salas Vincent
King Edmund J
2803A Steirly-Evans Co mfrs agt
Johnson Lester T
2804A Ramirez Ponciano
2805A Nelson James W
2807A Peterson Gus L
2817-19A Frank & Mrs Standard Serr Sta gas sta
2818A Carlsen Agnar S
2820A Melby Olga L Mrs
2824A Melby Waldo H
2824A Bayless Allyn H
2824A Hoff Donald R
2828A Sleg Albert H
2828A Lindahl Motor Co used cars
290A av interests
Franklin av interests

RIVERVIEW ROAD—From E 33rd to block, 1 s of Milwaukee av
5303A Guggisberg Lester C
5307A Holvik Berent J
5311A Hartke Edward H
5312A Hartke Studio photog
5313A Evans Clifford N
5319A Skarsten Harry E
5325A Nyberg Oscar A
Northfield Richd A
5324A Martens Theo J
5331A Dunsell Robert D
5332A Schubert L H
5335A Johnson Albert E
5336A Wilson Webster C
5339A Larson Roy P
5340A Larson Brons
5343A Carlson Anna C Mrs
5344A O'Brien Eug C
5347A Anderson Lloyd C
5348A Olson Victor E
5351A Wild Otto L
5352A Hursh Philip W
5355A Dongaska Leonard
5356A Craighead Herman W
5359A Knudson Kermit L
5360A Larson Edwin W
5364A Billie Edw R
5367A Doris Philip
5368A Benson Geo A
5371A Duncan Lowell R
5372A Berkman Benl F
5375A Rich Jas
5376A Solvie Adolph B
5379A Becker Lloyd S
5380A Nordskog Gordon H
5383A Gryggelke Anton G
5384A Burnett J
5387 Under construction
5391A Lambertson Donald W

ROBBINS—From Cumberland rd w to Vincent av, 1 s of 54th
2505A Nordquist Richd A Jr
2506A Halborg Theo G
2508A Nelson Vincent P
2510A Harris Carl V
2514A Murray Donald R
2518A Currier Russell D
2600A Burns Jas A
2601A Moore Morris E
2608A Osborne Eas A
2608A Dahlberg Harold E
2609A Harris Norman J
2610A Gilboen Alex M
2611A Christianus Rufus
2615A Grove Thos U

2616A Heinsch Margt L
2619 Jerrard John R
2620A Nelson Roland W
2623A Thielsch Edw G mfrs eng
2700A Helene K Mrs
2701A Horner Jas W Jr
2702A Gerner Emil E
2710A Schilling Walter J
2711A Crell Lulu M Mrs
2714A Spokora Lester F
2715A Bancroft Kenneth M
Upton av interests
2800A Ross Saml S
2801A Shannon Edw
2804A Neilson Geo A
2807A Kane Lola S Mrs
2808A Lynch Robt L
2810A Blair Geo W
2812A Gantert Othmar B
2813A McNurin Robt W
2816A Berry John R
2817A Lender Wm H
2820A Pederson Robt A
2823A Monley Martha A Mrs
2824A Gower Ralph W
2827A Mason Monte A

ROLLINS AV — From 28th to 14th av SE e to 18th av, 2 s of Como av
1420A Harris Boat Co boat hauler
rear: Harris Robt
15th av interests
1505A Raney Chas G
1506A Courtaut Lawrence T
1519A Ross Lena Mrs
1523A Hird Carl H
1717A Hills Horace H
1721A Lang Mark H

ROOSEVELT—From Traffic N to Kennedy (not opened to av to limits) 1 s of Stinson blvd
325A Viking Automatic Sprinkler Co
422A Laagford Elec Co Inc contr
424A Langford Elec Corp
Kennedy interests
(Not open to 22d)
22d av interests

2200A Kuwava Adam contr
2201A Boyle Hecy Mrs
2206A Gondek John T
2207A Binstner Fred W
2208A Knudsen Leif D
2211A Drage J Selmer
2214A Masley Proctor S
2215A Liberowski Theo E
2218A Ronan Vincent
2219A Murielock Henry V
2222A McCabe Asa W
2223A Schar Edw
2224A Plagman Geo F
2228A Opahl Harold
2231A Hoffman Chas D
2232A Kuharski Bernard
2235A Habsterit Jerome C
2236A Swierkowski Stanley W
2239A Ho Wm O
2240A Mahoney Michl J
2243A Gorber Carl P
2300A Hirt Harold C
2301A Liden Clarence W
2306A Diedrick Fred B
2307A Martin Mary L
2310A Sharpness Albert
2311A Vandepas Nell J
2314A Balaud Gerhard
2315A Ritsamer Chester L
2318A Nelson Mildred A Mrs
2319A Grimshaw Ulmont L
2323A Rzesutek Stanley E
2324A McKennan Ray G
2325A Brennan Carl F
2331A Sroka Geo
2334A Mesjak Theo J
2335A Budnick Henry A
2338A Mather Geo A
2339A Commers John A
2342A Ahlquist Donat T
2340 Johnson Jon M

ROSLYN PLACE—From 5025 Clinton av s to 4th av s, 2 s of 16th
337A Knowlton David B
340A Lindberg Clara M Mrs
340A Lindberg Clara M Mrs
340A Lindberg Clara M Mrs
340A Lindberg Clara M Mrs
340A Lindberg Clara M Mrs
340A Lindberg Clara M Mrs
340A Lindberg Clara M Mrs
340A Lindberg Clara M Mrs
340A Lindberg Clara M Mrs
340A Lindberg Clara M Mrs

ROYALSTON AV—From Giesse w to 4th N 12th av to 6th av N
22 Direct Oil Services Corp
Direct Service Oil Co (olef)
7A Associated Ice
Kemps Ice Cream Co
18A Drimalla Rose
18A Wildie Harry M
20 Vacant
20A Vacant
22A Kasper Larrit T
23A McArds J
25 No return
Nightstand av begins
27 Kennedey Francis J
28 Boeber Aug F
28A Knorr Wm C
28A Bonnell Walter
28A Beer Othmar B Mrs
30A Waters Edw W
31A Leon Jose A Mrs
32A Giesse Thos T
32 No return

1820
34A Rice Warner E
43A Minnesota Engineering Co tool designers
43A Minneapolis Royals-ton plant
48A Moses Emil
54 Ruel Julian
Gage David
58A Jakubik Frank J
60A Landery Vernon H
58 Vacant
58A Avangen LeRoy A
60A Cretzler Andrew
60A Carlson Earl C
68A Tucker John
Jordan Geo
68A Randolph Daisy Mrs
70A Bellevue Louis P
72A Thiffaut Ezra J
72A May Robt W
75 No return
76A Lawrence Rita Mrs
102A Fish Raymond C
int doc
83 Bailey Morris B
Calmar John
84A Alexander Winifred
86A Tell John L
Fruit Loops Mrs
88A Bowers Bertha E Mrs
91A Mealy Florida E
92A Howell Lillian Mrs
96A Miller Saml
104 Mitchell Forrest E
104 DuBois Jean
104A Heber Marilyn J
111 No return
118A Ann Legion Johnny Baker Post No 291
119A Freeman Louise C Mrs
120A Bernard Sam
120A Wilensky Max

RUSSELL AV N—From Chestnut w to Humboldt av
323A Bogema John
324A Fowler Jas J
328A Koveron Hugo R
328A Wiesche Emma R Mrs
333A Bruckelmyer Edw G
400A Needle John T
400A Bender James
408A Lund Melvin O
407A Peterson Chas W
424A Wood Floyd J
424A Thompson Peter J
428A Markson Arnold M
433A Josephson Eino A
433A Peterson Philip E
5th av interests
500A O'Keefe Jas
Farriston John J
Goodmumson Daisy
503A Wolertz Willard A
504A Sheridan E Juden
506A Ervin Wesley E
514A Robinson Gordon R
518A Forrae Sven M
518A Olson Hans S
525A Hammel Anthony J
526A Idelkoff Harry
526A Nilsson Wallace J
Lee Andrew
526A Robins Geo M
526A Schuster Halida
531A Geyer Harold W
533A Deschene Minnie A Mrs
6th av interests
614A Goodman Harry C
614A Segal Chas
615A Danielson Harold V
615A Lindholm John P
617A Divers Roy
618A Garelick Lena Mrs
618A McElmury Donald R
622A Brantzen Saml
625A Anderson John D
625A Robinson Earl A
627A Martin Irene E Mrs
702A Levin Henry
702A Regeky Anna R Mrs
702A Lindell Julius
707A Hanson Arth B
710A Granroth Albert A
711A Anderson Axel F
713A Johnson Donald A
715 Sues Alf J
718A Welner Irving
719A Kietshcka Doris M Mrs
Lerum Alf
722A Borman Marsha Mrs
722A Weber Kenneth J
728A Rossi Axel
728A Farnsworth Ella J Mrs
727A Nielson Axel F
8th av interests
801A Makl Mart
805A Robertson Archie L
807A Erickson Raymond W
810A Stimpson Frank W
811A Stone Melvin C
812A Albert John B
812A Salisbury Esther A Mrs
814A Korts Herman E
814A Olson Wm
815A Pajart Chester W
816A Hedman Edith
816A Mondin Norman W
816A Forrae Melvin K
821A Hagaman Cyril J
821A Kasper Eug
823A Lijns Ande M Mrs
824A Elichsen Robt M
824A Shaw Cath Mrs
824A Cesebino Werd
900A Feldman Jos
906A Torke Mary F Mrs
906A Weger Lester M
Alvi Harry L

45
RUSSELL AV N—From Chestnut w to Humboldt av
323A Bogema John
324A Fowler Jas J
328A Koveron Hugo R
328A Wiesche Emma R Mrs
333A Bruckelmyer Edw G
400A Needle John T
400A Bender James
408A Lund Melvin O
407A Peterson Chas W
424A Wood Floyd J
424A Thompson Peter J
428A Markson Arnold M
433A Josephson Eino A
433A Peterson Philip E
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503A Wolertz Willard A
504A Sheridan E Juden
506A Ervin Wesley E
514A Robinson Gordon R
518A Forrae Sven M
518A Olson Hans S
525A Hammel Anthony J
526A Idelkoff Harry
526A Nilsson Wallace J
Lee Andrew
526A Robins Geo M
526A Schuster Halida
531A Geyer Harold W
533A Deschene Minnie A Mrs
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614A Goodman Harry C
614A Segal Chas
615A Danielson Harold V
615A Lindholm John P
617A Divers Roy
618A Garelick Lena Mrs
618A McElmury Donald R
622A Brantzen Saml
625A Anderson John D
625A Robinson Earl A
627A Martin Irene E Mrs
702A Levin Henry
702A Regeky Anna R Mrs
702A Lindell Julius
707A Hanson Arth B
710A Granroth Albert A
711A Anderson Axel F
713A Johnson Donald A
715 Sues Alf J
718A Welner Irving
719A Kietshcka Doris M Mrs
Lerum Alf
722A Borman Marsha Mrs
722A Weber Kenneth J
728A Rossi Axel
728A Farnsworth Ella J Mrs
727A Nielson Axel F
8th av interests
801A Makl Mart
805A Robertson Archie L
807A Erickson Raymond W
810A Stimpson Frank W
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812A Albert John B
812A Salisbury Esther A Mrs
814A Korts Herman E
814A Olson Wm
815A Pajart Chester W
816A Hedman Edith
816A Mondin Norman W
816A Forrae Melvin K
821A Hagaman Cyril J
821A Kasper Eug
823A Lijns Ande M Mrs
824A Elichsen Robt M
824A Shaw Cath Mrs
824A Cesebino Werd
900A Feldman Jos
906A Torke Mary F Mrs
906A Weger Lester M
Alvi Harry L

1400A Levin Saml D
1401A Hagelin Lawrence W
1404A Jacobson Elmer W
1407A Hoffer Max
1409A Berg Fannie Mrs
1410A Fairchild Oscar G
1411A Rovner Leon H
1415A Bearman Sewell N
1418A Werner Earl
1418A Peterson Maurice
1419A Peterson Philip E
1844 Vacant
1845A Edelman Martin
1845A Kendall Anna Mrs
1849A Cohen Morris H
1850 Vacant
1853A Kaufman Paul
14th av interests
1400A Levin Saml D
1401A Hagelin Lawrence W
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1407A Hoffer Max
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1419A Peterson Philip E
1844 Vacant
1845A Edelman Martin
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1849A Cohen Morris H
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1853A Kaufman Paul
14th av interests

1600A Katsch Phillip
1605A Brody Geo E
1611A Kent Leonard B
1615A Goldman Oscar
1619A Palez Sam
1627A Gardner Joe E
1631A Carlson Frank A
1635A Hughes Minnie A Mrs
1639A Katsch Milton
1643A Sigel Melvin E
1643A Burdman Saml
1647A Sigel Arnold E
1649A Schmitzer Julius J
Schwartz Adolph
1651A Hansen John B
1659A Breun Orlando O
17th av interests
1700A Novak Joe J
1701A Kestel Carl W
1706A Steckman Loola Mrs
1707A Gary Reuben
1709A Friedick Harry
1710A Ostron Jack
1714A Gersmiller Saml
1714A Schmid Saml M
1717A Rippe Lester J
1718 Vacant
1722A Schicho Wm J
1723A Hartman Donald A
1802A Cohn Sally L
1803A Wickman Harry
1806A Kryala Reino R

910A Benowitz Louis
914A Chapman Ruth Mrs
915A Kaufman Theo R
915A Longene Beale R Mrs
918A Johnson Elna
919A Mondschein Sol B
922A Galt Julian
923A Cohen Geo M
925 Vacant
926A Landry Geo
927A Stamm Jack
928A Sloan Frank A
Oak Park av interests
1000A Silberman Louis
1001A Benowitz Geo
1008A Fischbein Theo J
1009A Lottos Geo H
1014A Brudnoy Esther Mrs
1015A Goldman Morris M
1018A Norman Jerry
1019A Blindman Benl
1024A Sabes Henry L
1027A Sobel Mina Mrs
101A Goldman Abr E
1102A Goldberg Adolph
1107A Manserwitz Julius
1108A Rosenzweig Nathan
1111A Silver Irving
1114A Leader Sol
1121A Beil Saml
12th av interests
1200A Blindman Frank S
1205A Sobel Herman
1206A Sanders Max J
1211A Rose Edwin S
1212A Reasen Harry
1216A Harris Saml I
1218A Goldstein Berli C
1221A Weisberg Saml E
1221A Baker Harry
1227A Fingerhut Manny
1230A Feldman Harry H
1240A Goldman Morris G
1243A Barenbaum Tony
1244A Moses Hyam
1247A Macabee Arth
1248A Kaplan Jos A
1248A Kaplan Jos A
1251A Ostrow Julius L
1251A Rosenberg Aaron
1256A Toloz Abe
Plymouth av interests
1305A L F Products food processors
1311A Desnick David M
1312A Johnson Elna C Mrs
1312A Johnson Gladys R Mrs
4th av interests
1317A Hillman Herbert J
1320A Rank Nathan
1320A Winnig Robt R
1321A Kowalek S E
1323A Martin Roy J piano tuner
1324A Rosen Bertha H
1328A Hellicher Menabehn
1330A Mosley Molly Mrs
1332A Benson D M
1332A Odoms Emma L Mrs
1333A Lasky Saml
1335 Vacant
1336A Gubman Phillip
1430A Oencke Henry C
1430A Oencke Sophie Mrs
1431A Peterson Philip E
1844 Vacant
1845A Edelman Martin
1845A Kendall Anna Mrs
1849A Cohen Morris H
1850 Vacant
1853A Kaufman Paul
14th av interests

1400A Levin Saml D
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1718 Vacant
1722A Schicho Wm J
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1806A Kryala Reino R

RUSSELL AV N—Contd
1807A LeGault Lionel H
1810A Longene Beale R Mrs
1813A Johnson Elna
1814A Bert Bertha N Mrs
1815A Wampon Paul A
1815A Fiterman Benl
1818 No return
1819A Manak Arth L
18th av interests
1900A West David
1906A Hirschman Edw A
1909A Smith Franklin
1910A Shaber Leml R
1911A Adlis Max A
1914A Genderson Edward E
1917A Lazover Harry D
1918A Mayes Jos
1922A Gustafson John S
1923A Strouen waiter J
1923A Witt Olin E
1927A Forsberg Anna Mrs
2002A Columbus Earl F
2003A Brown Nathanael L
2006A Schwitz Gabriel
2007A Laska Harry W
2010A Blocker Otto E
2011A Johnson Howard M
2014A Kingweiss John F
2015A Leuser Max E
2018A Keston Maurice R
2019A Lepist Melvin H
2023A Trumble Joseph W
2023A Laska Harry W
2023A Laska Harry W
2031A Sear Herbert C
21st av interests
2101A Kangas Joseph W
2102A Braunstein Rose Mrs
2106A Knight Peter P
2106A Kwas Frank
2110A Kaplan Taps ad
2112A Lewis Leo
2113 No return
2114A Grossman av Harry
2114A Kozitz Saml M
2115A Kozitz Saml M
2115A Kozitz Saml M
2118A Kozitz Saml M
2119A Siml Wm
2122A Toloz Abe
2122A Toloz Abe
2123A Toloz Abe
2123A Toloz Abe
2123A Toloz Abe
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2123A Toloz Abe
2123A Toloz Abe

HIAWATHA AVE 1955

HENNEPIN AV—Contd

- 3024 Finch Harriet
3032 Advance Tower Launderers & Cleaners
3028 Filipek Bakery
3029 Aphyllis Gift Shoppe
3030 Willis Gift
3031 Uptown Electric Co
3032 Adell & Lucille's Beauty Shop
3033 Uptown Bowling Center
3035 Under construction
3037 Uder construction
3039 Under construction
3040 Calhoun Insurance Agency
3041 Under construction
3043 Under construction
3045 Bonhus Hide Co
3047 Simon Verna L mus
3048 Kivacs Andrew J meats
3049 Uptown Pharm
3100 Mike's Mobil Service gas sta
3101 Mitchell Bros Texaco Service Sta
3105 Calhoun Post No 231 American Legion
3106 May Bernard W & Co acct
3108 Cardel Co real est brokers
3109 Kentopp Laura V
3112 Harrison Norman B
3114 Christianson Donna
3115 Pierson C A Co pntrs
3116 Raymond Evelyn L sculptor
3117 Kipp Albert @ real est
3121 Rochat Alice E Mrs
3122 Helin Hans
3123 Williams Earl H
3128 Hede Dagmar Mrs
3131 Ziegand Anthony D
3133 Grisso Russell A
3136 Apartments
3137 Boustead Jas C
3140 Vacant
3142 Wagner Ruth dancing tchr
3144 Wagner Ruth
3145 Fogel Fool Market
3148 Granada Beauty Salon
3149 Rose Betty Mrs
3151 Dealers Appliance & Radio Serv
3200 Krause P W gas sta
3203 Kerridge Fred D
3205 Strand Emil L
3208 Vacant
3209-11 Apartments
3212 Nelson Phyllis L
3215 Smith Edw G Rev
3216 Holmes Joseph G
3217 Debedard Walter E
3220 Bedeleman Rlchd M

- 3221 No return
3221-23 Apartments
3224 LaBaite Jerome
3225 Leonard Frank S
3229 Russ Milton L
3232 Robinson Joseph J
3233 Hance Heien E Mrs
3236 Savage Tree Export Co
3237 Hilln Alex L
3240-42 Apartments
3241 Hanley Park L
3244 Freese B W
3245 Standard Home Serr Co
3245 Apartments
3246 Gant Ray B
3247 Krasker Tony J
3248 Christian Mathias
3254 Troxel Harry
3255 Barrington Chevrolet Co
3300 Millan Edna M Mrs
3301 Jackson Sw an H
3304 Miller Ross A
3305 Wood Irene K Mrs
3308 Schwarsinske Delos
3309 Aidan Ellis Mrs
3311 Mallinger Donald
3312 Tuttle Lorna
3316 Wiggs Margaret J Mrs
3315-17 Apartments
3316 No return
3318 Ballard Chas
3320 Nikolatos Katherine Mrs
3321 Wright Montgomery W
3324 Heines Ruth E Mrs
3325 Quenby Arth H
3326 Smith Harry H
3327 Berlin Archie R
3329 No return
3331 Suthiff E A
3332 Gould Harold
3334 Hinek Rola E
3336 Olson Martin
3338 Maf-lo-co serv sta
3342 Lakeview Pharmacy
3344 Charles Studio int dec
3345 Nelson Duane
3346 Larson's Meat Mkt
3348 Dreiman's Grocery
3400 Arlington E
3401 Arnett Sam R
3404 Crowell Harold L
3405 Gonyea Win G
3408 Thoresen Martin O
3411-13 Apartments
3412 Brown Florence
3413 No return
3416 Belzer Meyer N
3417 Young John J
3420 Dorrance Albert P
3421-23 Apartments
3424 Snykin Edw E
3425 Boyes Margt R
3428 MacMillan Jos C
3429 Spellopolous Ted
3435 No return
3436 Johnson Myron
3439 Powell Donald A
3440 Marshall Oscar F
3443 Quinn R J

- 3444 Hatlestad Andre A
3445 Watulla Esther K
3448 Levinson Max J
3449 Mathman Wilfred H
3453 Lane Cornelius B
3501 Garlock Re-Roofing Co
3505 Rutchie Engineering Co
3513 Apartments
3515 York Monument Co Inc
3517 Roos Gert Studio pntr
3519 Roos Gert Studio pntr
3523 Haskins Ben T
3524 Minneapolis Civi De-
3525 No return
3529 Bogie Lee M Co
3544 Sheffield Florists & Nuttery greenhous
3600 Lakewood Cemetery
3601 East Hennepin av
3602 Clark's Super Gas sta
3603 Pen-O-Tex Oil Corp
3604 Rite Mfg Co pistons
3605 Carleton Screw Prod-
3606 Apartments
3607 Thomas Howard B
3608 Wilson Kenneth D
3609 Williams Alberta G
3610 Clair Aloysius V
3611 Chesley Josephine Mrs
3612 Howard Theo J
3613 Vacant
3614 Kenneth J
3615 Howard Ralph
3616 Lead Supplies Inc plmb
3617 Supplies 25 1/2 ends
3618 Hiawatha Box & Barrel Co
3619 Pearson Henry E
3620 Interchemical Corp
3621 Rowe Alvin J
3622 Philier Anthony S
3623 Anderson Benj gas sta
3624 Cramer Elmer R
3625 Olson Al O Tire Co
3626 Kvello Jas
3627 Morrissey Mfg Co metal
3628 Four Corn Oil Co
3629 DuFour Distributing Co
3630 Durrant Arth T
3631 Voltch Chas E
3632 Richards Harry B
3633 Spikens Babe H
3634 White Castle Sys Corp
3635 Anderson's Sewing Machine Service
3636 Anderson Herbert
3637 Kaufman Morris M
3638 Lederman Sol
3639 Flodin Aluminum Fdry
3640 Kahl Geo H
3641 Murphy Wm M
3642 Tempo Mfg Co
3643 Sagendorf Gerald P
3644 Peterson Elsie A
3645 Clements Chester J
3647 Venstad Benj A
3648 Schmeck Herman
3649 Hiawatha Fruit Co
3650 Daniels Margt E Mrs
3651 Rogers Thom L Mrs
3652 Marschall Oscar F
3653 Rite Price Market
3654 Bach E E Millwork Co

- 3122 DeGidio Tony
3126 Fenny Everett B
3130 Peterson Betsy E Mrs
3138 Benson Algot B
3146 Vacant
3147 N S P (sub sta)
3181 Acme Fdry Co
3201 Char-Gale (trans)
3208 Hlawatha Drive Inn
3216 Busch's Garage
3224 Patterson Ceila
3245 Carpenter Paper Co
3301 Imperial Refineries of Minn gas sta
3304 Johnson Geo H
3308 Morrissey Edw
3312 Dahl Edwin C Plumbing
3316 Madison Helen J
3320 Galvin Ambrose J contr
3324 Powers Regular Co
3326 Brezinka Louis J
3330 Erickson Olive M
3341 Landers-Norblom-Christenson Co (whse)
3345 Laugerud Trygve G
3400 Lehan Susie N Mrs
3401 Holman Printing
3420 Red Wood Inn restr
3438 Christensen Victor A
3442 Selby Lloyd T
3443 Hiawatha Electric Sewer & Pipe Clean-
3446 Hazel Jos J A Mrs
3447 Herrick Mary A Mrs
3454 Howley's Tavern
3456 Eversole Grocery
3463 Moriarty Service gas sta
3500 Erickson Albert B
3501 Commander-Larabee Milling Co (eler)
3502 No return
3528 Thompson's Mkt Inc gro
3532 Thompson Off Sale liquor restr
3540 Thompson Floral Co
3544 Haffley Thos H
3556 Carl's Hiawatha Serv gas sta
3600 Asker Pauline Mrs
3616 Benny's Drive In gas sta
3620 Sheffield Harry J
3628 Skjefstad Terry L
3632 King Milton C
3636 Trease Anton H
3640 McAluse John H
3646 Bentson Nellie Mrs
3700 Anderson's Pure Oil Serv Sta
3745 Atkinson Milling Co (mill)
3752 Bert's 66 Service gas sta
3800 Larry's Cities Service Sta
3801 Under construction
3808 Parrish Albert
3815 Ralston Purina Co
3831 Ralston Purina Co (whse)
3832 Ranch Market gro
3852 Dubray Kenneth D
3904 Hafvenstein Andrew G
3906 Kolesar John
3910 Cunningham Frank R
3915 Huhn A Mfg Co mach
3926 Vacant
3928 Hiawatha Home Build-ers Inc
3930 Hiawatha Home Build-ers Inc
4000 Fremming Benj H gas sta
4001 Lake Street Sash & Door Co
4008 Fredrick Murf F
4012 Hansen Louie
4016 Deadrick Ernest M
4034 Wee Par Golf
4100 Lake St Sash & Door Co whse
4108 Dinner Best restr
4112 Vacant
4115 Connors Chas
4120 Vacant
4121 Wood Edw W
4122 Bergstrom Lewis
4127 Vacant
4131 Polansky Henry J
4145 Schubert Wm H
4151 Singer John M
4154 Snyder Bob gas sta

- 4155 Buterworth Edw H
4200-4200 Club 42nd intersects
4202 Knapp Ernie C
4206 Kroska Jos G
4209 Terry's Drive-In restr
4210 Flannery Mary E Mrs
4218 Palmquist Carl L
4222 White Harold M
4223 Melton's Grill
4225 Constoms Int sporting gds
4236 Norrell Earl C
4230 Potrotz Donald L
4251 A & W Root Beer Stand
4310 Nelson Denny E
4325 Printing Inc
4336 Eggan Harold F
4411 Minneapolis Plastic Molders Inc
4432 Haug's Elea R
4436 Hessburg Eleanor A Mrs
4443 Brobak A G Co bidg cont
4447 Eaerg Gerhard
4451 Vacant
4500 Carston 66 Service Station
4501 Gopher Equipment & Supply Co contrs sups
4511 Vacant
4530 Lee Edw W
4539 Armstrong Cork Co
4537 Hartzell Coal & Oil Co Inc
4600 Hiawatha City Service gas sta
4601 Melton's Island-ard Service gas sta
4608 Vacant
4632 McMiller Urban C
4641 Alexander & Kingway contrs
4644 Archambeau Milburne E
4652 Knuppen Wm B
4664 Curtis David W
4668 Ring Dean M
4672 Hillden Kenneth C
4678 Handy Dorsey J
4700 Anderberg Fred W
4704 Wilson Evelyn N Mrs
4708 Anderson Henry G
4720 Thompson's Nursery Seed Store
4733 Polkinghorne Jack E
4734 Bud's Diner restr
4750 Taylor's Pkwy Shell Serv gas sta
4757 Parkway Service Inc gas sta & restr
4914 Vacant
4918 Wheeler Christian E
4920 Olson Carl E
4922 Vacant
4926 Forslund Vernon L
4930 Holter Frank J
4934 Bellinger Cletus E
5000 Carl's Hiawatha Service Station
5028 Novotny John
5040 Glade Rollo M
5040 Norblom Ella M Mrs
5046 Holm Roald G
5050 Almqvist Elmer O
5120 White Chas L Jr
5140 Aucutt Lewis E
5152 Sorenson Harold E gas sta
5300 Barkman Klomens A
5301 Mielke Leo M
5306 Peterson Herbert H
5309 Hallman Richd O
5312 Gisch John B
5315 Vancey Chas B
5328 Vacant
5321 Wheeler Roy H
5324 Westby Oscar
5325 Helen Harts A
5328 Bowers Arth F
5329 Youso Walter F
5332 Dale Clayton M
5333 Lund Herman F
5336 Cassman Geo
5339 Beck Walter E
5340 Kolesar Wm R

HIAWATHA AVE 1955

HIAWATHA AV—Contd

- 5343 Johnson Henry J
5344 Deak R G
5347 Workman Laurens M
5348 Sklaner Robt B
5350 Butler Louise Mrs
5351 Bonin Richd V

4 HIGH —From Bridge Square south to 2d av S, 1 west of the river Marquette av begins

15 HIGHLAND AV— From Roy-al-ton av N northwest to Lyndale av between Royal-iston and Lakoside av

- 2 Schuch Minnie A
9 Vacant
10 Vacant
12 No return
13 Pedersen Herbert
14 Kallunki Marvin H
15 Kallio Raymond P
18-20 Highland Apts
A1-2 Carter Earl E
A3-4 Burke Jos
A5 Standish E B
A6 Dunsker Jos
A7 Vacant
A8 Vacant
A9 Ellsaver John L
A10 Lynch Robt
A11 Vacant
B1-2-3 Hegman Clifford
B4 Vacant
B5 Honkala David D
B6 Erickson Emma
B7-8 Thompson Raymond
B9 Underhill Grace Mrs
B10 Vacant
B11 Brown Harold
B12 Madison Andrew
B13 Laune Esther A Mrs
21-24 Highland Apts
C1 Nelson Walter R
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C3-4 Benson Elmer J
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C7-8 Fryer Jas
C9 Grimes Patk
C10 Armstrong John A
C11 Vacant
C12 Macki Stanley
D3 Vacant
D4 Brown Wm
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D6 Devlin Phillip
D7-8 Badford Delia M Mrs
D9-10 Snodgrass Jesse
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25-26 Wilson Floyd W
27 New Market Cafe
Webber Emery H
28 Apartments
1 Jenkins Hazelteen Mrs
2 Jones Walter
3 McKenny Freeman
4 Bolden Paul
5 Harvell Wm

Highland pl ends 34 Highland Food Mkt gro & meats
Delta Goodwin Terrace
34 McKenzie Clem
40 Fisher Saele H Mrs
Darnelle Howard
48 Mpls-Honeywell High-land Plant
50 Powell Jas R
56 Posey Effie C Mrs
66 Oliver Addie Mrs
70 Swain Mary R Mrs
82 Swain Dan L
76 Kelley Wm M
82 Liljebom Lennie
Jenkins Earl
Gould Pearl Mrs
94 Ringold Mary E Mrs
98 Bobo Jas
104 Jones Shelby T
106 Neal Hrs
110 White Percy L
Percy Sherman
116 Checki Carol Mrs
122 Davis Ira M
Edwards Ira
128 Pentecostal Baptist Church
Ingram L A Rev
134 Crushins Benj A
140 Miller Geo
148 Ames Lodge No 106 (RPOE)

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1522 Lehto Jack S

- Wollschlaeger Morris A
Reininger Walter
Quaman Michl
Sangster Laverne H
Nemes Wm M
1525 Mann Rose I Mrs
1529 Lucke Wilford R
Jorgensen Ernest R
1530 Noel Rudolph F Jr
Working Harriet E Mrs
1532 Whitford Roy
1534 Middlemist Henry B
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1538 Weberg Willard W
Guzy Bertha E Mrs
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1565 Dreleson Mabel H Mrs
Erickson Ralph G
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Crow Ruth E
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Housman Rosemary
McManus Clarence
1626 McDermond Wm
1628 Persons David R
Persons David P
1634 Turquist Alice F Mrs
Garanz Wm
1636 Levenoski Henry B
Norman Swan
Huan av intersects
1700 Skurdahl Alvin A
Asklia Ida M Mrs
1707 Glad Helen M Mrs
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1712 Reithart Wm M
1714 Anderson Fred O
1715 O'Hara Frank
James av intersects
1814 Jellison Wm C
Selpel Martha Mrs
1815 Olson Benny J int
dec
1818 Pearson Albert
1820 Spence Virgil W
Logan av intersects
1910 Olson Harold O
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1912 Bulte Wm H
1914 Duffy Frank J
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Boistad Roy A
1923 Sullivan Edw M
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1953 Duffy Hugh T
1955 Teub Delbert G
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2003 Miller Harry V
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1912 Bulte Wm H
1914 Duffy Frank J
Crome Arth H
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Boistad Roy A
1923 Sullivan Edw M
Andrade Louis
1925 Syverson Hilmer
1929 Campbell Thos J
1953 Duffy Hugh T
1955 Teub Delbert G
1959 Gauke Frank C whol eggs
Newton av intersects
2003 Miller Harry V
2005 Urbanak Anton T
Blalido Louis
2011 Schwartz Adrienne M Mrs
2013 Whalen Thos M
Niznik Edw J
2017 Isker Harold W
2023 Robertson Lillian M
Maurer August W

1522 Lehto Jack S

- Wollschlaeger Morris A
Reininger Walter
Quaman Michl
Sangster Laverne H
Nemes Wm M
1525 Mann Rose I Mrs
1529 Lucke Wilford R
Jorgensen Ernest R
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Niznik Edw J
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2023 Robertson Lillian M
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728 Jones Lena E Mrs

- 728 Jones Benj F
HOLDEN—From N 9th w to Borden av, 1 s of Glenwood av
10th intersects
11th intersects
12th intersects

128 Vacant

- Royalston av intersects
138A Fors Metal Specialties mach
146 American Linen Sup Co (garage)
160 Liennu Clair T
HOLLYWOOD AV — From 3650 Johnson ne to 37th av NE
1600 Vanderblit Wm E
1602 Larson Adln L
1606 Huchinski Jos J
1612 Sexton Jos A
1618 Benjamin Herbert R Jr
1624 Hewitt Clarence V
1625 Sandler Jas
1631 Callender Wayne C
1637 Holloway Anson E
1642 Quast Jas H
1649 Leatt Howard V
1654 Andrajack Frank A
1701 Kraemer Otto F
1707 Heck Russell J
1713 Prangen Pat A
1748 Prangenkopf Albert II
1754 Gauger Wm A

128 Vacant

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128 Vacant







# HIAWATHA AVE 1950

**Used Cars, Wholesale—Retail**      **Repairing All Makes**

1527 W. Broadway, Zone 11      Tel. Cherry 3643

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94

**HENNEPIN AV.—Contd**  
 3149 Rose Betty Mrs @  
 3151 Light Herbert E radios  
 3200 Evans Standard Service gas sta  
 3203 Kerridge Fred D  
 3204 Chaleen Andrew  
 3205 Hennepin Investment Co real est  
 3208 Thompson Robt  
 3209 Apartments  
 1 Hanson Edw T  
 2 Brandenburg Roy A  
 3 Leach Lyle  
 4 Skogerboe Caroline Mrs  
 5 Raines Jas E  
 6 Peterson Alice L  
**Street continued**  
 3212 Kurtz Lillian Mrs @  
 3213 Raymond Ada W Mrs  
 3215 Whitman Nims M Mrs  
 3216 Smith Claude R  
 3217 Bednarek Walter E  
 3220 Beideman Richd R  
 3221 Anchor Realty Co  
 3221-23 Apartments  
 1 Smith Douglas B  
 2 Bradbury Don @  
 3 Vilek Leo J  
 4 Kenney Eloy W  
**Street continued**  
 3224 LaRatte Jerome  
 1 Olson Paul  
 2 Leonard Frank S @  
 3228 Brown Stanley D @  
 4 Sandbade Ed  
 3229 Rooney Bernard @  
 4 Coleman Mark  
 3232 Underhill Stella M @  
 3233 Savage Meade J @  
 4 Jensen  
 3236 Savage C D Tree Expert Co  
 1 Savage Chas @  
 2 Savage Floris  
 3237 Hilln Alex L @  
 3240 Miller Myrtle G Mrs @  
 3241 Hanley Patk L @  
 3242 Apartments  
 1 Aepner Mina O Mrs  
 2 Muehly Agnes J  
 3 Brown Florence L  
**Street continued**  
 3244 Frevel Bart W @  
 1 Standard Home Serv Co  
 2 Weather Strip  
 3 Source of Supply Inc  
 4 contrs equip  
 3245 Apartments  
 1 Gambie Ray E  
 2 Barr Roll E  
 3 Zeller Jack L  
 4 Kraskey Tony J  
 3248 Payne Esther A Mrs @  
 3254 Troxel Harry @  
 3255 Bloodham Motors autos  
**33rd Intersects**  
 3300 Mullan Edna M Mrs @  
 3301 Jacobson Swan H @  
 3304 Stratton  
 3305 Wood Irene K Mrs  
 3308 Schwertsinske Delop @  
 3309 A. Whelan Eric  
 4 Nelson Kenneth R @  
 3311 Melling Thos C @  
 3312 Hvas Chas T @  
 3314-17 Apartments  
 1 Saml Trio Beauty Shop  
 2 Silver Saml J furs  
 3 Cody Wm K  
 4 Osborne Saml  
 5 Harberg Ernest G  
**Street continued**  
 3316 Woodlen Frank M  
 3318 Chasler Chas E @  
 3320 Nickolatos Gust J @  
 3321 Wright Montgomery W @  
 3324 Johnson Robt W  
 1 Haines Ruth E Mrs  
 3325 Quenby Arth H exter-  
 1 minator  
 3326 Scheiber Severina Mrs  
 3327 Ross Lloyd H  
 3329 Heintz Arth M @  
 3331 Sutliff Elbert A @  
 3332 Gould Harold @  
 3334 Johnson Raymond F  
 1 Erickson Carl R @  
 3335 A. Erickson Louis F @  
 3335-38 Erickson's Grocery  
 3341 Apartments  
 1 Slorby Edwin A  
 2 Underwood Miller H  
 3 Morrow Donald E  
 4 Emanuelson Mathilda C  
**Street continued**  
 3342 Lakeview Pharmacy  
 3344 Gopher Realty Co  
 3344 1/2 Vacant  
 3345 Tenold Oscar A  
 1 Nelson Duane L  
 3346 Larson Frank meats  
 1 Ristrum Geo F  
 2 Bumburg Donald D  
 3348 Dreiman Saml N gro  
 24th Intersects  
 3400 Artington Edw N @  
 1 Halvorson Henry A  
 3401 Aarnest Saml E @  
 3404 Palmer Kenneth B @  
 3405 Genyres Wm G @  
 3408 Bowen Don P @

**3411-13 Apartments**  
 1 Vost Howard G  
 2 Nelson Kermit J  
 3 Bishop Eleanor A  
 4 Simionich Sophie J  
 5 Nylander C Henry  
 6 Ericson Chas G @  
 7 Probst Al H  
 8 Kennell Leroy H  
 9 Dodman Michl S  
 10 Farnham Kath M  
 11 Maunsell Frances  
 12 Biesard Thos  
 13 Olsen Peter V  
**Street continued**  
 3414 Brown Fred A @  
 3416 Belzer Meyer M @  
 3417 Blowers Elwin F @  
 3420 Durrance Albert F @  
 3421-23 Apartments  
 1 Murray Max E Mrs  
 2 Bupp Luna W Mrs  
 3 Green Edw E  
 4 Perrin Nathan J  
**Street continued**  
 3424 Resenstihl Sadie Mrs  
 3425 Sletky Edw B @  
 3425 Boyer Margt R Mrs @  
 3428 Axilrod Harold M  
 3429 Apartments  
 1 Speliopoulos Theo P @  
 3432 Johnson Emil  
 1 Luncher Yv E  
 3435 Jamison Louise H Mrs  
 3436 Davis John O  
 3439 Orneside Clar H  
 1 Powell Donald A @  
 2 Olson Stias  
 3440 Mandell Oscar F  
 3440 No return  
 3444 Bowlin A Homer  
 1 Stelmets Jennie C @  
 2 Revter Roger C  
 3444 Weaver Adele Mrs  
 1 Flornshin Max J  
 3445 Mahlin Wm W  
 1 Mahlin Wm T @  
 3453 Lane Cornelius R @  
 35th Intersects  
 3501 Garlock R-Roofing Co  
 1 Lincoln Elec Co  
 3508 A. Richards Engineering Co  
 1 Michaud-Hickey Realty  
 1 Inc  
 2 Neils H L Investment  
 Co real est  
 3216 Apartments  
 1 Bjork Nellie B Mrs @  
 2 Donovan Frank P Jr  
 3 Norton  
 4 Berger Gen L  
 5 Bergert John R  
**Street continued**  
 3515-18 Apartments  
 1 Bjork Monument Co Inc  
 3517 Ros Gust Studio  
 1 decarators  
 2 Sales Engineers mtrs rep  
 3 West End Air Condition-  
 3523 Ingalls Robt C @  
 3524 Vacant  
 3525 Venuzke Elroy W @  
 3528 Bogie Leo M Co  
 3544 Sheffield Florist &  
 1 Nursery greenhouse  
 36th Intersects  
 3600 Lakeswood Cemetery  
 1 Lakeswood Cemetery Assn  
 2 Lakeswood Cemetery  
 3 Greenhouse  
**HENNEPIN AV EAST — 6**  
**East Hennepin av** 94  
**HIAWATHA AV.—From E 22d**  
 and Cedar av to limits  
 24th Intersects  
 2401 O'H Service Co Inc  
 2408 Clark's Super Gas (br)  
 1 fill sta  
 2419 Penn-O-Tex Oil Corp  
 2420 Riefti Mfg Co plators  
 1 Johnson Wm  
 2424 Carleton Screw Products  
 Co  
 2430 Apartments  
 1 Vinson John L  
 2 Bryant Leroy H  
 3 Williams Alberta  
 4 Quinn Mary C  
**Street continued**  
 2434 Emmet Jas J  
 1 Selness Orrell A  
 2 Shephard Urey  
 3444 Cheskey Harry A @  
 1 Rhyn Inel  
 2449 Howard  
 2500 Howard Theo J @  
 2501 Coal-Box Co Inc  
 2506 Spillman Kate E Mrs @  
 2523 Northwestern Smelting  
 & Refining Co  
 25 1/2 ends  
 2533 Hiawatha Box Co  
 2538 Vacant  
 2542 Medrano Andrew  
 1 Medrano Jos @  
 2546 Jones Rudolph  
 1 Rowe Alvin J  
 2548 Gunderson's One Stop  
 Service  
 26th Intersects  
 CMSP&PR trusses 96  
 2840 Cramer Elmer R @  
 29th Intersects  
 2908 Dorste Alma W Mrs  
 1 gas sta  
 2012 Kvollo Jos @

**2919 DuFour Jos W Coat**  
 2920 Durrant Arth T @  
 2926 Voltz Chas P @  
 2930 Richards Harry B @  
 2932 Spilans G @  
 23d av Intersects  
 Lake Intersects  
 3001 White Circle Corp  
 No 15 restr  
 3015 Oshang Ralph E  
 3016 Kaufman Morris fruits  
 3018 Helser Products Inc  
 1 roller rink supplies  
 3020 Kaufman Morris M @  
 1 Aquilney Kath  
 3022 No return  
 3023-27 Flodin Aluminum  
 3026 Kahl Geo H @  
 3030 Benson Ole P @  
 3031 Tempo Mrs Co  
 3034 Gabrielson Carrie S  
 1 Mrs @  
 3038 Petersen Morris S  
 3039 Christiansen Harley E @  
 3044 Peterson Elna Lewis @  
 1 Fitchie Arth W  
 3047 Segelstrom Raymond S  
 3051 A. Goodrie Sylvester J @  
 31st Intersects  
 3100 Hiawatha Fruit Co  
 3109 Finckhert Ellen W  
 1 Hill Vernon B  
 3112 Peterson Willard O @  
 3115 Schmeck Ross M Mrs  
 3147 N S 2nd Intersects  
 1 Garmatz Otto E  
 3121 Bach E E Millwork Co  
 3122 DeGroot Jerry G @  
 1 uphol  
 3126 Mitchell Harry G @  
 3130 G. Reuber H. Hansen  
 1 Peterson Betts E Mrs @  
 3138 Benson Algot B @  
 3148 Petrich Wm F @  
 3147 N S 2nd Intersects  
 3161 Acme Fndry Co  
 25th av Intersects  
 3201 A. LaTuff Transfer Service  
 1 Inc transportation  
 2 Achar-Gale (Transp) divi  
 3208 Kinnaird Drive  
 3216 Duowan Orville R gas  
 1 sta  
 3224 Nelson Timothy\* 98  
 33d Intersects  
 3301 Imperial Refiners of  
 1 Main Inc gas sta  
 3304 Vacant  
 3308 Morrissey Edw @  
 3312 A. Bruyn Chas E @  
 3316 Gabrielson Geo M  
 3320 Fish Vivian F Mrs  
 3326 Kling Albert W @  
 3330 Erickson Olive M @  
 3345 Landers-Norblom-  
 1 Christenson Co (whse)  
 2 Laugerud Torvres C  
 34th Intersects  
 3400 Lohan Susie N Mrs @  
 1 Lorenson Arth A  
 3401 Priority Milling Inc feed  
 1 Rickels S & Son  
 27th av Intersects  
 3438 Christensen Victor A @  
 3442 Solly Lloyd T @  
 1 Higgins Electric  
 2 Sewer Clng Co  
 3448 Hazel Jos J @  
 3450 Herrick Frank M  
 3454 Stop In The beverages  
 3456 Eversore Chas R gro  
 3463 Moriarty Service auto  
 1 repr auto gas sta  
 35th Intersects  
 3500 Lane Helmer T @  
 3501 Commander-Laraba  
 1 Milling Co (elev)  
 3528 Thompson's Mkt Inc gro  
 3544 Haffely Thos H @  
 3556 Carl's One Stop Serv  
 1 auto repr  
 36th Intersects  
 3600 Asker Pauline Mrs @  
 3616 Tanker Gas Inc Sta No  
 19  
 3620 Madden John T @  
 3628 Skjelstad Eader @  
 3632 King Milton C @  
 3636 Cosgrove Kenneth W @  
 3640 Johnson Walter G @  
 3646 Bentson Albin R  
 37th Intersects  
 3700-04 Gordy's Garage  
 1 Central Oil Sup Co  
 30th av Intersects  
 3745 Atkinson Milling Co  
 1 (mkt)  
 3752 Berr's 66 Service  
 38th Intersects  
 3800 Anderson's Bulk Service  
 3801 Direct Service Oil Co  
 1 fill sta  
 3808 Brulle Francis @  
 1 Nekomis av Intersects  
 3815 Ralston Purina Co  
 1 cereal mtrs  
 3831 Ralston Purina C whse  
 3836 Rutman Sam

**3852 Johnson H Earle @**  
 39th Intersects  
 3904 Hafvenstein Andrew G  
 3906 Kolesar John @  
 39th Intersects  
 3910 Cunningham Frank R  
 1 Kelly Ambrose M  
 3915 Hohn A Mfg Co mill  
 1 machinery  
 3936 Hiawatha Lewis E  
 3950 Minnebaha Terrazzo &  
 1 Cement Co  
 40th Intersects  
 4000 Hiawatha Motor Co fill  
 1 sta  
 4001 Lake Street Sash &  
 1 Door Co  
 4008 Pretter John F  
 4012 Banks Everett W @  
 4016 Deadrick Ernest M @  
 4034 Wee Par Golf  
 32d av Intersects  
 4106 Lowe Chas W @  
 4111 Hiawatha Shoe Repair  
 4112 A. Truone Hilman  
 4115 Connors Chas @  
 4121 Woods Edw W @  
 4122 Bergstrom A Lewis @  
 33d av Intersects  
 4127 A. Bemis Kenneth W  
 4131 A. Biedern Earl @  
 1 Robert Walter S  
 4143 Schubert Herman G @  
 4151 Singer John M @  
 4154 A. Kallunki Clarence H  
 4155 A. Armonies Martha Mrs  
 4159 Tysdale Peter @  
 4163 Kemi-A. 42d Intersects  
 4200 Knapp Ernie C  
 1 beverages  
 42nd Intersects  
 4202 Knapp Ernie C @  
 4204 A. Truone Hilman  
 4209 A. Culp's Pension Custard  
 4210 Kallunki Clarence B Mrs @  
 4218 A. Finckhert Carl L @  
 4222 A. Thompson Donald F @  
 4223 A. Anderson's Coffee Shop  
 4225 A. Carlson's Heating &  
 1 Sheet Metal Inc  
 4226 A. Norell John H @  
 4228 A. Kallunki Danl @  
 4251 Under construction  
 132  
 34th av Intersects  
 4310 A. Falkanger Harold E  
 4325 A. Char-Gale Mfg Co  
 1 sht ml products  
 4336 Egan Harold E  
 35th av Intersects  
 4411 Minneapolis Plastic  
 1 Molders Inc  
 4412 A. Tool Co die mtrs  
 4432 Benz Edith M @  
 4436 No return  
 4443 A. Erickson Arth G Co  
 1 bldg mts  
 36th av Intersects  
 4447 Carlson Arnold A @  
 1 carp. contr  
 4451 Olson Harry S @  
 45th Intersects  
 4500 A. Sadosky Andy gas sta  
 4501 A. G. Smith & Son  
 1 Supply Co road equip  
 4522 A. Malone Frank  
 1 Rentals  
 4523 A. H. Hill Carl G  
 4557 A. Black Hawk Coal Co  
 1 Harl Hill Oil Co  
 1 Inc  
 4572 A. Hartzell Sand Co  
 1 Wawin Hill Gr  
 37th av Intersects  
 4601 A. McNew-Nelson Standard  
 4608 A. Granger Contracting Co  
 1 Inc  
 4612 A. Granger Ray  
 4641 A. Alexander Construction  
 Co rd contrs  
 4644 A. Arambau Wilburn E @  
 4652 A. Kuennen Wm R @  
 4664 A. Curtis David W @  
 4668 A. Anderson Clyde E @  
 4672 A. Radke Walter E @  
 4676 A. Handy Donald J @  
 4700 A. Anderson Fred W @  
 4704 A. Wilson Raymond C @  
 4708 A. Anderson Henry G @  
 4720 A. Osterberg Oscar W  
 1 repair shop  
 4734 A. Ray's Diner  
 4750 A. Taylor's Pkwy Shell  
 1 Serv gas sta  
 4757 A. Parkway Service Station  
 1 gas sta  
 Nawadaha divd Intersects  
 Minnehaha pkwy Intersects  
 48th Intersects  
 4806 A. Bolander Donald L @  
 4818 A. Peterson Arth W @  
 4820 A. Fox Richard M @  
 4822 A. Arningquist Edna M Mrs  
 4826 A. Forslund Vernon L @  
 4830 A. Benson Chas R  
 4834 A. Bollinger Cletus E @  
 50th Intersects  
 5000 Vacant  
 44th av Intersects

**HIAWATHA AV.—Contd**  
 5028 A. Novotny John @  
 1 Newman Marrel F  
 5040 A. Norblom Ella M Mrs @  
 5050 A. Almqvist Edm M @  
 51st ends  
 5120 A. Wauht Lillian E  
 46th av Intersects  
 5140 A. Aull Lewis E @  
 5152 A. Sorenson Harold E gas  
 1 station  
 52d ends  
 134  
 47th av Intersects  
 536 Intersects  
 48th av Intersects  
 5300 A. Backman Klemens A @  
 5301 A. Mielke Lee J @  
 5306 A. Peterson Herbert H  
 5309 A. Tallman Richd O @  
 5312 A. Jarsnek Ernest @  
 5315 A. Tancey Chas B  
 1 A. Sel Lyle F  
 5320 A. Towers Stanley A @  
 5321 A. Wheeler Roy H @  
 5324 A. Westby Orest @  
 5325 Under construction  
 5328 A. Bowers Arth @  
 5329 Under construction  
 5332 A. Dale Marie L Mrs @  
 5333 A. Lund Herman F @  
 5336 A. Balmer Don L @  
 5338 A. Schaefer Wm F @  
 5340 A. Kolesar Wm R @  
 5344 A. Cook Robt L @  
 5348 A. Carlson Lauri M @  
 5350 A. Butler Louise Mrs @  
 5351 A. Bonin Richd W @  
 54th Intersects  
**HIGH — From Bridge Square**  
 and 2d av S, 1 west of the  
 14th  
 Marquette av begins  
**HIGHLAND AV.—From Royal-**  
 15  
 16th N. N. Hartley to Lyn-  
 17th  
 18th  
 19th  
 20th  
 21st  
 22nd  
 23rd  
 24th  
 25th  
 26th  
 27th  
 28th  
 29th  
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 91st  
 92nd  
 93rd  
 94th  
 95th  
 96th  
 97th  
 98th  
 99th  
 100th

**5725 HI-WAY 7**

**GOOD FOODS, INC.**

Manufacturers of  
**SKIPPY Peanut Butter**

Tel. Whittier 1851



HIAWATHA AVE 1946

HIAWATHA AV—Contd
3450 Herrick Frank M
3454A Furon Harold E beverages
3456A Everette Chester R gro
3463A Senak Ralph J auto repr
3500 Lane Helmer T
3501A Commander-Larabee Milling Co
3523A Thompson Mary Mrs gro
3544AHaffely Thos H
3600A Asker Pauline Mrs
3616AGold Star Welding & Garage
3820ARouth Glen I
3828ASkjefstad Raymond A
3832AKing Milton C
3836ALee Jim Len
3840AJohnson Walter G
3846ABenson Albin R
3700-04AJohnson Walter G auto repr
3745AAtkinson Milling Co mill
3800ABulk Oil Co fill sta
3801ADirect Service Oil Co fill sta
3808 Kurtz Louis M
3831APurina Mills feed mfrs
3832A Purina Co cereal mfrs
3836 Vacant
3852 Lehnen Theo H
3904AHafvenstein Andrew G
3906AKolesar John
3910 Cunningham Frank L
3915 Huhn A Mfg Co mill machy
3919A Olson Gordon L trucking
4000AHiwatha Motor Co fill sta
4001ALake Street Saah & Door Co
4008A Kreter John F
4012 Vacant
4016 Deardrick Ernest M
4106ALowe Chas W
4112A Lodiendorf Chas
4115A Commers Chas
4121APicciano Paul A
4122A Bergstrom Lewis
4127ABemis Kenneth W
4131ADanielsen Elmer M
4132A Hubot Walter S
4133ASchubert Herman G
4151ASinger John M
4154AFloyd Robt R fill sta
4155A Armonies Max
4159ADaymond Raymond A
4163ADysdale Peter fill sta
4200AKnapp Ernie beverages
4202AKnapp Ernie
4206ASusiner Stanley A
4209ATanko Bros auto repr
4210AKellington Hazel B Mrs
4218APalmquist Carl L
4222AScogan Wm
4225ACronstrom's Heatinz & Sheet Metal Works
4226ANorell John H
4230A Stanko Danl
4310 Pletcher Arin L
4336ANelson Norman
4401AMinneapolis Plastic Molders
4402ABenz Wm F auto repr
4436A Hessburg Eleanor A Mrs
4441 Vacant
4447ACarlson Arnold A
4451 Olson Harry S
4500A Holme Bros fill sta
4501AGoscher Equipment & Supply Co road equip
4511AMalone Frank
4530ALee Edw W
4537A Black Hawk Coal Co
4574AHartzell Coal & Oil Co Inc
4608ANutter Bros auto repr
4644A Aronmanau Midburn E
4652AKuennen Wm B
4664 Curtis David W
4668A Anderson Clyde E
4672ACorredato Dino A
4676A Heady Dou J
4700A Anderberg Fred W
4704AWilson Raymond C
4708 Anderson Henry G
4745 Vacant
4750A Westensee Emmell fill sta
4757AParkway Service Station
4801 Vacant
4916ATrakowski Fred W
4918APeterson Mary Mrs
4920AMcArthur Chas D
4922A Anstensen Tilmun A
4926AForsland Vern L
4930ABroughton Robt M
4934ABellinger Clota E
5000AMichaels F H fill sta
5028 Boeser Emil H
5040ANordblom Ella M Mrs
5050A Almqvist Elmer O

5120 Chastek John M
5140AAucutt Lewis E
5200ABackman Klemens A
5201AMielke Leo J
5206AKnox Howard J
5209A Hallman Klond O
5212APatrnek Ernest
5220 Emerson Ralph W
5221 Wheeler Roy H
5224A Westby Oscar
5228 Daniels John R
5233ALund Herman F
5239A Heck Walter E
5247A Workman Laurenc M
5248 Carlsen Robt A
5250A Butler Louise Mrs
5251ABonin Klond V
5300A Backman Klemens A
5301AMielke Leo J
5306AKnox Howard J
5309A Hallman Klond O
5312APatrnek Ernest
5320 Emerson Ralph W
5321 Wheeler Roy H
5324A Westby Oscar
5328 Daniels John R
5333ALund Herman F
5339A Heck Walter E
5347A Workman Laurenc M
5348 Carlsen Robt A
5350A Butler Louise Mrs
5351ABonin Klond V
HIGH—From Bridge square south to 2d av S, 1 west of the river
HIGHLAND AV—From Royalston av N Northwest to Lyndale av between Royalston and Lakeside avs
1000A Highland Apartments
1-2 Baker Chas
A3-4 Pertinen John
A5 Coulter Dora Mrs
A6 Ring Jos
A7-8 Carter Earl E
A9 VanEtten Ruben
A10 McCarthy Timothy J
A11 Ohlstrom Henry
A12 Lamoresch Wm L
B5 Wilson Floyd
B6 Villeneuve Al
B7 Ellers Dolores O
B9 Wietron Jean
B10 Clark Chas
B11 Black Donald
Street continued
19AD Madison Andrew
21ALaine Esther A Mrs
22-24 Highland Apartments
C1 Henokski C E
C2 Benson Elmer J
C3-4 Corey Sidney L
C5 Sand Oscar A
C6 Bryan Marion D Mrs
C8 Fryer Jas E
C9 Lajack Mary
C10 Armstrong John
C11 Westerlund Doris
D1 Hultner Marie H
D2AWinkelmann Alf
D3-4 Frigaard Ervin L
D5 Eskilten Vivian
D6 Bihout John E
D7-8 Hendrickson John
D9-10 Quayle Clarence
D11 Dahl Bernard
Street continued
25AWilcox Floyd W restr
27ARowe Ray
28AEwing Jos A
Ewing Jos A
34ARosenfield Simon
Hauskins Florence M Mrs
ASKlader Louis gro and meats
AFisher Sadie H Mrs
50AManion Clarence F
56A Anderson Ada M Mrs
Ervin Frank
Johnson Frank E
Nelsen Victor E
70ACorden Thos P
71 Bernard Saml
82AFrazier Arth T
AThompson Chas C
94ARiggins John M
95ABobo Jas
104 Ewing Merton O
ADavies Jas R
AClay Geo
Lytle Claude
110 Barnes Abb Leon
ACarlisle Cleota L Mrs
116 Cash Walter
AChnecki Jos M
Dunavsky Max
122ADavid Ira M
128ARum Boogie Cafe
128 1/2 Wilson Ben
134ACrushton Benj A
AO Shields Marie F Mrs
140AMiller Geo
148ABPOE Ames Lodge No 106
HIGHLAND PLAGE—From Border av east to Highland av, 2 north of Glenwood av
11 Richter Martha M Mrs
HIGHVIEW AV—From Prospect av east to Long View ter, 2 north of Winnehaha pkwy
27ACook Geo F
35AGreter Harold C
HILLSIDE AV—From Irving av north and 21st av northwest to 25th av
1503A Commers Delia E Mrs
1513A Palmer Ingelborg M Mrs
1514 Erickson Gabriella Mrs
1517 Webster Willis
1521A Stewart Moses F
1522 Pihlstrom Vesta C Mrs
ACorcoran Jas R
ASnell Ben A
1525AMann Rose I Mrs
1529 Hayes Paul W

1530A Noel Rudolph F
1533A Carlson Geo E
1534AMidlemist Henry B
1537AMcNiff Ray F
1538AKnapp Lester T
1541A Nivola Viola E
Welch Kenneth E
1542AWeld Orson A
1545A Engen Theo M
1546AJasper Frank R
1547ASherard J Wesley
1550A Reinking Geo L
1551A Shively Viola E
1554ASausele Emma M Mrs
1555AMeyers Anna Mrs
1558AMontour Edwin J
1559 McIntosh John R
1564AWalsh Lawrence S
1565ABredeson Mabel H Mrs
1566A Olson Olga C Mrs
1600A Parcell Wm J
1601AMeyer Carl F
1602AMarks Nicholas E
1607 McClellan Ralph W
1607A Bialistka Teta Mrs
1608A Hierlinger Lloyd W
1608 Lewis Marvin
1611A Devery Patk J
1612A Conover Louise C Mrs
Fischer John
1613AVoilbrecht Carl A
1617 Anderson Fred
ACarpenter Hubert J
1618ABrown Minnie B Mrs
AGrunike Henry H
Smetsen Wm J Mrs
1621 Burns Wm F
1622ADevine Jas
ASmita Sadie
Stag Lester
1626AJohnson Edwin W
1628A Engquist Elmer C
APersons David E
1634ATurkman Carl
MickKadacy Chester
1636A Beahan Jos A
ATimmons Robt C
1700A Hamilton Phillis R
1707AMeyer Wm J
1708A Chapman Chas P
1712AStrunk Frank R
1712A Reinhart Wm M
1714 Edison Motor S
1715AO'Hara Frank
James av intersects
1814AJellison Hattie L Mrs
Thies Fredk J
1815AHogan Humphrey T
1816A Garrison Albert
1820AWoyke Henry
Logan av intersects
1906 Vacant
1910A Olson Harold O
1912ABolte Wm H
1914ARosen Paul G
ASwanson Theo P
1913 Bolstad Rol A
ASchmuiz Aug
1928ALandquist Fred
1925 Turmus Helmer L
1929ASooler John
1933 Hagen ngs S Mrs
1935 Ferrigan Geo L
1938AKnarrt Jacou L
Newton av intersects
2003 Gill Agnes Mrs nurse
AWorthing Elva A
2005A Abrams Jos E
2011ASchwartz Henry M
2013ADunnigan Eva A
AKomatko John Mrs
2017ASaker Harold W
2023 Gerber Walter C
ASreed Ernest V Rev
HOAG AV—From Royalston av north to 8th av N, 3 east of Lyndale av
75ALear Walter
McCarthy Stella Mrs
77A Earl Irene Mrs
ADames Geo W
79 Brown Julia Mrs
79AScott Robt G
81 Guinn Beaser
ADackson Wm E
83ATolliver Frank D
AWatts Lester L
Jones Alton
85 1/2 Martin Susie Mrs
ARobinson Louis
89A Anderson Ruben J
ADisa Suoma M Mrs
ADisen Allen O
ARichard Bert E
93AHarris Jas C
ACain Wm M
N 7th intersects
610A North Western Hanna Fuel Co (garage No 4)
620 Smallwood Tressaionia Stone Geo K
7th av intersects
728 Freeman L Stewart
728 Robinson John
HOLDEN—From N 9th west to Border av, 1 north of Glenwood av
85 Vacant
128 Sherman Wm T
Royalston av intersects
134AKamp's Ice Cream Co garage
137A Swan Big Co tire molters
146A American Lumber Co garage
160ALibau Clair T restr
HOLMES AV—From The Mall north to W 36th, 1 west of Hennepin av
2870 Lagoon Apartments
Apartments:
bmsntA Allen Geo C
101APerry Vera E Mrs
102ANelson Wm H
103AMurray Ella W Mrs
104AMorris Mabel O Mrs
105AFleming Louise A

HOLMES AV—Contd
Lagoon Apartments—Contd
106ASanderson Chas C jr
107A Olson Thor O
108ATodd Ruth P Mrs
201ALundgren Carl L
202ASlater Harold M
203A Whelstone A P
204AKemp Leo
205ABryan Ebel A
206AHord Caroline Mrs
207ANordenfoss Bernice M Mrs
208ATwinc May S Mrs
301AGillespie Petra S
302ARichardson Jas
303ALaittre Earle W
304ADawson Chas F
305AMoore Arto F jr
306A Hilpek Albert T
307A Anderson Essie M Mrs
308A Ohman Ruth L Mrs
Street continued
2873 Lagoon Apartments
Apartments:
bmsnt Dars Allen A
1ASeiberlich Leo L
2AOchs Harold C
3ACarlson Ruschli
4 Haxton Chas L
5AKidder Marguerite A
6ARowley Minnie A Mrs
7 Griggs Wm B
8 Rundblom Elmar W
9ABarton Helen C Mrs
10A Anderson Jessie M Mrs
11A Olson Beulah P Mrs
12AEllhot Angeline H Mrs
Street continued
2877 Lagoon Apartments
Apartments:
bmsntA Williams Cedric K
1AShort Mabel M Mrs
2APurdy Edw T
3ABuchley Grace M Mrs
4AGreco Jas B
5AKlovstad Thos
6ASloutt Arlene L
7AGrace Dargine M Mrs
8ALove Jas C
9ADurista Leonard
10AJohnson Arnold H
11AJackson Iver E
12A Hokey Edith H
Street continued
2878 Lagoon Apartments
Apartments:
bmsntA Nystuen John B
1AJerome Mable W Mrs
2A Olson Helen S
3AJohnson Milton H
4AJohnson Gustaf H mfrs act
5A Seebach Fred J
6A Crockett Jennie Mrs
7A Crockett Curtiss V
8A Frey Winifred H
9A Thompson Emma Mrs
10ARandall Chas W
11A Peltou Zee H Mrs
12AMalia Francis E
Street continued
2883 Lagoon Apartments
Apartments:
bmsntA Dunne Vincent R
1AEngelman Effie Mrs
2ABardouche Margt O Mrs
3A Anderson Tena
4A Farwell Richd
5ARiley May H
6ADallan Albert A jr
7ALenox John H jr
8APeters Forrest J
9A Andrus Kenneth C
10AMoulton Frank V
11AGess Paul E
12AKress Oscar A
2910 Apartments Lagoon av intersects
1ASherman Fred W
2 Zetah Vern
3ASmith Elmer P Mrs
4ADahlen Alf C Lake intersects
3003AKolosky Victor D
ARick John H
3008A Edmond Leunie H
3009A Staber Geo J beauty shop
3013A Ekstrom Gustave W
3014 Antoinette Apartments
Apartments:
1A Chaik Edwin J
2AMoratzka Fredk A
3AJones Susan B Mrs
4ACaldie Herschel E
5A Albinson Reuben N
6A Armstrong Jos L
7AKennis Wm D
8ASchlemmer Gertrude H Mrs
9ADragon John J
10AMCullough Clara I Mrs
Street continued
3016AWerzes LeRoy P
3017A Kalar Julius
3020A Foster Elmore H
AJohnson Jos
3021 Gravdaal Oscar P
AHartzell Richd S
3024A Harrison Annette C Mrs
3027ANiemac F Ethel
3028ADallis Paul L
3029 Apartments
bmsntA Frank Roger S
ASkrjack Jos
1A Anderson Edgar O
2A Thompson Mabel A Mrs
3ABlock Ida L Mrs
4AParkins Alice Mrs
Street continued
3030A Harrison Howard M
3032AKnox Martt C
3033A Eildred Betty F Mrs
AFrancis Fern M
AThorstad Harold M
3034AKnox Clarence L
3036A Weisen Robt E
3037 Apartments
1A Pope Edw D
2A Cresner Perry E
3A Franckel Jos A
4ADanielson Frank
5AJohnson Clifford M
6ASchwartz Rebecca
7AVolding Ella N
8AWanvig Florence T Mrs
9AWaener Herman L
10ABames Lettie M
Street continued



54TH E 1940

SOUND INSURANCE PROTECTION AT A SAVING IN COST

FIFTY-THIRD W—Contd
1118 Andrews Edson J
1119 O'Toole Edw M
1122 Hayward Robt V
1123 Kulp Thos M

Shelley Jos M
Emerson av intersects
1200 Upham Lionel R
1202 Adamson Edwin C
1206 Miller J Carleton
1209 Hall Levi M Hon
1210 Waldo Earl A
1214 Harder Porter E
1215 Durrrell Roy S
1218 O'Brien Frank C
1219 Card Delbert R
1222 Day Osborne R
1223 Huber Wm J
1226 Brown Wm H

Fremont av intersects
1300 Schueller Adolph R
Girard av intersects
Humboldt av intersects
Irving av intersects
James av intersects
Knox av intersects
Logan av intersects
Moody Sheldon D
2018 Blaese Robt M
2022 Herrick Paul H
Newton av intersects
2100 Borch Clifford G
2102 Barrett Jas W
2104 Barker Merlin M
2110 Tull Howard O
2114 Lillehell Axel O

Oliver av intersects
2200 Dugan Ralph F
Penn av intersects
2400 Thompson John T
Upton av intersects
2815 Kline Jason H
2821 Mark Maurice K
Vincent av intersects
2915 Edwards Earl E

Washburn av intersects
Xerxes av intersects
York av intersects
Zenith av intersects
Abbott av intersects
Beard av intersects
Chowen av intersects
Drew av intersects
3712 Wilson Robt A
Ewing av intersects
France av intersects

FIFTY-THREE AND ONE-HALF E — Changed to Mondamin

FIFTY-FOURTH E — From 5341 Nicollet av e to Nokomis blvd and from Woodlawn blvd to the river

17 Roth Ruth E
19 Jensen Grace Y Mrs
21 Smith Dean S
23 Dickinson Wm
25 Landquist Herman J
27 Vacant
99 Griffis Herbert A
1st av intersects
101 Scherer Theo A
Stevens av intersects
2d and 3d avs intersect
Clinton av intersects
4th av intersects
Portland av intersects
624 Baillie Jas
Baillie Leonard T
Chicago av intersects
740 Bratrud Mina beauty shop
742 Seivert Wm P dentist
Elliot av intersects
10th and 13th avs intersect
1307 Boden Gordon E
1315 Rhoades Herbert E
1323 Hoey Errol

14th av intersects
1400 Compton Roy G
1404 Vacant
15th av intersects
Bloomington av intersects
1526 Lyons Wm D
1530 Allen Loren L
Goodrich Harry L
1534 Clay Earl C
Garfield av intersects
612 Parrette Mark L gro
614 Vacant
616 McLaughlin C J Indry
Lyndale av intersects
Aldrich av intersects
Bryant av intersects

3118 Patch Renford M
3130 Smith Ray D
32d and 33d avs intersect
3300 Johnson Carl J
3306 Wallin Alf H
3310 Moody John K
3317 Berg John F
3318 Funk Hubert R shoe rebldr
3321 Thompson Gust barber
34th av intersects
3405 Sowles Cecil H
3409 Vacant
3417 Launceford Earl G
3421 Kolb Clinton C
3425 Huotte Margt J Mrs nurse
3501 Swedien Pehr A
3509 Anderson Christine Mrs
3517 Baloc John J
3521 Noble Hartsel L
3525 Haugness Ingvald
3527 Arneson Melvin A
36th av intersects
3601 Bailey Benj B
Rataczak John G
3607 Carston Wm L
3611 Swanson Lawrence B
3619 Johnson Beverly H pntr
37th av intersects
3701 Crozier John B
3709 VanHeuveln Wm
3715 Johnson J Albert
3723 Platt Melvin G
3727-29 Carr Ralph W gro and meats
38th av intersects
3801 Boren Edw fill sta
3811 Slabej Roy W
3815 Anderson Walter F
3817 Northcutt Gordon B
39th av intersects
3901 Magnusson Martin gro
3903 Larsen Asbjorn H
3911 Erickson Elvin O
3921 Bofferding M W
3925 McMullen Lee R
40th av intersects
4001 Frondell L C
4005 Foster Lawren P
4011 Peavey Jos E
4017 Evjen Thorleif
4021 Linn John A
4025 Cunningham Earl J
4029 Switala Roman A
41st av intersects
4101 Vacant
4111 Sherwood Reine
4115 Lovas Edd J nurse
Lovas Dorothy A
4119 Rosdahl Hjalmer B
42d av intersects
4201 Houser Geo W drugs bsmt vacant
4203 Remick John gro and meats
4205 Strandy C M baker
4207 Kachel A A beauty shop
Klevan Carl B barber
4209 Morton Saml J variety store
43d av intersects
4301 Vacant
4303 Nichols Jacob F confr
4305 Levetentz Holger E shoe rebldr
4307 Anderson Adeline E beauty shop
Pratt Harry E barber
4309 Brown Thos W tailor
4311-15 Natl Tea Co gros and meats (br)
44th and 50th avs intersect
5100 Beaty Warren H
5106 Bjerke Norman R

3130 Smith Ray D
32d and 33d avs intersect
3300 Johnson Carl J
3306 Wallin Alf H
3310 Moody John K
3317 Berg John F
3318 Funk Hubert R shoe rebldr
3321 Thompson Gust barber

34th av intersects
3405 Sowles Cecil H
3409 Vacant
3417 Launceford Earl G
3421 Kolb Clinton C
3425 Huotte Margt J Mrs nurse
3501 Swedien Pehr A
3509 Anderson Christine Mrs

35th av intersects
3517 Baloc John J
3521 Noble Hartsel L
3525 Haugness Ingvald
3527 Arneson Melvin A
36th av intersects
3601 Bailey Benj B
Rataczak John G
3607 Carston Wm L
3611 Swanson Lawrence B
3619 Johnson Beverly H pntr

37th av intersects
3701 Crozier John B
3709 VanHeuveln Wm
3715 Johnson J Albert
3723 Platt Melvin G
3727-29 Carr Ralph W gro and meats

38th av intersects
3801 Boren Edw fill sta
3811 Slabej Roy W
3815 Anderson Walter F
3817 Northcutt Gordon B
39th av intersects
3901 Magnusson Martin gro
3903 Larsen Asbjorn H
3911 Erickson Elvin O
3921 Bofferding M W
3925 McMullen Lee R

40th av intersects
4001 Frondell L C
4005 Foster Lawren P
4011 Peavey Jos E
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41st av intersects
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4207 Kachel A A beauty shop
Klevan Carl B barber
4209 Morton Saml J variety store

43d av intersects
4301 Vacant
4303 Nichols Jacob F confr
4305 Levetentz Holger E shoe rebldr
4307 Anderson Adeline E beauty shop
Pratt Harry E barber
4309 Brown Thos W tailor
4311-15 Natl Tea Co gros and meats (br)

44th and 50th avs intersect
5100 Beaty Warren H
5106 Bjerke Norman R

FIFTY-FOURTH W — From 5342 Nicollet av w to limits

Grand av intersects
414 Plummer L T Mrs
415 McNeal Joseph W
423 VanSant Frank W
424 Williams Thos E

Harriet av intersects
500 Maley Anna Mrs
509 Lang Francis J Rev
520 Hamann Joseph
524 Carlson Lawrence H
525 Church of the Annunciation
Annunciation School
Garfield av intersects
612 Parrette Mark L gro
614 Vacant
616 McLaughlin C J Indry

Lyndale av intersects
Aldrich av intersects
Bryant av intersects
5000 Maley Anna Mrs
509 Lang Francis J Rev
520 Hamann Joseph
524 Carlson Lawrence H
525 Church of the Annunciation
Annunciation School
Garfield av intersects
612 Parrette Mark L gro
614 Vacant
616 McLaughlin C J Indry

Colfax av intersects
1010 Nelson Carl E
Dupont av intersects
Penn av intersects
2312 Sherwin Wm H
3116 Darby Lewis E
2322 Saann Selma L
2326 Merrill E E nurse

Queen av intersects
2400 Vacant
2406 Carroll Gerald T
2410 Bylund Clarence W
2414 Jacobs Edw F
2700 Noodelman Oscar L

Russell av intersects
Beard av intersects
3501 McClellan Leo A gro
3509 Simpson Wm L
Chasen av intersects
3605 Lindberg Andrew
Drew av intersects
3721 Velnor Edw D
3725 Norris Leslie H
3729 Tyehsen Carl A

Ewing av intersects
3833 Austin Oliver nurse
Austin Lucille M nurse

FIFTY-FIFTH E — From 5459 Chicago av e to Edge-water blvd and from Shore View av e to limits
1420 Milne Raymond G
2310 Seablom Axel

34th av intersects
3412 Vacant
3418 Vacant
3420 Smestad B K Mrs
35th av intersects
3500 Tiegen Elsie E Mrs
3502 Oscein Alf O
3508 Carlson Bernard W
3512 Hofstad John
3516 Dahl Edwin C
3520 Jones Fredk A
3524 Ellingson Oliver A

36th and 38th avs intersect
3800 West Wyatt H
39th av intersects
3902 Born Elroy W
3904 Mullane Robt E
3908 Krahn Fred W
3912 Austin Thos
40th av intersects
4016 Mattson Carl J
4020 Berglund Fredk A
41st av intersects
4104 Larson Henry
4109 Vacant
4111 Vacant
4114 Johnson Olaf
4122 Fossum Oscar B
Johnson Elias S

42d to 45th avs intersect
4516 Olson Arnold C
46th av intersects

FIFTY-FIFTH W — From 5448 Pleasant av w to limits

Grand av intersects
Harriet av intersects
Garfield av intersects
Lyndale av intersects
704 Whitten Clayton D trucking
Hanson Lena Mrs
Parker Clarence L
710 McDonough Jas P florist
Aldrich av intersects

FIFTY-SIXTH E — From 5553 Nicollet av e to limits

15 Hansen Robt G
1st av intersects
Stevens av intersects
129 Adams Thos J
2d av intersects
Clinton av intersects
Portland av intersects
Chicago av intersects
805 McGraw Chas baker
809 Hedberg Walter C hdw
811-13 Anderson Elmer J gro and meats
815 Dimick Henry A barber
Rivet Bernice E Mrs beauty shop

15th av intersects
1520 Moehrl Henry A
Bloomington av intersects
22 1/2 av intersects
2242 Strandberg John

23d av intersects
5553 Nicollet av e to limits
15 Hansen Robt G
1st av intersects
Stevens av intersects
129 Adams Thos J
2d av intersects
Clinton av intersects
Portland av intersects
Chicago av intersects
805 McGraw Chas baker
809 Hedberg Walter C hdw
811-13 Anderson Elmer J gro and meats
815 Dimick Henry A barber
Rivet Bernice E Mrs beauty shop
15th av intersects
1520 Moehrl Henry A
Bloomington av intersects
22 1/2 av intersects
2242 Strandberg John

FIFTY-SIXTH W — From 5554 Nicollet av w to limits Blaisdell av intersects

114 Vacant
Wentworth av intersects
136 Orcutt Frank R
Mitchell Fredk R
Pillsbury av intersects
Girard av intersects
1406 Johnson Frank A
Humboldt av intersects

FIFTY-SEVENTH E — From 5661 Nicollet av e to limits

1st av intersects
Stevens av intersects
2d av intersects
623 Wright C Lee
639 Mick Kerwin L
Chicago av intersects
19th av intersects
20th av intersects

2005 Carlson Arth G
2214 Jierce Russell B
22 1/2 av intersects
2241 Koehler Philip O

FIFTY-SEVENTH W — From 5660 Nicollet av w to limits Newton av intersects

2120 Huston Richd D
Oliver av intersects

FIFTY-EIGHTH E — From 5779 Nicollet av e to limits

3 Jackson Maurice M gro
9 Schwalen Peter C
11 Schwalen Peter C gro
15 Neuberger Frank P
19 Dixon Cyril E
1st av intersects
101 Mostu Arth
105 Wilson Leonard J
109 Chubb Wm E
115 Lindell Carl G elec contr

121 Person Anton E
125 Antelman Warren W
Stevens av intersects
131 Pinckard Jos A
2d av intersects
201 Jansen Walter A
203 Christianson Raymond A

209 Klatte Rudolph R
215 Eckard Wm A
218 Flynn John J
219 Drongeson Elz Mrs
221 Thompson Burton D
Stribling Chas D
222 Nelson Wm O
229 Fuglseth C D pntr

Clinton av intersects
Portland av intersects

610 Bell Donald C
618 Stelter Lloyd A
630 Doty Howard H
634 Kromer Orlando W
638 Lundquist Paul E
700 Hagen Howard E
704 Lindahl Edw H
708 Dietz Emil A
34th av intersects
3416 Carlson J Fredolf

FIFTY-EIGHTH W — From 5758 Nicollet av w to limits

8 Austin Perry S barber
10 Fifty Eighth Street Beauty Shop

Blaisdell av intersects
Wentworth av intersects
135 Perlch Max E
140 Richfield English Lutheran Church
147 Colin Arth J
Elmer Eva A Mrs
Larson Esther R

Pillsbury av intersects
Pleasant av intersects
329 Landis E C
Drake Mary F nurse
Grand av intersects
Fremont av intersects
1333 Lunde Gustave E
County rd intersects
Humboldt av intersects
sw cor Model Cement Stone Co

Irving av intersects
1619 Nelson Arth E
James av intersects

**HIAWATHA AVE 1940**

**JOYCE INSURANCE, INC.**

**THIRD FLOOR National Building**

**HENNEPIN AV—Contd**

3421-23 Apartments—Contd  
 2 Vacant  
 3AKidd Wm S  
 4ASmilev Georgiana Mrs  
**Street continued**  
 3424ALevy Julian H  
 AStephens Clyde  
 3425ASchilling Wilbur H @  
 3428ARich Ernest A  
 AWest Donald B  
 3429ASpeliopoulos Theo @  
 3432ADutt Ray C  
 Koeppenick F F Mrs  
 3435 French Jas L @  
 3436AClarkson Kenneth J  
 AKaplan Harold  
 3439AHoag Harry C  
 AShacker Julius  
 3440AFisher Chas W @  
 AMiller Chas R  
 3443ARoth Hugo E  
 3444AGross Herbert A  
 AWray Bert S  
 3445 Higgins Peter H  
 2d fl vacant  
 3448ABarber Paul M  
 ASmithers Jos  
 3449ALEach Lawrence D @  
 2d fl vacant  
 3453AD Fleming Kathryn @  
 Hilstad Julius  
**35th intersects**  
 3501A Osbourne-Peterson Inc  
 monuments  
 Peterson P N Co Inc  
 monuments  
 ATwin City Granite  
 Works  
**3513 Apartments**  
 1ABjork Harold S @  
 Bjork Lillian D  
 2 Carney Ivan M  
 3ARaiche Eva M L Mrs  
 4AOmlid Margt  
 5ASchaefer Bernard B  
**Street continued**  
 3515ABjork Monument Co  
 3517-19A Allan Monument Co  
 Slaney Allan L  
 3523ANaslund Willard E  
 3524AEngine Co J  
 3525 Myers Richd B  
 3529ABogle Lee M Co monu-  
 ments  
 3546ASheffield E F florist  
**36th intersects**  
 3600 Lakewood Cemetery  
 ALakewood Cemetery  
 Assn  
 ALakewood Cemetery  
 Assn Greenhouse

**HENNEPIN AV EAST See East Hennepin av**

**HIAWATHA AV—From E 22d and Cedar av se to limits**

2205ABaker Iron Co  
 AWilcox Boiler Co  
 2300 Lempe Bernard C  
 2312ANorthern States Coal  
 Co  
 2318 Dwinell Angus N @  
**24th intersects**  
 2401AZephyr Oil Co Inc  
 Hite Howard L fill sta  
 2404 Kelley Albert G  
 Peterson Alf R  
 2408 Heinz Herman F  
 2410 Lowe Wm @  
 2415AHiawatha Oil Terminal  
 2420ARitefit Mfg Co pistons  
 2421 Vacant  
 2424 Carleton Screw Prod-  
 ucts Co  
 2430 Hawkins Frank V @  
 Camerolla Cyrus  
 Collins Mayme Mrs  
 2434 Hansen Wm @  
 O'Brien J Danl  
 Wood Harry J  
 2444AThayer Della Mrs @  
 Utterback Chas A  
 2449 Cedar Lake Ice & Fuel  
 Co br  
 2500A Beasecker H V Mrs  
 Howard Theo J  
 2501ACoal-Blox Co Inc  
 2506 Spillman Kate E Mrs @  
 2523ANorthwestern Smelting  
 & Refining Co Inc  
**25 1/2 ends**  
 2533AMoskovitz Jacob boxes  
 2538 Clemmer Forest R  
 ALint Gary  
 2542ASperling Lulu Mrs  
 restr  
 2546 Kokusis Gust @  
 2548 Levato & Cunningham  
 fill sta  
**26th intersects**  
 C M St P & P R R crosses  
**28th intersects**

2800ABareco Oil Co  
 ADodds E V fill sta  
 2846ACramer Elmer R  
**29th intersects**  
 2908 Bersie Alma W Mrs  
 fill sta  
 2912 Kvello Jas @  
 rear Vacant  
 2916 Vacant  
 2919ADuFour Jos W Coal &  
 Oil Co  
 2920ABruno Peter @  
 2926AAnderson Alma A @  
 2930 Harris Emmanuel M @  
 Hopkins Rose Mrs  
 Johnson Geo  
 2932ALindemer Arch L @  
**23d av intersects**  
**Lake intersects**  
 3001 Swanson John fill sta  
 3015 Johnson Wm  
 3016 Kaufman Morris fruits  
 3019ATushke F L Mrs @  
 3020ABakke Bardon E  
 LaValley Chas A  
 3022 Berrier Orville B  
 3026AJensen Jens J @  
 3027 Goodrie Sylvester J  
 2d fl vacant  
 3030 Benson Ole P @  
 3034 Gabrielson John E @  
 3038AGraetz Jacob @  
 3039 Baltzore Emery  
 3044 Petersen Ele A Mrs @  
 Tillman Chas  
 3047 Boss David @  
 3051 Chalberg Wallace F  
**24th av intersects**  
**31st intersects**  
 3100ARouse Juanita B Mrs  
 fruits  
 3109 Rouse Bernard T  
 Wohrmann Phillip  
 3112AOppheim Alf O @  
 3115 Schmeck Herman W @  
 3116ARouse Urban @  
 Finkbeiner Jacob W  
 3121ABach E E Millwork Co  
 3122ANorris Grover M @  
 3126AJewett Kath E Mrs  
 3127-33AChar-Gale Mfg Co  
 sheet mtl wks  
 3130APeterson Ole H @  
 3138 Collins Marie Mrs  
 3146 Boyum Edw P @  
 3147ANorthern States Power  
 Co Hiawatha av sta  
 3161AAcme Foundry Co  
**25th av intersects**  
**32d intersects**  
 3208 Howe B M beverages  
 3224ANelson Timothy @  
 Johnston Wm H  
**33d intersects**  
**26th av intersects**  
 3301ACentral States Oil Co  
 br fill sta  
 3304ASpital John @  
 3308 Johnson Olive E Mrs @  
 3312AArgy Louis @  
 3316AWood Hesper M  
 3320 Blaker Kate Mrs @  
 3326 Behres Wm G  
 3330 Erickson Adolph @  
 3345ALanders-Norblom-  
 Christenson Co (yd)  
 bldg matl  
 Laugerude Trygve G  
**34th intersects**  
 3400A Lehan Susie Mrs @  
 Sandey Lloyd O  
 3401 State Testing Mill  
 (Dept of Agriculture)  
**27th av intersects**  
 3438 Christenson Victor A @  
 3442ASelby Lloyd T @ sewer  
 contr  
 Bandzak Thos A  
 3446AOlson Clifford R @  
 3450AHerrick Frank M @  
 3454 Hillman Clare bev-  
 erages  
 3456AMcLeod Hulda Mrs @  
 gro  
 3463 Nudlin Newman fill sta  
**35th intersects**  
 3501 Mpls Milling Co mill  
 3520 Thompson Geo A nurs-  
 ery  
**28th av intersects**  
 3544 Haffely Thos H  
**36th intersects**  
 3600 Asker Pauline Mrs @  
**29th av intersects**  
 3616ADechene Lawrence J @  
 fill sta  
 Hoffenbrodel Edw  
 3620 Schmelke Richd @  
 AToohey Edw J  
 3628 Melander L F @  
 3632 King Milton C @  
 3636 Ramsey Ethel F Mrs  
 3646ABentson Albin R @  
**37th intersects**

3700AJohnson Walter G @  
 3704AJohnson Walter G fill  
 sta and auto repr  
**30th av intersects**  
 3745AAtkinson Milling Co  
 mill  
**38th intersects**  
 3800ABulk Oil Co (br) fill  
 sta  
 3801ADirect Service Oil Co  
 (br) fill sta  
 3808 Sandler Irving R  
**Nokomis av intersects**  
 ARalston Purina Co  
 cereal mfrs  
 APurina Mills feed mfrs  
 ARy-Krisp Plant bakers  
 3836 Lebewitz & Shink fruits  
 3852AJahr Geo @  
**39th intersects**  
 3904AHafvenstein Andrew G  
 3906 Kolesar John @  
 3910 Marcum Jas T  
 Sperliche Emiel G  
**31st av intersects**  
 3915AHuhn A Mfg Co mill  
 machy  
 3919ASperliche E G fill sta  
**40th intersects**  
 4000AAnderson Frank A fill  
 sta  
 4001ALake Street Sash &  
 Door Co  
 4008APretter John F  
 4012AHavir Thos H  
 4016 Salmon Albert M  
**32d av intersects**  
**41st intersects**  
 4106 Lowe Chas W @  
 4112 Ladendorf Chas @  
 4115 Hagen Conrad J @  
 4121 Oscarson H Marvin  
 4122ABergstrom Lewis @  
 cement contr  
**33d av intersects**  
 4127 Knapp Ernest  
 4131ADanielson Eimer N  
 Hobot Walter S  
 Zadach Hugo H  
 4143ASchubert Herman G @  
 4151ASinger John M @  
 4154 Galaas Hugo P fill sta  
 4155A Armonies Max @ bldg  
 contr  
 Armonies Martha Mrs  
 Nelson Robt L  
 4159ANyberg Erick @  
 Anderson Arth W  
 4163ADavis Albert T fill sta  
**42d intersects**  
 4200 Knapp Ernest bever-  
 ages  
 Ernst Leslie E  
 4202 LeGro Modiste @  
 Gamer Edwin W  
 4206 Bosinski Stanley A @  
 4210 Kellington Chas A  
 4218 Clark Kenneth E  
 4222AKeeegan Wm J @  
 4228 Norell John H @  
 ANorell Earl C  
 4230ADillree Fred A @ pntr  
**34th av intersects**  
**43d intersects**  
 4310 Fletcher Arth L @  
 4336 Jesme Phillip G  
**35th av intersects**  
**44th intersects**  
 4432AKloss Vitalis M @  
 4436AHessburg E A Mrs @  
 4441ABourke Dell E coal  
**30th av intersects**  
 4447AEllefson Harry B  
 4451 Olson Wm M @  
 Neu LeRoy  
**45th intersects**  
 4500 Olson & Markwell fill  
 sta  
 4501AFire Dept Eng Co 24  
 4511 Vacant  
 4515-55 Hartzell Coal & Oil  
 Co yds  
 4530ALee Edw W @  
 4557A Black Hawk Coal Co  
 AHartzell Coal & Oil Co  
 Inc  
 Hartzell Sand Co  
 AWawin Coal Co  
**37th av intersects**  
**46th av intersects**  
 4608AHagen Mal @ bever-  
 ages  
 4652AKuennen Wm B @  
 4684 Vacant  
 4668AAnderson Clyde E  
 4672 Loftus Louis E @  
 4676AMair Robt @  
 4700 Anderberg Fred W @  
 4704ADahlberg Bernhard G  
 4708ALarson Donald L  
 4745 Foley Jas P restr  
 4750AMcNew & Carlson  
 fill sta

**HIAWATHA AV—Contd**

4757AJones C R Mrs restr  
**Minnehaha pkwy intersects**  
 4801 Wattles A R pony  
 livery  
**48th intersects**  
**42d av intersects**  
 sw cor Wenonah Triangle  
 4916A Trakowski Fred W @  
 4918A Chandler Margt Mrs  
 4920AMcArthur Chas D @  
 bldg contr  
 4922ACunningham A Frank  
 Hokenson Leonard L  
 4926 McAdams Francis C  
 Ryan Cyril F  
 4930 Kelley Lawrence L @  
 Kelley John  
 4934ABellinger Cletus E  
**50th intersects**  
 5000 Aagaard & Enguell fill  
 sta  
**44th av intersects**  
 5028 Miller Ewald T  
 Sahlstrom Jos F  
 5040ANorblom Chas H @  
 plmbr  
 Norblom C Richd  
 5050ALycke Evenold E @  
 5054A Associated Sales Dis-  
 tributors bronze  
 memorials  
**51st ends**  
**45th av intersects**  
 5120A Chastek John M @  
**46th av intersects**  
 5140 Aucutt Lewis E  
 5152A Thompson H R fill sta  
**52d ends**  
**47th av intersects**  
**53d intersects**  
**48th av intersects**  
 5306 Knox Howard J @  
 5309ACowen Ralph E  
 5312 Darsnek Ernest @  
 5315AMarch Anthony F  
 Prodoehl Harry C  
 5320 Anderson Ralph W @  
 5321 Wheeler Roy H @  
 5333 Lund Herman F @  
 5339 Beck Walter E @  
 5347A Workman Laurens M @  
 5350 Butler Andrew @  
**54th intersects**  
**HIGH—From Bridge sq s to 2d av S 1 w of the river Marquette av begins**  
**HIGHLAND AV—From Royalston av N hv to Lyndale av bet Royalston and Lakeside avs**  
 2ACoveny Matilda A @  
 3 Moline Reuben W  
 Sbeskas Peter  
 10ADahl Earl E  
 Griep Emma Mrs  
 12 Paavola Henry M  
 Roslin Paul T  
 13 Weireter Dumas Mrs  
 15AParker Helen Mrs  
 AWinne Frank J  
 18-20A Highland Apts  
 Hulberg Mary S Mrs  
 furn rms  
 Ahmann Herbert L  
 Bowles Donald K  
 Green Donald E  
 Hulberg John O  
 Jellison Edw  
 Schauble M J Mrs  
 West Arth L  
 Wilson Geo  
 19AMadison Andrew @  
 21ALaine Esther A Mrs @  
 furn rms  
 22-24A Highland Apts  
 Armstrong John  
 Brennan Emmett E  
 Corsie Mabel J  
 Donsker Jos  
 Heidelberg John H  
 Hiltunen Matt  
 O'Hern Peter F  
 Rover Elva  
 Sand Oscar A  
 Savela Aug  
 Winters John C  
 25-27AWilcox F W restr  
 28AEwing's Beer Service  
 whol  
 Ewing Jos A  
**Highland pl ends**  
 34ARosenfield Simon A gr  
 40AFisher Sadie H Mrs  
 2d fl vacant  
 42A Rice Eli R  
 46ALatinen Minnie Mrs @  
 50 Manion Clarence  
 O'Toole Michl  
 56A Anderson Ada M Mrs @  
 Erwin Frank  
 Johnson Frank E

54TH E 1935

**FIFTY-FOURTH E—Contd**

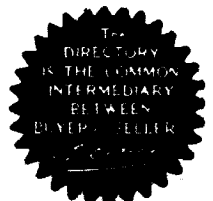
21 Vacant  
 23 Vacant  
 25 Wallace Jas M jr  
 27 Nicholson Clarke @  
 99 Griffiths Herbert A @  
 101 Scherer Theo A @  
 Stevens av intersects  
 624 Baillie Jas @  
 15th av intersects  
 1305 Vacant  
 1309 Lindgren Chester R @  
 1323 Hoey Errol @  
 14th av intersects  
 1400 Schwarz Fred @  
 15th av intersects  
 Bloomington av intersects  
 1526 Lyons Wm D @  
 1530 Allen Lauren L  
 Goodrich Harry L  
 1534 Hansen Hjalmer @  
 Nokomis blvd intersects  
 Woodlawn blvd intersects  
 30th av intersects  
 Nokomis av intersects  
 31st av intersects  
 3118 Patch Renford M @  
 3130 Peterson Levin G @  
 32d and 33d av intersects  
 3300 Johnson Carl J @  
 3306 MacLean Roy I  
 3310 Johanson John  
 3317 Stoutenburg Robt J  
 3318 Stack Clinton shoe repr  
 3321 Thompson Gust barber  
 3326 Vacant  
 34th av intersects  
 3417 Launceford Earl G @  
 Byrne Earl G @  
 3421 Kolb Clinton C  
 3425 Huotte Frank O @  
 Huotte M J Mrs nurse  
 35th av intersects  
 3501 Sweden Pehr A @  
 3509 Brodowy Frank C @  
 3517 Wannebo Oscar C @  
 3521 Beamer Albert A  
 3525 Dunham Gay @  
 3527 Arneson Melvin A  
 36th av intersects  
 3601 Anderson Olaf  
 3607 Furrur Maurice O  
 3611 Swanson Lawrence B  
 3617 Langford C E Mrs @  
 37th av intersects  
 3701 McCormick V M Mrs  
 3709 Norberg Burton V @  
 3711 Taylor Herbert @  
 3723 Brandt Herman J @  
 3727-29 Carr R W gro and meats  
 38th av intersects  
 3801 Varino & Plankey fill sta  
 3811 Edwards Luverne  
 3815 Anderson Walter F  
 3817 Northcutt Gordon B @  
 39th av intersects  
 3901 Magnusson Martin @  
 3903 Larson Jacob K @  
 3905 Vacant  
 3911 Erickson Elvin O @  
 3921 Zimmerman Reinhard @  
 3925 Neisinger Jacob @  
 Burmayer E M Mrs  
 McCullen Allan  
 40th av intersects  
 4001 Anderson Carl E  
 4003 Dahl Sihlim D  
 4011 McVeigh Wm W  
 4017 Kuester L M Mrs @  
 Kuester Lee R  
 4021 Holmer Earl  
 4025 Hatland Jas P  
 4029 Swiltala Roman A @  
 41st av intersects  
 4101 Sokolik John @  
 4111 Sherwood Reine @  
 4115 Lovaaas Edd J @  
 4119 Rhoten Clarence B  
 42d av intersects  
 4201 Weld Pharmacy  
 4203 Remick John meats  
 4205 Vacant

4207 Klevan Carl B barber  
 4209 Remick John  
 43d av intersects  
 4301 Johnson Jennie C Mrs  
 dry gds  
 4303 Nichols Jacob F confr  
 4305 Leverentz Holger E  
 shoe repr  
 4307 Weiss Wm L barber  
 and beauty shop  
 4309 Benson Chester E  
 baker  
 4311 Natl Tea Co gros (br)  
 rear Vacant  
 44th and 50th avs intersect  
 5010 Tolan Edw C  
 5100 Lawson Hazel O Mrs  
 5106 Wilsey John G  
**FIFTY-FOURTH W—From**  
 5342 Nicollet av w to limits  
 Grand av intersects  
 414 Plummer L T Mrs @  
 Briggs John G Rev  
 415 Bigg Mary J Mrs @  
 423 VanSant Frank W  
 424 Lufkin Nathaniel H  
 Harriet av intersects  
 509 Lang Francis J Rev  
 520 Bruner Gene  
 524 Carlson Lawrence H @  
 525 Church of the Annun-  
 ciation  
 Annunciation School  
 Garfield av intersects  
 612 Vacant  
 614 Vacant  
 616 Longworth H W Indry  
 Lyndale av intersects  
 Aldrich av intersects  
 Lyndale av intersects  
 Aldrich av intersects  
 Colfax av intersects  
 1010 Nelson Carl E  
 Dupont av intersects  
 Penn av intersects  
 2312 Sherwin Wm H @  
 2316 Derby Lewis E @  
 2326 Merrill Bertha E @  
 nurse  
 Queen av intersects  
 2406 Carroll Gerald T @  
 2410 Bylund Clarence W @  
 2414 Jacobs Edw F  
 Russell av intersects  
 Beard av intersects  
 3501 McClellan Leo A @ gro  
 3509 Williams Jesse M  
 Chauwen av intersects  
 3605 Lindberg Andrew @  
 Brew av intersects  
 3721 Lindahl Frank O @  
 3725 Norris Leslie H @  
 3729 Tychsen Carl A @  
 Ewing av intersects  
 3833 Austin Oliver W @  
**FIFTY-FIFTH E — From**  
 5459 Chicago av e to Edgewater blvd and from Shore View av e to limits  
 23d av intersects  
 2310 Seablom Axel @  
 34th av intersects  
 3412 Locke Warren C @  
 3416 Pennison Hartley C  
 3420 Smestad Mabel K  
 Mrs @  
 35th av intersects  
 3500 Tiegen Elsie E Mrs @  
 3502 Bennett Harold E  
 3508 Maanum Hilman A  
 3512 Hofstad John  
 3516 Dahl Edwin C  
 3520 Roggeman Eug J  
 3524 Ellingson Oliver A @  
 36th and 38th avs intersect  
 3800 Manlove Mark B  
 39th av intersects  
 3902 Born Elroy  
 3904 Vacant  
 3908 Krahn Fred W  
 3912 Nodholm Maurice S  
 40th av intersects  
 4016 Erickson John @  
 41st av intersects  
 4104 Larson Henry @

4109 Morris Park Gospel  
 Mission  
 4111 Vacant  
 4114 Johnson Olaf @  
 4116 Hall Elsie L Mrs  
 42d to 45th avs intersect  
 4516 Carlson Grocery  
 Carlson Elmer J  
 46th av intersects  
**FIFTY-FIFTH W — From**  
 5448 Pleasant av w to limits  
 Grand av intersects  
 Harriet av intersects  
 Garfield av intersects  
 Lyndale av intersects  
 704 Hanson Lena Mrs  
 Whitten Clayton D  
 Aldrich av intersects  
**FIFTY-SIXTH E — From**  
 5553 Nicollet av e to limits  
 15 Hansen Robt G @  
 1st av intersects  
 Stevens av intersects  
 129 Ellingboe John L  
 2d av intersects  
 Chicago av intersects  
 15th av intersects  
 1512 Samuelson Olaf J @  
 Bloomington av intersects  
 22½ av intersects  
 2242 Johnson Edw B @  
 23d av intersects  
**FIFTY-SIXTH W — From**  
 5554 Nicollet av w to limits  
 Blaisdell av intersects  
 114 Kamps Henry G  
 Wentworth av intersects  
 136 Orcutt Frank R @  
 Lighter Willard C  
 Pillsbury av intersects  
 Girard av intersects  
 1406 Johnson Frank A @  
 Humboldt av intersects  
**FIFTY-SEVENTH E—From**  
 5601 Nicollet av e to limits  
 1st av intersects  
 Stevens av intersects  
 2d av intersects  
 Chicago av intersects  
 19th av intersects  
 1905 Mogan Francis P @  
 20th av intersects  
 2005 Schwartz Jos L  
 2241 Koehler Philip O @  
**FIFTY-SEVENTH W—From**  
 5600 Nicollet av w to limits  
 Newton av intersects  
 2120 Huston Richd D  
 Oliver av intersects  
**FIFTY-EIGHTH E — From**  
 5750 Nicollet av e to limits  
 3 Marshall W C gro  
 7 Olmstead Edwin F ice  
 9 Schwalen Peter C @  
 11 Schwalen Grocery  
 15 Chilstrom Jennie Mrs @  
 19 Van Wegen Chas U @  
 1st av intersects  
 101 Mostu Arth  
 106 Petersen John J  
 109 Hanson Robt L  
 121 Person Anton E @  
 125 Bengston Fred W  
 Stevens av intersects  
 131 Aronsen Willard A  
 2d av intersects  
 201 Hansen Geo O  
 203 Moen Sigurd J  
 209 Klatte Rudolph R @  
 215 Eckard Wm A @  
 218 Fitzgerald Gregory J  
 219 Peir Walter J @  
 Drongeson Eliz Mrs  
 222 Nelson Wm O @  
 223 Smith Margt I @  
 229 Fuglseth Conrad D @  
 Clinton av intersects

**FIFTY-EIGHTH E—Contd**  
 34th av intersects  
 3416 Carlson Fredk J @  
 35th av intersects

**FIFTY-EIGHTH W — From**  
 5758 Nicollet av w to limits  
 8 Austin Perry S barber  
 10 Thompson Lillian K  
 beauty shop  
 Blaisdell av intersects  
 Wentworth av intersects  
 140 Richfield English  
 Lutheran Ch  
 147 Hoppe Minnie A Mrs @  
 Barker Kenenth A  
 Obrecht Leonard H  
 Pillsbury av intersects  
 Pleasant av intersects  
 329 Landis E C @ florist  
 Drake Mary F nurse  
 Grand av intersects  
 Fremont av intersects  
 nw cor Vacant  
 County rd intersects  
 Humboldt av intersects  
 s w cor Model Cement Stone Co  
 Irving av intersects  
 1619 Nelson Arth E @  
 James av intersects  
**FIFTY-NINTH E — From**  
 5838 Nicollet av e to 46th av  
 Clinton av intersects  
 333 Robinson Harold H @  
 353 Robinson Arth E @  
 4th av intersects  
**FIFTY-NINTH W — From**  
 5839 Nicollet av w to limits  
**SIXTIETH E—From Nicollet**  
 av e to limits 6 s of Minnehaha pkwy  
**SIXTIETH W — From Nicollet**  
 av w to limits 5 s of Minnehaha pkwy  
 Lyndale av intersects  
 Colfax av intersects  
 Dupont av intersects  
 Emerson av intersects  
 Fremont av intersects  
 Morgan av intersects  
 2024 Broughton Carsten O @  
 2124 Cornelius Frank A @  
 mkt gdnr  
 Penn av intersects  
 Russell av intersects  
 2505 Vacant  
 2518 Peterson Erik W @  
 Sheridan av intersects  
 2611 Vacant  
 2616 Vacant  
 Thomas av intersects  
 2700 Severson Gunder E  
 2708 Van Epps Edwin L  
 Upton av intersects  
 2825 Olson Elmer T  
 Vincent av intersects  
 Washburn av intersects  
 Xerxes av intersects  
**SIXTY-FIRST E — From**  
 Nicollet av e to 34th av 1 n of limits  
 30th av intersects  
 3024 Sorenson Soren P @  
 Nokomis av intersects  
 31st av intersects  
**SIXTY-FIRST W — From**  
 Nicollet av w to limits 6 s of Minnehaha pkwy  
 7 Chaney Francis  
**SIXTY-SECOND E—South-**  
 ern boundary line of city from Nicollet av e to limits  
**SIXTY-SECOND W—South-**  
 ern boundary of city from Nicollet av w to limits



# HIAWATHA AVE 1935

**HIAWATHA AV—Contd**

3345 Landers-Norblom-Christenson Co (yd) bldg mail  
 Laugerude Trygve  
**34th intersects**  
 3400 Lehan Susie Mrs @  
 3401 State Testing Mill (Dept of Agriculture)  
**27th av intersects**  
 3438 Jacobson Walter  
 3442 Fenton Wm S  
 Wyatt Eug  
 3446 Olsen Clifford R @  
 3450 Herrick Frank M @  
 3454 Svidron Andrew J beverages  
 3456 Abrahamson Ambrose A gro  
**35th intersects**  
 3500 McCullum L L Mrs  
 3501 Mpls Milling Co mill  
**28th av intersects**  
 3544 Haffley Thos H  
**36th intersects**  
 3600 Asker Pauline Mrs @  
 3601 Nagel Coal & Fuel Oil Co  
**20th av intersects**  
 3620 Wallman Fred W @  
 Baxter Bruce  
 Shoemaker Harlow W  
 3628 Melander Lawrence F @  
 3632 King Milton C  
 3636 Ramsey Thos  
 3646 Bentson Albin R @  
**30th av intersects**  
 3700 Johnson Walter G @  
 3704 Johnson Walter G auto repr  
 3745 Atkinson Milling Co mill  
**38th intersects**  
 3800 Bulk Oil Co (br) fill sta  
 Lebewitz & Shink fruits  
**Nokomis av intersects**  
 3831 Ralston Purina Co cereal mfrs  
 Purina Mills feed mfrs  
 Ry-Krisp Plant bakers  
 Swanson Ernest O @  
**39th intersects**  
 3904 Carlson Axel  
 3906 Kolesar John @  
 3910 Lockrem Geo N  
**31st av intersects**  
 3915 Huhn A Mfg Co mill machy  
 3919 Stambaugh Russell C fill sta  
**40th intersects**  
 4000 Hiawatha Motor Co fill sta  
 4001 Lake Street Sash & Door Co  
 4008 Campion Jas M  
 4012 Fretter John F  
 4016 Salmon Albert M  
**32d av intersects**  
**41st intersects**  
 4106 Lowe Chas W @  
 4112 Ladendorf Chas @  
 4115 Caven David N @  
 4121 Thompson Gust @  
 4122 Thompson Julian T  
 Vacant  
**33d av intersects**  
 4127 Britzius Alan J  
 4131 Armonies Max @  
 Harff Bernard J  
 4143 Schubert Herman G @  
 4151 Singer John M  
 4155 Arnfelt Ralph W genl contr  
 Raab Jos B  
 4159 Nyberg Erick A @  
 Anderson Ole A  
 4163 Davis Albert T fill sta  
**42d intersects**  
 4200 Klingelhoets J M restr  
 Wachter Paul  
 4202 Carlin Eliz Mrs @  
 Garden Donald L  
 4206 Meehan M A Mrs @  
 Langer Edw W  
 4210 Kellington Chas A  
 4218 Muske Paul W  
 4222 Keegan Wm J  
 4226 Norell John H @  
 Norell Earl C  
 4230 Twedt Jacob  
**34th av intersects**  
**43d intersects**  
 4310 Fletcher Arth L @  
 4336 Over Arnold M  
**35th av intersects**  
**44th intersects**  
 4432 Kloss Vitalis M @  
 4436 Hessburg Jas P  
 4441 Vacant  
**36th av intersects**  
 4447 Shepherd Roy E  
 4451 Jaspersen Bertha Mrs  
**45th intersects**  
 4500 Nelson Earl J E fill sta

4501 Fire Dept Eng Co 24  
 4511 Hollingsworth Harlen E  
 4515-55 Hartzell Coal & Oil Co yds  
 4530 Lee Edw W @  
**37th av intersects**  
**46th intersects**  
 4608 Hagen Mal @ garage and restr  
 4652 Vacant  
 4664 Even Nicholas @  
 4668 Anderson Clyde E  
 4672 Welch Russell M  
 4676 Nason Clifford J @  
 4700 Anderberg Fred W @  
 4704 Mettayer David A @  
 4708 Lambert Harold C  
 4750 Shell Petroleum Corp fill sta  
 4757 Crosby John S restr  
**Minnehaha pkwy intersects**  
**49th intersects**  
**42d av intersects**  
 sw cor Wenonah Triangle  
 4916 Trakowski Fred W @  
 4918 Vacant  
 4920 McArthur Chas D bldg contr  
 4922 Cunning Amos F  
 4926 Haas John A  
 4930 Kelley John @  
 4934 Makaroff Wm N  
**50th intersects**  
 5000 Mueller W J fill sta  
**44th av intersects**  
 5016 Crocker Lewis F @  
 5028 Miller Edw T  
 Sahlstrom Jos F  
 5040 Norblom Chas H @ plmbr  
 5050 Vacant  
**51st ends**  
**45th av intersects**  
 5120 Chastek John M @  
**46th av intersects**  
 5140 Aucutt Lewis E  
 5152 Kay D J fill sta  
**52d ends**  
**47th av intersects**  
**53d intersects**  
**48th av intersects**  
 5306 Knox Howard J @  
 Shrewsbury Robt  
 5309 Lagerstrom E M  
 5312 Darsnek Ernest @  
 5315 Moore Bessie A Mrs @  
 5320 Emerson Ralph W @  
 5321 Wheeler Roy H @  
 5333 Long Frank L @  
 5339 Beck Walter E @  
 5347 Workman Laurens M @  
 5350 Butler Andrew @  
**54th intersects**  
**HIGH—From Bridge sq s to 2d av S 1 w of the river Marquette av begins**  
**HIGHLAND AV—From Royalston av N nw to Lyndale av bet Royalston and Lakeside avs**  
 2 Coveny Mathilda A  
 Dimock Mary Mrs  
 6 Vacant  
 8 Vacant  
 9 Genopolo Satros  
 Moline Reuben W  
 10 Dahl Earl E  
 Griep Wm H  
 12 Roslin Paul T  
 2d fl vacant  
 13 Spalt Wm F @  
 2d fl vacant  
 15 Parker Oscar S  
 Winne Frank J  
 18 Alespa Wm  
 19 Madison Andrew @  
 20 Bachman Olaf E  
 Bird John E  
 Hulberg John O  
 21 Nelson Alex @ furn rms  
 Green Jos W  
 22 Sand Oscar  
 24 Hilterman Math  
 Kastama Henry  
 25 Vacant  
 27 Vacant  
 28 Ewing's Beer Service whol  
 Ewing Jos  
**Highland pl ends**  
**31 Apartments'**  
 bsmt Maezek John  
 1-2 Vacant  
 3 Harrison Mayme Mrs  
 Hoyt Geo H  
 Starry Jacob W  
 4 Knertz Leo  
 5 LaBonte Jos  
 6 Keeley Jas  
 7 Green John  
 8 Vacant

**Street continued**  
 34 Rosenfield Simon @ gro  
 2d fl vacant  
 37 Roach Marvel F  
 Sherman Jos  
 40 Friedman Louis B @  
 2d fl vacant  
 42 Rivkin Nathan @  
 46 Laitinen Nestor A  
 50 Manion Clarence  
 51 Laine Alex  
 52 Paquette Alex  
 55 Jackson Freda Mrs  
 2d fl vacant  
 56 Anderson Ada Mrs @  
 Erwin Frank  
 Johnson Frank E  
 59 Anderson Hilma Mrs @  
 61 Moffitt Jerry P  
 65 Byrd Magnolia Mrs @  
 66 Schwarg Henry J @  
 Adams Walter  
 Bock Mathilda Mrs  
 Knight Florence Mrs  
 70 Corden Thos P @  
 Baldwin Albert E  
 Hendrickson Carl G  
 71 Williams Ethel  
 76 Martin Susie Mrs  
 Robinson Roy  
 77 Stewart Ida  
 82 Thompson Chas C  
 83 Tolliver Frank  
 91 Pratt Eug E  
 94 Waters Edw  
 95 Gamble Edw  
 98 Hayes Merrill B  
 Grigsby Wm  
 99 Florez Harriet M Mrs @  
 Clubb John  
 101 Whiting Saml @  
 104 Myrtes Clifford  
 Wright Preston M  
 Clay Geo  
 106 Lytle Claude  
 Garth Orville  
 107 Woodson Eug W  
 Lippman Harry S @  
 110 Bryant Onie Mrs  
 Checki Jos  
 Lunaevsky Max  
 Hanson John J  
 117 Gates Emily Mrs  
 121 Vacant  
 122 Brown Rufus J  
 127 Johnson Roy  
 Jones Eastman H  
 128 Vacant  
 129 Head Blanche Mrs  
 Mitchell Asa  
 Petty Abr  
 134 Karatz Ernest @  
 2d fl vacant  
 135 Martin Herbert  
 O'Brien Claude  
 137 Davis Ira M  
 140 Fisher Sadie Mrs  
 141 Harlen Breakfast Club  
 148 Ames Lodge No 106 (Improved B P O E of the World)  
**HIGHLAND PL—From Border av e to Highland av 2 n of Glenwood av**  
 11 Richter Julius R  
 14-16 Highland Place Apts  
 bsmt Townsend Andrew  
 1 Ward John E  
 2 Yeomans Victoria Mrs  
 3 Vacant  
 4 Desantis John  
 5-6 Vacant  
**Street continued**  
**HIGHVIEW AV—From Prospect av e to Long View ter 2 n of Minnehaha pkwy**  
 27 Hyman J Jesse  
 35 Genter Harold C @  
**HILLSIDE AV—From Irving av N and 21st av nw to 25th av**  
 1509 Obert John A @ pntr  
 1513 Palmer Helmer G @  
 1514 Anderson Peter A @  
 Beucus Thos F  
 Claflin Wm L  
 Mitchell Geo L  
 Molin Augusta Mrs  
 Quinn Anna C  
 1517 Webster Willis @  
 1521 Stewart Moses P @  
 1522 Dietz Ernie F  
 Lovely Chas W  
 Mohr Jos A  
 Peters Bernard W  
 Swanson Grant R  
 1524 Witczek Leo A  
 1525 Mann Rose I Mrs @  
 1529 White Claude E  
 1530 Meding Carl F  
 Rapke Chas F

**HILLSIDE AV—Contd**  
 1533 Carlson Geo E @  
 1534 Middlemist Henry B @  
 1537 Feilzer John A @  
 Feilzer G E nurse  
 1538 Knapp Lester T @  
 Knapp Miland A @  
 1541 Peters Alvin J @  
 Anderson Edw D  
 1542 Weld Orson A @  
 1545 May Jacob @  
 Patrek Peter J  
 1546 Jasper Frank R @  
 1547 Sherard John W @  
 2d fl vacant  
 1550 Reinking Geo L @  
 1551 Shively Viola E @  
 1554 Sausele Christian M @  
 1555 Keran Michl @  
 1558 Myklebust Ingvard L  
 1559 Lawrence Alvah H @  
 1564 Walsh Lawrence S  
 1565 Bredeson G A @ ice Granstrom Harry M  
 1600 Wolf Oscar @  
 1601 Meyer Carl F @  
 1607 Smith Louis L @  
 1608 Schwalen Jacob H @  
 Ekman Philip C  
 1611 Devery Mary A Mrs @  
 Devery Patk J  
 1612 Conover John A @  
 1613 Behmen Anna Mrs @  
 1617 Brew Jas L  
 Engh Erik K  
 1618 Knoblauch Mollie Mrs @  
 Geske F J Rev  
 1621 Galka John F  
 Young Chas E  
 1622 Christopher Benj B @  
 Hasselberg Grant W  
 Horsley Harry T  
 Thompson Earl T  
 1626 Salisbury Florence M @  
 1628 Engquist Elmer C @  
 Tisdale Norman J  
 1634 Turnquist Carl J @  
 Deppe Russell  
 1636 Nelson Carl A  
 Shirling Nellie Mrs  
**Ilion av intersects**  
 1700 Hamilton Philip R @  
 1707 Meyer Wm J  
 1708 Myrman Ragnar A  
 1711 Vacant  
 1712 Reinhart Wm M @  
 1714 Olson Eug @  
 1715 O'Hara Frank @  
**James av intersects**  
 1814 Jellison Wm C  
 Theis Fred J  
 1815 Hogan Humphrey T  
 1818 Pearson Albert @  
 1820 Monahan Mark E  
**Logan av intersects**  
**24th intersects**  
 1910 Nordberg Raymond A  
 1912 Kammerer John J  
 1914 Hayes Albert L  
 1916 Brachlow Alf E @  
 Goldner Chas R  
 1923 McCormick John C @  
 1925 Johnson Albert K baker  
 1929 Johnson Glenn U  
 1933 Haugen Inga S Mrs  
 1935 Bolte Wm H  
 1939 Knauff Jacob L  
**Newton av intersects**  
 2003 Worthing Ada F Mrs @  
 Worthing May E nurse  
 2005 Dahlquist Elmer H  
 2d fl vacant  
 2011 Brustad Halvor @ pntr  
 2013 Curran Dennis J  
 Dunnigan Thos J  
 2017 Johnson Arth E  
 2023 Nelson Ivan C  
 Szente Alex  
**HOAG AV—From Royalston av n to 8th av N 3 e of Lyndale av**  
 70 Stephenson Bros trucking  
 75 McCarthy Stella Mrs  
 Nelson Christ V  
 77 Peterson Arth  
 79 Murphy Jennie Mrs  
 81 Sues Chas F  
 Sues LeRoy C  
 83 Vacant  
 85 Vacant  
 87 Vacant  
 89 Billie Randell E  
 93 Cain Wm @  
**7th and 6th av intersect**  
 615 Ness Mayme M Mrs  
 618 Vacant  
 620 Sexton Michl H @  
**7th av intersects**  
 726 Jackson Edw L  
 728 Jackson Earl H

54TH ST E 1930

**FIFTY-FIFTH ST E—Contd**  
 2316 Seablom Axel  
 No houses to  
 34th av S intersects  
 3412 Locke Warren C  
 3416 Vacant  
 3420 Smestad Lucile  
 35th av S intersects  
 3500 Tlegen Clifford  
 3502 Shinnick Howard B  
 3508 Osberg David  
 3510 Hofstad John  
 3516 Adamson Austin G  
 3520 Ahlberg Walter  
 3524 Ellingson Oliver A  
 36th av S intersects  
 37th av S intersects  
 38th av S intersects  
 3800 McDanel John E  
 39th av S intersects  
 3902 Eustis Joseph  
 3904 Vacant  
 3908 Quittum Verdi L  
 3912 Berg Manney  
 40th av S intersects  
 4016 Erickson John  
 4018 Smestad Lena Mrs  
 41st av S intersects  
 4104 Forsman Henry A  
 Larson Henry  
 4109 Vacant  
 4111 Vacant  
 4114 Johnson Olaf  
 4116 Vacant  
 42d av S intersects  
 43d av S intersects  
 44th av S intersects  
 45th av S intersects  
 4516 Erickson Harold gro  
 46th av S intersects

**FIFTY-FIFTH ST W—From**  
 5448 Pleasant av, west to  
 city limits  
 Grand av intersects  
 Harriet av intersects  
 Garfield av intersects  
 Lyndale av S intersects  
 704 Christiansen Arnold S  
 Rose Frank V  
 Aldrich av S intersects  
 (No houses to city limits)

**FIFTY-FIRST AV N—From**  
 5049 Lyndale av N west to  
 city limits  
 (no houses)

**FIFTY-FIRST ST E—From**  
 5043 1st av S east to Cedar  
 av and from Woodlawn  
 blvd east to Hiawatha av  
 14 Roberts Emma  
 Luverne av begins  
 1st av S intersects  
 101 Hillstrom Theo J  
 107 Bros Ernest T  
 114 Hanson Geo W  
 121 Hart A Tod  
 Stevens av intersects  
 129 Ziegler Wm H  
 141 Winston Margt C Mrs  
 144 Krumm Thos Z  
 147 Heckrich Karl H  
 2d av S intersects  
 Tarrymore av intersects  
 409 O'Brien Alan J  
 5th av S intersects  
 Luverne av ends  
 501 Chalberg Ewald  
 Portland av intersects  
 Oakland av intersects  
 Park av intersects  
 Columbus av intersects  
 Chicago av intersects  
 Elliot av intersects  
 10th av S intersects  
 1004 Nelson T Helmer  
 1008 Larson Alf M  
 11th av S intersects  
 12th av S intersects  
 1210 Simonsen Joseph C  
 13th av S intersects  
 14th av S intersects  
 15th av S intersects  
 Bloomington av intersects  
 16th av S intersects  
 1610 Potter Ward E  
 17th av S intersects  
 No houses to  
 31st av S intersects  
 3100 Holmbeck John E  
 3101 Hermanson Walter N  
 3104 Weld Frank E  
 3112 Lenz Walter W  
 3115 Hermanson Johanna G  
 3119 Brandenborg Geo  
 3123 Bredinger Felix A  
 3127 Corcoran John H  
 3128 Pierson Carl W  
 3131 Rittenhouse Rolla L  
 3201 Nelson Mary

3204 Stockwell S Albert  
 3207 Smedegaard Soren P  
 3211 Sues Chas F nurse  
 Sues Marion R nurse  
 3212 Gerardy Roy E  
 3215 Stolee Haakon J  
 3224 Lindgren Erick  
 3225 Swanson Carl F  
 3229 Wannerstrom John M  
 3300 Connor Guy M  
 3300 Paulson Peter J  
 3301 Vacant  
 3305 Seaberg John A  
 3306 Olson Arth A  
 3311 Kinsey Robt G  
 3312 Lund Oscar J  
 3315 Johnson Walfred W  
 3321 Westberg Edwin  
 34th av S intersects  
 35th av S intersects  
 ss Nokomis Jr High Sch  
 36th av S intersects  
 37th av S intersects  
 3727 Erickson Henry F gro  
 38th av S intersects  
 ns Old Minnehaha School  
 39th av S intersects  
 (No houses to end)

**FIFTY-FIRST ST W—From**  
 5068 Garfield av, west to  
 city limits  
 Lyndale av S intersects  
 Aldrich av S intersects  
 Bryant av S intersects  
 Colfax av S intersects  
 Dupont av S intersects  
 Emerson av S intersects  
 1215 Nelson Philander J  
 1219 Morse Solon O  
 Fremont av S intersects  
 No houses to  
 Thomas av S intersects  
 2715 Anderson Raymond N  
 2725 Samels John P  
 Upton av S intersects  
 No houses to  
 Drew av S intersects  
 3709 Riley James Whitcomb  
 Sch  
 Ewing av S intersects  
 France av S intersects  
 City Limits

**FIFTY-FOURTH ST E—**  
 From 5341 Nicollet av, east  
 to Nokomis blvd and from  
 Woodlawn blvd east to the  
 river  
 17 Smith Chadwick B  
 19 French Steph R  
 21 Dunham Otis N  
 23 Harris S Grant Jr  
 25 Dox Wm D  
 27 Thompson Cora R  
 99 Griffis Herbert A  
 1st av S intersects  
 101 Scherer Theo A  
 Stevens av intersects  
 No houses to  
 13th av S intersects  
 1309 Lundgren Chester  
 14th av S intersects  
 1400 Peterson Henry A  
 15th av S intersects  
 Bloomington av  
 intersects  
 1526 Harrigan Emmett L  
 Nokomis blvd intersects  
 Woodlawn blvd  
 intersects  
 No houses to  
 30th av S intersects  
 3006 Vacant  
 31st av S intersects  
 3118 Patch Renford M  
 32d av S intersects  
 33d av S intersects  
 3300 Johnson Carl J  
 3310 Paulson Hannah R  
 3317 King Benj W  
 3326 Wilcox Bros barbers  
 34th av S intersects  
 3417 Byrne Earl J  
 Launcelord Earl G  
 3421 Anderson Geo  
 3425 Huotte Frank  
 35th av S intersects  
 3509 Brodowy Frank  
 3517 Tanner Lester J  
 3519 Vacant  
 3523 Dunham Gay  
 3527 Quinlan Joseph H  
 36th av S intersects  
 3601 Muller Erling U  
 3607 Johnson Lewis  
 3611 Gunderson Arth W  
 3617 Langford Clara E Mrs  
 37th av S intersects  
 3701 McLean Claude  
 3709 Holmes Harry J  
 3711 Taylor Herbert L

3723 Harder Cath Mrs  
 38th av S intersects  
 3809 Vacant  
 3811 Snyder Geo W  
 39th av S intersects  
 3901 Dorsher Carrie Mrs gro  
 Dorsher Peter J  
 3903 Larsen Jacob  
 3906 Duncan Wm  
 3925 Neisinger Jacob  
 40th av S intersects  
 4001 Witt Karl E  
 4003 Kloster Louis H  
 4011 Pooles Harold V  
 4017 Vacant  
 4021 Peterson Andrew  
 4025 O'Toole James  
 4027 Vacant  
 41st av S intersects  
 4101 Sokolik John  
 4111 Sherwood Reine  
 4115 Sherwood Bertha Mrs  
 4119 Armstrong Arth A  
 42d av S intersects  
 4201 Weld Pharmacy  
 4221 Bauman Emil J ice sta  
 43d av S intersects  
 4301 Hahn Walter H dry gds  
 4303 Vacant  
 4305 Peterson Otto E shoe  
 repr  
 4307 Kachel Adele beauty shop  
 4307 Walter Chas barber  
 4309 Benson Chester E baker  
 4311 Seefeldt & Cronkhite  
 gros  
 rear Cronkhite DeElbert D  
 4315 Lingen & Olson meats  
 44th av S intersects  
 No houses to  
 50th av S intersects  
 5100 Butler Andrew

**FIFTY-FOURTH ST W—**  
 From 5342 Nicollet av,  
 west to city limits  
 144 Peterson John B  
 316 Lackore Lucius H  
 Grand av intersects  
 414 Plummer Lucy T Mrs  
 415 Bigg Mary J Mrs  
 423 VanSant Frank W  
 424 Smith Leo C  
 Harriet av intersects  
 509 Lang Francis J Rev  
 520 Kaiser Wm H  
 524 Einhorn Herbert A  
 525 Church of the Annuncia-  
 tion  
 Annunciation School  
 Garfield av intersects  
 612 Vacant  
 614 Vacant  
 616 Vacant  
 Lyndale av S intersects  
 Aldrich av S intersects  
 Bryant av S intersects  
 Colfax av S intersects  
 1010 Lynch Kath Mrs  
 Schilling James E  
 Dupont av S intersects  
 No houses to  
 Penn av S intersects  
 2312 Sherwin Wm H  
 2316 Derby Lewis E  
 2326 Merrill Bertha  
 Queen av S intersects  
 2406 Carroll Gerald T  
 2410 Bylund Clarence W  
 2414 Lasley E Webb  
 Russell av S intersects  
 No houses to  
 Drew av S intersects  
 3725 Norris Leslie H  
 3729 Tychsen Carl A  
 Ewing av S intersects  
 City Limits

**FIFTY-NINTH ST E—From**  
 5838 Nicollet av, east to  
 46th av S  
 Unopened to Clinton av  
 Clinton av intersects  
 333 Conley Raymond W  
 4th av S intersects  
 (No houses to end)

**FIFTY-NINTH ST W—From**  
 5839 Nicollet av, west to  
 city limits  
 (No houses)

**FIFTY-ONE AND 1/2 ST E—**  
 From Lake Nokomis east  
 to 37th av S, 1 south of E  
 51st st  
 (No houses)

**FIFTY-SECOND AV N—**  
 From 5157 Lyndale av N,  
 west to city limits  
 207 Kounovsky James A

**FIFTY-SECOND AV N—**  
 Contd  
 217 Berg Aug J  
 N 3d intersects  
 312 Bachinski John  
 320 Bailey James C  
 325 Smith Walter  
 N 4th intersects  
 N 6th intersects  
 Camden av intersects  
 710 Lind Jenny School  
 Aldrich av N intersects  
 (No houses to end)

**FIFTY-SECOND ST E—**  
 From 5158 4th av S, east  
 to Cedar av and from  
 Woodlawn blvd east to  
 Minnehaha av  
 404 Linderberg Edwin A  
 412 Olson T Joseph  
 Pearl Lake intersects  
 Portland av intersects  
 No houses to  
 15th av S intersects  
 1512 Silker John W  
 Bloomington av intersects  
 1530 Brockman Reider J S  
 barber  
 1536 Fischer Larce H fuel  
 16th av S intersects  
 17th av S intersects  
 18th av S intersects  
 Nokomis blvd intersects  
 1810 Smith Geo W  
 Cedar av intersects  
 Woodlawn blvd intersects  
 2518 Ixow Edw T  
 2522 Miller James J  
 26th av S intersects  
 27th av S intersects  
 28th av S intersects  
 29th av S intersects  
 2915 McCord Lee L  
 30th av S intersects  
 31st av S intersects  
 3100 Hedberg Walter C  
 3101 Kemmer Jess A  
 3104 Olson Oscar M  
 3107 McGorman Frank S  
 3110 Olson Joel  
 3111 Deming Ethridge E  
 3114 Morrill Claude E  
 3115 Vacant  
 3118 Rodwell John  
 3119 Nelson Claude A  
 3122 Lavers Wallace E  
 3126 Mackall Roger W  
 3130 Betts Mabel  
 32d av S intersects  
 3200 Harm Wm  
 3206 Forster Anthony  
 3208 McCabe James H  
 3212 McCarthy Thos F  
 3214 Lytell Earl  
 3220 Olson Carl G  
 3224 Zimmerman Harold W  
 33d av S intersects  
 3300 Christiansen Emanuel  
 3304 Parker LeRoy J  
 3308 Olsen Nels O  
 34th av S intersects  
 35th av S intersects  
 36th av S intersects  
 37th av S intersects  
 38th av S intersects  
 39th av S intersects  
 3912 Madvig John L  
 3915 Pederson Oscar  
 40th av S intersects  
 ns Minnehaha Sch  
 41st av S intersects  
 42d av S intersects  
 43d av S intersects  
 44th av S intersects  
 45th av S intersects  
 46th av S intersects  
 4621 Larson Freeman A gro  
 47th av S intersects

**FIFTY-SECOND ST W—**  
 From 5157 Nicollet av,  
 west to city limits  
 Belmont av intersects  
 100 Welch Harold A  
 103 Goldsworthy John D  
 106 Johnson Bert K  
 107 White Zada A  
 111 Benschaw Marvin J  
 112 Fraser Donald E  
 119 Kersten Geo A  
 125 Smith J Raymond  
 Wentworth av intersects  
 201 Kemming John C  
 205 Melony Clinton C  
 209 Cady James S  
 215 Irwin Geo W  
 219 Berg LeRoy H  
 220 Beck Adolph C  
 223 Thatcher Eva M  
 224 Hall Eugene A  
 227 Stewart Chester A Dr  
 228 Smith Wm L

HIAWATHA AVE 1930

**HENNEPIN AV—Contd**  
 3320 Zalusky John F @  
 3321 Vacant  
 3324 Dallman Edw W  
 3325 Quenby Arth H @  
 3326 Scharlin Louis J  
 3327 Johnston Raymond T  
 3329 Cohen Wm  
 Suiter Paul P  
 3331 Stansberry O Donald  
 3332 Dahlin Anna M  
 Ferrin Fredk @  
 3334 Ferrin Forrest W  
 Rutledge Richd G  
 3335 Rischmueller Louis F  
 3336 Bertram Chas J gro  
**3341 Apartments**  
 1 Lorby Edwin A  
 2 Penn Roy W  
 3 Prauly John  
 4 Rapp Eliz Mrs  
**Street continued**  
 3342 Natl Tea Co gro  
 3344 Patnode Andre barber  
 Smull Ruth M Mrs  
 beauty shop  
 3345 Adams Clarence A  
 Hoffman Aaron @  
 3346 Larson Frans meats  
 Kasowitz Harry  
 3348 Dreiman Saml gro  
 Rowe Arth N phys  
**W 34th intersects**  
 3401 Arnett Saml R @  
 3404 Rhodes Chas R  
 3405 Vacant  
 3408 Bowen Donald @  
**3411-13 Apartments**  
 1 Yost Howard C  
 2 Hughes Harry C  
 3 Duchscher Bartle D  
 4 Bishop Mary T Mrs  
 5 Bell Merton J Jr  
 6 Magaw John T  
 7 Roberts Merrill D  
 8 Kittle Harry R  
 9 Erskine Lawrence F  
 10 Rowett J Clarke  
 11 Elliott Wm J  
 12 Williams John E  
 13 Cummings Irving W  
**Street continued**  
 3412 Wilfong DeVere E @  
 3416 Lawson Hugh @  
 3417 Dugan Edmund @  
 3420 Dorrance Albert P @  
**3421-23 Apartments**  
 1 Murray Mara E Mrs  
 2 Vacant  
 3 Hamilton Mildred J  
 4 Finkle Richd E  
 Levis Frank W  
**Street continued**  
 3424 Avery Milo V  
 Wing Frank  
 3425 Schilling Wilbur H  
 3428 Robinson Arth W  
 Simpson E DeWitt Dr  
 3429 Leisses Frank T  
 3432 Dutt Ray C  
 Frizzell Sidney H  
 3435 Voss Adolph M  
 3436 Rogers Lloyd L  
 Turner Wm M T  
 3439 Vacant  
 3440 Cunningham Eug G  
 Fisher Chas W @  
 3443 Lyon Burke @  
 3444 Henry Raymond R  
 3445 Mears Mason R  
 Wessling Richd H  
 3448 Albert Carl J  
 Burrill Douglas G  
 3449 Vacant  
 3453 Cavanaugh Michl  
**W 35th intersects**  
 3501 Twin City Granite  
 Works Inc  
**3513 Apartments**  
 1 Bjork Harold S  
 2 Brown Dale W  
 3 Raiche John A  
 4 Bjork Ivan D  
 5 Goodacre Geo W  
**Street continued**  
 3515 Bjork Monument Co  
 Inc  
 3523 Haynes Chas E  
 3524 Mpls Fire Dept Sta  
 No 28  
 3525 Schultz Paul  
 3529 Harrison Granite Co  
 Inc

3537 Forbes John W  
 3546 Vacant  
**W 36th intersects**  
 3600 Lakewood Cemetery  
 Lakewood Cemetery  
 Assn  
 3601 Lakewood Cemetery  
 Assn Greenhouse  
**HIAWATHA AV—From E  
 22d and Cedar av, S E to  
 city limits**  
 2205 Baker Iron Co  
 2300 Seeman Clarence  
 2318 Dwinell Angus N @  
**E 24th intersects**  
 2404 Allen Benson T Dr @  
 Jansen John P  
 2408 Murray Thos  
 2410 Lowe Wm @  
 2420 Ritefit Mfg Co Inc  
 pistons  
 2423 Vacant  
 2424 Carleton Screen Prod-  
 ucts Co  
 Gray Tractor Co  
 2430 Hanson Ernest E  
 2434 Lischefski Edw C  
 2444 Thayer Della Mrs @  
 2446 Howard Theo J @  
 2506 Smith Ernest C dray-  
 age  
 Spilman Kathryn  
 Mrs @  
**E 25½ ends**  
 2530 C M St P & P R R Co  
 shops  
 2538 Hawkins Frank V @  
 2542 Vacant  
 2545 Vacant  
 2546 Kokusis Gust @  
**E 26th intersects**  
**C M St P & P R R**  
**intersects**  
**E 28th intersects**  
 2800 Bisher Harley S gas  
 sta  
 2846 Spooner Robt R @  
**E 29th intersects**  
 2908 Westline Geo A  
 blksmith  
 2912 Sullivan John L  
 2919 Pittsburgh Coal Co  
 yards  
 2920 Mahan Wm A @  
 2926 Schaub Fred H  
 2930 Harris Emanuel  
 Young Fred  
 2932 Lindemer Archie L @  
 2950 Colonial Oil Co  
**E Lake intersects**  
 3001 Phillips Petroleum Co  
 gas sta  
 3015 Moulton Cassius B  
 3019 Hettwer Auto Safety  
 Signal Co Inc  
 Liberty Medicine Sup-  
 ply Co Inc  
 3020 Hansen Albert A  
 LeTourneau Geo F  
 3022 Johnson Otto F @  
 3026 Jensen Jens J @  
 3027 Vacant  
 3030 Benson Ole P @  
 Larkin Martha Mrs  
 3031 Farson James W  
 Smith Harden  
 3034 Gabrielson John E @  
 3038 Graetz Jacob @  
 3039 Baltezare Emery  
 3043 Thole John H  
 3044 Coburn Isaac  
 Coffield Geo P  
 3047 Danaher Thos W @  
 3048 Maher Michl  
 3051 Stroberger Byron  
 3055 Scott Wm H  
**E 31st intersects**  
 3109 Brown Henry  
 Kingsley Max F  
 Savage Garrett  
**24th av S intersects**  
 3112 Ophelm Alf @  
 3115 Schmeck Herman W @  
 3116 Amsler Clarence H  
 Hughlett Anna M Mrs  
 3117-59 Lake St Sash & Door  
 Co factory  
 3122 Cleveland Lester J @  
 3126 Jewett Kath E Mrs  
 3130 Peterson Ole H @  
 3138 Anderson Axel B  
 3146 Anderson Carl T

3161 Progressive Metal  
 Products Inc foundry  
**E 32d intersects**  
**25th av S intersects**  
 3224 Fredell Emma A Mrs @  
**E 33d intersects**  
**26th av S intersects**  
 3304 Swenson Anton E @  
 3308 Selberg John A @  
 3312 Armstrong Arth P @  
 3316 Fromer Carl @  
 3320 Blaker Kate Mrs @  
 3326 Perry Arth C @  
 3330 Erickson Adolph @  
 Erickson Otto  
 3345 Landers-Morrison-  
 Christenson Co (br)  
 whse  
 Laugerude Trygve  
**E 34th intersects**  
 3400 Lehan Susie @  
 3401 State Testing Mill  
 (Dept of Agriculture)  
**27th av S intersects**  
 3442 Wyatt Eug  
 Winter Fred W  
 3446 Davey Herman I  
 3450 Nelson James R  
 3454 Vacant  
 3456 Nordgarden Sever T  
**E 35th intersects**  
 3500 Ondich John  
 3501 Minneapolis Milling Co  
 mill  
**25th av S intersects**  
 3544 Knoke Marine L  
 May Floyd B  
**E 36th intersects**  
 3600 Asker Axel @  
 3601 Collette Geo S  
**29th av S intersects**  
 3616 Todd Walter H  
 3620 Wallman Fred W @  
 3628 Melander Lawrence  
 3632 Robillard Joseph @  
 3636 Pearson John A  
**30th av S intersects**  
 3700 Bleissman Mary  
 Mrs @  
 3745 Atkinson Milling Co  
**E 38th intersects**  
 3808 Haynes Rolla A  
**Nokomis av intersects**  
 3831 Ralston Purina Co  
 Ry-Krisp Co  
 3852 Singer Edw A  
**E 39th intersects**  
 3904 Vacant  
 3906 Kolesar John @  
 3910 Vacant  
**31st av S intersects**  
 3915 Huhn A Mfg Co  
 mill machy  
**E 40th intersects**  
 4001 Lake Street Sash &  
 Door Co  
 4008 Tidslevold Saml  
 4012 Sande Walter  
 4016 Salmon Albert M  
**32d av S intersects**  
**E 41st intersects**  
 4106 Lowe Chas W  
 4115 Caven David N @  
**33d av S intersects**  
 4121 Thompson Gust @  
 4122 Ladendorf Chas @  
 4127 Armonies Max @  
 4131 Engdahl Matte R  
 Lee Raymond O  
 4143 Schubert Herman G @  
 4151 Anderson Abel P  
 4155 Maris Ada  
 4159 Nyberg Erick A @  
 4163 Davis T Albert gas sta  
**E 42d intersects**  
 4200 Anderson Clifford C gro  
 Connor Margt  
 4202 Carlin Eliz @  
 Pluth Henry A  
 4206 Frederick Rene H  
 Meehan Mary A @  
 4210 Kellington Albert E @  
 Kellington Richd T  
 4218 Muske Paul W  
 4222 Gaugh Robt  
 4226 Norell John H @  
 4230 Twedt Jacob  
**34th av S intersects**  
**E 43d intersects**  
 4310 Fletcher Arth  
 4336 Douglas Geo

**HIAWATHA AV—Contd**  
**35th av S intersects**  
**E 44th intersects**  
 4432 Kloss Vitalis  
 4436 Hessburg James P @  
**36th av S intersects**  
 4447 Campbell Ronald T  
 4451 Spencer James  
 Engine Co No 24  
**E 45th intersects**  
 4511 Weber Theo  
 4515-55 Hartzell Coal Co  
 yards  
 4530 Lee Edw  
**37th av S intersects**  
**E 46th intersects**  
 4608 Hagen Mal garage  
 4652 Nelson Lester W  
 4664 Even Nicholas @  
 4668 Peterson Victor L  
 4672 Miller Omer J @  
 4700 Anderberg Fred W @  
 4704 Mettayer David A @  
 4708 Anderson Henry G @  
**E Minnehaha pkwy  
 intersects**  
 ws Longfellow Gardens  
**E 49th ends**  
 4916 Mehaffey Emma C Mrs  
 Trakowski Fred W @  
 4918 Mehaffey Robt J  
 4920 McArthur Chas D  
 4926 Jamieson Wm  
 4930 Kelley John @  
 4934 Falconer Ida  
**E 50th ends**  
 5000 Shourt Arth J gas sta  
**44th av S intersects**  
 5016 Crocker Lewis F  
 5028 Hill Sidney J  
 Julson Ole M  
 5040 Norblom Chas H @  
 5050 Fluxrud Ole E  
 Fretter John F  
**E 51st ends**  
 5114 Vacant  
 5120 Chastek John M  
**46th av S intersects**  
 5140 Dean Wm M @  
 5152 Kaye Douglass J  
 gas sta  
**E 52d ends**  
**47th av S intersects**  
**E 53d intersects**  
**48th av S intersects**  
 5306 Knox Howard J  
 5312 Darsnek Ewald  
 5315 Jenkins Jack T  
 Moore Bessie A Mrs  
 5320 Hayes Henry  
 5321 Wheeler Roy  
 5333 Reese Mae Mrs  
 5339 Beck Walter E  
 5347 Workman Laurens M  
**E 54th intersects**  
**City Limits**  
**HIGH ST—from Bridge sq  
 south to 2d av S, 1 west  
 of river**  
 9 Wojciak Joseph  
 billiards  
 11-13 Vacant  
 17 Cliff Hotel  
 Krause Fred  
 17 Mpls Elevator Repair  
 & Supply Co  
 21 Vacant  
 27 Vacant  
 29 Vacant  
**Marquette av begins**  
**HIGHLAND AV—from Roy-  
 alston av, northwest to  
 Lyndale av, bet Royalston  
 and Lakeside avs**  
 1 Brabant Earl P  
 2 Burke John @  
 3 Bird Albert E  
 5 Troost Sidney C @  
 6 Vacant  
 7 Vacant  
 8 Boyler Chas W  
 9 Freden Agnes Mrs  
 Holmes Elmer  
 Rahier John  
 10 Berg Axel P  
 Copeland Albert A  
 12 Ashbaugh G Thos

**APPENDIX E**  
**BUILDING INSPECTION RECORDS**



INSPECTOR OF BUILDINGS

1 D

X

*Directory*  
*11/27/11*  
 LOCATION 5343-Smelling Ave.  
 River View Road

LOT 14 BLOCK 1 ADD. Thorpe Bros. Minnehaha Grove  
 6611 3089 0092 0855

PERMIT NO.	CONSTRUCTION	DATE	CONTRACTOR	COST	O. K.
B 181858	12x16 Pri. fr. gar.	8-13-24	Eliza. Husted	100.	
B 182225	24x26 Fr. dwlg.	8-27-24	V. I. Peeble	2500.	
F 185830	Elect.	9-22-24	E. F. Schultz	50.	11-19-24
D 166610	Plbg.	9-28-24	Albin Paulson	250.	11-30-24
F 187457	Elect.	11-5-24	E. F. Schultz	45.	11-19-24
M-31156	Gas Burner	9-6-46	Lloyd R. Burns	85.	
F-387624	Transf.-gas	11-20-46	Henry J. Mester	12.	
I17116	Wreck 24x26x12x1 dwlg.	1-8-23	Alvin J. & Wrecking	400.	

**WRECKING**



RUN DATE: 05/05/90  
 RUN TIME: 00:44

CITY OF MINNEAPOLIS  
 DEPARTMENT OF INSPECTIONS  
 MICROFILMED PERMITS REPORT

PAGE 25112  
 REPORT 440-B10640

ADDRESS	PERMIT NUMBER	ISSUE DATE	COMPL DATE	PLAN FILE	LOT BLOCK	ADDITION NAME	USE N CODE B	ESTIMATED COST	FEE AMOUNT	CONTRACTOR NAME	CONSTRUCTION EXP COMMENTS
5336 RIVERVIEW RD					003 002	THORPE BROS MHAHA GROVE					
	D813948	08/14/78	07/99/80	0000				20	.00		DRYER MINNEGASCO
	D821556	05/17/79	12/07/79	0000				350	.00		W-EXT 100' G-WH OSTRON
	B560086	08/19/88	10/27/88	0000		M1B N		-9,000	81.50	HOME OWNER	CONSTRUCT DETACHED GARAGE RES 24X26 X
5340 RIVERVIEW RD					004 002	THORPE BROS MHAHA GROVE					
	B469763	04/22/77	01/10/78	0000				500	.00		REROOF DWLG #123
5344 RIVERVIEW RD					005 002	THORPE BROS MHAHA GROVE					
	F670873	06/23/72	00/00/00	0000				500	.00		NEW SERV. 100 AMP, 1 METER, CHG. WIR. FIX
	D854061	09/12/83	01/12/84	0000				200	18.50	SWAGGERT PLUMBING CO	INSTL 1 GW RES
5348 RIVERVIEW RD					006 002	THORPE BROS MHAHA GROVE					
	B448256	07/16/74	12/19/74	0000		R3A M1B		200	.00		5N 16X22XB DET GARAGE 4FT YLARD OK BY ZON Y
	B482659	08/10/78	02/12/79	0000				800	.00		REROOF DWLG #10
5352 RIVERVIEW RD					007 002	THORPE BROS MHAHA GROVE					
	0011292	01/19/81	05/27/82	0000				990	.00		P-MHA, M-GAS BRNR ** RAY WELTER
	F758797	01/29/81	12/18/81	0000				70	.00		WIRE FURNACE-LEIN ELEC
	F802269	03/05/86	03/18/86	0000				600	55.50		INSTL 1 100A SER. 12 30A CKT. 2 100A CKX
5356 RIVERVIEW RD					008 002	THORPE BROS MHAHA GROVE					
	F808493	12/05/86	12/15/86	0000				0	44.50	MAJOR ELECTRIC	INSTL 1 100A SER. 8 30A CKT. RES
5364 RIVERVIEW RD					010 002	THORPE BROS MHAHA GROVE					
	D803935	08/17/77	08/24/77	0000				50	.00		GAS WTR HTR VENTED
	F824155	09/16/88	01/09/89	0000				300	29.50	BLAINE HEATING & AIR	INSTL 2 30A CKT. RES
	0054403	09/16/88	10/19/89	0000				0	19.99	BLAINE HEATING	INSTL AC, PA 1 GAS BR. RES
	0054403	09/16/88	10/05/88	0000				1,000	16.08	BLAINE HEATING	INSTL AC, PA 1 GAS BR. RES
	0054934	10/13/88	01/09/89	0000				1,000	21.50	THERMEX CORPORATION	INSTL AC. RES

5336

RIVERVIEW RD

TO: 5364

RIVERVIEW RD

112



RUN DATE: 05/06/89  
 RUN TIME: 19:20

CITY OF MINNEAPOLIS  
 DEPARTMENT OF INSPECTIONS  
 MICROFICED PERMITS REPORT

PAGE 19256  
 REPORT 440-81440

ADDRESS PERMIT NUMBER	ISSUE DATE	COMPL DATE	LOT PLAN FILE	BLOCK	ADDITION NAME	USE N CODE	ESTIMATED COST	FEE AMOUNT	CONTRACTOR NAME	CONSTRUCTION TYP COMMENTS
5336 RIVERVIEW RD			003	002	THORPE BROS MHAHA GROVE					
DB13948	08/14/78	07/99/80	0000				20	.00		DRYER MINNEGASCO
DB21556	05/17/79	12/07/79	0000				350	.00		W-EXT 100' G-WH OSTRUM
5340 RIVERVIEW RD			004	002	THORPE BROS MHAHA GROVE					
B469763	04/22/77	01/10/78	0000				500	.00		REROOF DWLG #123
5344 RIVERVIEW RD			005	002	THORPE BROS MHAHA GROVE					
F670873	06/23/72	00/00/00	0000				500	.00		NEW SERV. 100 AMP, 1 METER, CHG. WIR, FIX
DB54061	09/12/83	01/12/84	0000				200	18.50	SWAGGERT PLUMBING CO	INSTL 1 GW RES
5348 RIVERVIEW RD			006	002	THORPE BROS MHAHA GROVE					
B448256	07/16/74	12/19/74	0000		R3A M1B		200	.00		5N 16X22X8 DET GARAGE 4FT YLARD DK BY ZON V
B482659	08/10/78	02/12/79	0000				800	.00		REROOF DWLG-HO
5352 RIVERVIEW RD			007	002	THORPE BROS MHAHA GROVE					
Q011292	01/19/81	05/27/82	0000				990	.00		P-MWA, M-GAS BRNR ** RAY WELTER
F758797	01/29/81	12/18/81	0000				70	.00		WIRE FURNACE-LEIN ELEC
5364 RIVERVIEW RD			010	002	THORPE BROS MHAHA GROVE					
DB03935	08/17/77	08/24/77	0000				50	.00		GAS WTR HTR VENTCO
5372 RIVERVIEW RD			012	002	THORPE BROS MHAHA GROVE					
D771293	05/30/74	10/16/74	0000				5	.00		REPL GAS RANGE MNGSCO
B532851	10/22/84	04/09/85	0000			N	1,000	18.50		INSTL ALUM SIDING GARAGE RES
5384 RIVERVIEW RD			015	002	THORPE BROS MHAHA GROVE					
B503806	03/06/81	03/06/81	0000				800	.00		TEAR OFF & REROOF-H.O.
2505 ROBBINS ST			002	004	SOUTH GATE TERRACE 2ND DIVISION					
B456415	07/18/72	00/00/00	0000				500	.00		REROOF DWLG AND GARAGE
B441023	05/01/73	00/00/00	0000				1,200	.00		5N ENCLOSE EXISTING PORCH
T678471	05/22/73	00/00/00	0000				150	.00		WIR & FIXT
DB43696	01/20/82	07/99/82	0000				50	.00		GPIP METER OUT MNGSCO

5336

RIVERVIEW RD

TO: 2505

ROBBINS ST

4256







DI-191-35

ORIGINAL

# PERMIT TO BUILD OUTSIDE OF FIRE LIMITS

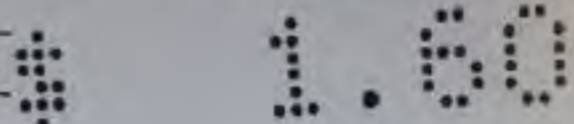
No. B

340701

Owner Eugene O' Brien

Architect \_\_\_\_\_

Builder RG Richardson



Office of the INSPECTOR OF BUILDINGS,

Minneapolis, Minn.,

21 May 1954 195

## PROPOSED LOCATION OF BUILDING

No.	Street	Part of Lot	Lot	Block	Town, Addition or Subdivision
5344	Riverview Road				

## DESCRIPTION OF BUILDING

Front	Depth	Height	Stories	Built of	Manner of Construction	To be Used as	To be Completed	Estimated Cost
12'x	9'-8'	8'	1	Frame	addition to rear of existing dwelling for enlargement of kitchen/ concrete ftgs min 3'6" below grade		Jul 31 '54	\$1000.00
cubic ft 2000 survey # 172600								

ok--SJJ

Ward	12	Plate
G-Elev.		
D-Plng.		
E-Moving		
F-Elect.		
G-Fltg.		
H-Stein.		
K-Plast.		
M.		
N-O.		
P-O.		
Engr's Cert.		

Permission is hereby granted to R G Richardson to add to the building foundation described in the above statement. This permit is granted upon the express condition that the person to whom it is granted, and his agents, employes and workmen, in all the work done in, around and upon said building, or any part thereof, shall conform in all respects to the ordinances of the City of Minneapolis, regarding the construction, alteration, maintenance, repair and removal of buildings within the city limits; and this permit may be revoked at any time upon violation of any of the provisions of said ordinances.

R. G. Richardson Inspector of Buildings

## AGREEMENT AND SWORN STATEMENT

In consideration of the issue and delivery to me by the Inspector of Buildings of the City of Minneapolis of the above permit, I hereby agree to do the proposed work in accordance with the description above set forth and according to the provisions of the ordinances of the City of Minneapolis, and, being first duly sworn, I hereby state and say that the facts stated by me and contained in the above permit are true as therein stated.

Subscribed and sworn to before me at Minneapolis, Minnesota,  
 this 20 day of May A. D. 1954  
Ralph J. Ernst Notary Public, Hennepin  
 County, Minnesota. My commission expires 1-15 1955

R. G. Richardson



# INSPECTOR OF BUILDINGS

10

X

River View Road

LOCATION 5344 Snelling Ave.

LOT +5

BLOCK 2 ADD. Thorpe Bros. Minnehaha Grove  
 6611 3089 0092 0856

PERMIT NO.	CONSTRUCTION	DATE	CONTRACTOR	COST	O. K.
B 172600	18x22 fr dwlg.	9-1-23	C. H. Johnson	500.	
B 181769	12x16 fr pri gar.	8-11-24	C. H. Johnson	100.	
F 195147	Elec.	7-7-25	I. H. Klampe	35.	7-9-25
B 246457	6x8 add to fr dwlg.	9-30-36	O. Nyberg	150.	
D 267794	Plbg.	2-8-37	C. Conner	150.	7-7-37
F 292650	Elec.	3-4-37	V. E. Frykman	40.	
D387180	Repl. gas range	12-11-47	M. Mattson	75.	
M 86240	Gas Burner	1-20-53	Noble Gas Co.	140.	
D 481209	Gas wat. htr.	2-25-53	Fox Plbg.	30.	
B 340701	12x9x8 Fr addn dwlg	5-20-54	R G Richardson	1000.	S172600
D 598306	repl g wat htr	10-4-60	Edwin C Dahl	160.	
B. 409968	Reside & reroof dwlg.	7-15-68	Jerry Vertina	1500.	
F670873	New serv; 100amp; lmeter; chg; wir; fix;	6-23-72	Bomar Electric	500.	



ORIGINAL

# PERMIT TO BUILD OUTSIDE OF FIRE LIMITS

No. B 358598

Owner Lloyd C Anderson

Office of the INSPECTOR OF BUILDINGS,

Architect \_\_\_\_\_

Builders Jim Roberts

Minneapolis, Minn., Aug 7 '57

195

### PROPOSED LOCATION OF BUILDING

No.	Street	Part of Lot	Lot	Block	Town, Addition or Subdivision
	5347 Riverview Road				

### DESCRIPTION OF BUILDING

Front	Depth	Height	Stories	Built of	Manner of Construction	To be Used as	To be Completed	Estimated Cost
21'	8'6"	8'	(1)	Frame	addition to rear of dwelling for bed-room & porch-foundation in place.		Oct 1 '57	\$1000.00 addition \$1820.00 addition
& reside dwelling								
cubic ft 4000								

Ward 12	Plate
C-Env.	
D-Fltz.	
E-Moving	
F-Elect.	
G-Mis.	
H-Sign.	
K-Plat.	
L-Plat.	
M-O.	
P-O.	
Engr's Cert.	

Permission is hereby granted to Jim Roberts to add to/alter/reside the building foundation described in the above statement. This permit is granted upon the express condition that the person to whom it is granted, and his agents, employes and workmen, in all the work done in, around and upon and building, or any part thereof, shall conform in all respects to the ordinances of the City of Minneapolis, regarding the construction, alteration, maintenance, repair and removal of buildings within the city limits; and this permit may be revoked at any time upon violation of any of the provisions of said ordinances.

*Ronald A. Erickson*  
Inspector of Buildings

### AGREEMENT AND SWORN STATEMENT

In consideration of the issue and delivery to me by the Inspector of Buildings of the City of Minneapolis of the above permit, I hereby agree to do the proposed work in accordance with the description above set forth and according to the provisions of the ordinances of the City of Minneapolis, and, being first duly sworn, I hereby state and say that the facts stated by me and contained in the above permit are true as therein stated.

Subscribed and sworn to before me at Minneapolis, Minnesota, this 7 day of Aug A. D. 1957

*John R. Zaldua* Notary Public, Hennepin County, Minnesota. My commission expires 4/30/1958

*John R. Zaldua* Public Notary  
*James N. Roberts*  
*James A. No.*



ORIGINAL

# PERMIT TO WRECK BUILDING

Permit Fee \$ 10.00

Owner State of Minnesota  
Wrecker Carl Bolander + Sons Co.

DEPARTMENT OF INSPECTIONS

No. **I17318**

Minneapolis, Minn., 2/2-1974

### LOCATION OF BUILDING

No.	Street	Part of Lot	Lot	Block	Town, Addition or Sub-division	Ward	Plate
5347	Riverview Rd		13	1	Thorpe-Mennecke Bldg. add	12	

### DESCRIPTION OF BUILDING

Front	Depth	Height	Stories	Type of Building and Construction	No. of Dwlg. Units	Water and Taxes paid?	To be completed	Estimated Cost
20	36	16	1	frame dwelling	1	OK EJK State Highway Dept	3/1/74	800.00
								Content Co. Ft. .....18,000

Permission is hereby granted Carl Bolander + Sons Co. to wreck the building for State of Minnesota Highway Dept. foundation described in the above statement. This permit is granted upon the express condition that the person to whom it is granted, and his agents, employes and workmen, in all the work done in, around and upon said building, or any part thereof, shall conform in all respects to the ordinances of the City of Minneapolis, regarding the construction, alteration, maintenance, repair and removal of buildings within the city limits; and this permit may be revoked at any time upon violation of any of the provisions of said ordinances.

Ronald A. Erickson Inspector of Buildings

### AGREEMENT AND SWORN STATEMENT

In consideration of the issue and delivery to me by the Inspector of Buildings of the City of Minneapolis of the above permit, I hereby agree to do the proposed work in accordance with the description above set forth and according to the provisions of the ordinances of the City of Minneapolis, and, being first duly sworn, I hereby state and say that the facts stated by me and contained in the above permit are true as therein stated.

Subscribed and sworn to before me at Minneapolis, Minnesota,  
this 22 day of FEB A. D. 1974  
W. A. Kalin Notary Public, Hennepin  
County, Minnesota. My commission expires 4/30 1977

Signed Carl Bolander Sons Co.  
(Company or Individual Owner)  
By Ray M. Purschert (Agent)  
Address 2733 Pleasant, 825-6051  
(Company or Owner Address)

A 0806005

PERMIT FEE PAID



OVER

## INSPECTOR OF BUILDINGS

10

X

River View Road

LOCATION 5347-Snellings Ave.

LOT 13 BLOCK 1 ADD. Thorpe Bros. Minnehaha Grove

5511 3089 0092 0857

PERMIT NO.	CONSTRUCTION	DATE	CONTRACTOR	COST	O. K.
B 191797	16x20 Fr. dwlg.	9-8-25	Harry Rowe	200.	
F 260771	Elect.	6-15-33	R. C. Gordon	15.	7-3-33
F 260960	Elect.	6-30-33	R. C. Gordon	10.	7-3-33
E 17957	Move fr. dwlg. same lot	10-28-36	Edw. Carlson	55.	
B 246962	12x20 Shingle & ven. add. dwlg. & rep.	10-30-36	Aaron Carlson	1000.	
D 266084	Plbg.	11-12-36	R. L. Deming	340.	1-20-37
F 290911	Elect.	12-18-36	Williams Elect. Co.	40.	
L 15806	Lathing	1-4-37	E. A. Johnson	25.	1-11-37
K 42297	Plast.	1-4-37	E. A. Johnson	110.	1-15-37
M-14956	Gas burner	9-10-41	Burns P&H Co.	65.	
F-347100	Transf. for gas burn.	9-16-41	Henry J. Mester	10.	
D-344285	Rpl. water htr.	5-11-44	J. T. Howdeshell	90.	
F-388469	Alts.	12-9-46	C. A. Richmond	125.	
D 426126	Con. gas range & gas servel	11-17-49	M. Mattson	15.	
F 454320	Transf. gas	12-5-50	J. M. Christianson	20.	

WRECKING

DELL



OVER

# INSPECTOR OF BUILDINGS

LOCATION 5347 Riverview Road

LOT 13

BLOCK 1 ADD. Thorpe Bros. Minnehaha Grove  
6611 3089 0092 0858

PERMIT NO.	CONSTRUCTION	DATE	CONTRACTOR	COST	O. K.
B343620	8x8x8 rear porch addn	9-30-54	Lloyd C. Anderson	500.	
B 354061	20x8'8 addn dwlg	9-4-56	Lloyd C Anderson	2000.	
B358598	21x8.6x8 fr addn rear	8-7-57	James N. Roberts	2,820.	
Q 18958	Altr Grav.w.a. htg	8-13-57	Lovejoy Htg	90.	
I-17318	Wreck; 20x36x16x1 frame dwelling	2-22-57	Carl Bolander & Sons	800.	

**WRECK**



# INSPECTOR OF BUILDINGS

River View Road

10

X

LOCATION 5348 ~~Shelling Ave.~~

LOT 6 BLOCK 2 ADD. Thorpe Bros. Minnehaha Grove  
 6611 3089 0092 0859

PERMIT NO.	CONSTRUCTION	DATE	CONTRACTOR	COST	O. K.
B 263969	34x28.3 Sto.& Stu.Sgl. Dwlg.	8-26-40	Mrs. Arthur Abrahamson	4500.	
P 2936	Mech.W.A.Htg.	10-16-40	Cronstrom Furn. Co.	460.	
D 312186	Plbg.	10-18-40	Spetz & Berg	450.	
F 337141	Elec.	10-24-40	Edw. F. Seestrom	150.	2-25-41J
L 21426	Lath.	10-30-40	Walter L. Peterson	100.	11-22-40
K 49218	Plast.	10-30-40	Walker L. Pehrson	600.	
M 12648	Gas Burner	11-22-40	H.O. Soderlin	15.	
F 339240	Elec	12-27-40	E F Seestrom	75.	2-25-41J
B-296221	22x24 fr. pvt. garage	9-29-47	Arthur E. Abrahamson	500.	
D 418703	Repl Gas Rge.	7-14-49	Boutell Bros.	235.	
M 130620	Gas Burner	9-29-61	Twin City Gas Heat	45.	
P 45025	Mech.W.A.	10-13-61	Heating Service	425.	
E 22668	Move on 16x22x14 garage	9-24-74	Safeway House Movers	250.	



RUN DATE: 05/05/90  
 RUN TIME: 00:44

CITY OF MINNEAPOLIS  
 DEPARTMENT OF INSPECTIONS  
 MICROFILMED PERMITS REPORT

PAGE 25112  
 REPORT 440-611110

ADDRESS	PERMIT NUMBER	ISSUE DATE	COMPL DATE	LOT	BLOCK	ADDITION-NAME	USE N	ESTIMATED COST	FEE AMOUNT	CONTRACTOR NAME	CONSTRUCTION TRF COMMENTS
5336 RIVERVIEW RD				003	002	THORPE BROS MHAHA GROVE					
	D813948	08/14/78	07/99/80	0000				20	.00		DRYER MINNEGASCO
	D821556	05/17/79	12/07/79	0000				350	.00		W-EXT 100' 5-WH OSTRON
	B560086	08/19/88	10/27/88	0000		M1B N		-9,000	81.50	HOME OWNER	CONSTRUCT DETACHED GARAGE RES 24X26 X
5340 RIVERVIEW RD				004	002	THORPE BROS MHAHA GROVE					
	B469763	04/22/77	01/10/78	0000				500	.00		REROOF DWLG #123
5342 RIVERVIEW RD				005	002	THORPE BROS MHAHA GROVE					
	F670873	06/23/72	00/00/00	0000				500	.00		NEW SERV. 100 AMP, 1 METER, CHG, WIR, FIX
	D854061	09/12/83	01/12/84	0000				200	18.50	SWAGGERT PLUMBING CO	INSTL 1 GW RES
5348 RIVERVIEW RD				006	002	THORPE BROS MHAHA GROVE					
	B448256	07/16/74	12/19/74	0000		R3A M1B		200	.00		5N 16X22XB DET GARAGE 4FT YLARD OK BY ZON V
	B482659	08/10/78	02/12/79	0000				800	.00		REROOF DWLG #40
5352 RIVERVIEW RD				007	002	THORPE BROS MHAHA GROVE					
	0011292	01/19/81	05/27/82	0000				990	.00		P-MHA, M-GAS BRNR ** RAY WELTER
	F758797	01/29/81	12/18/81	0000				70	.00		WIRE FURNACE-LEIN ELEC
	F802269	03/05/86	03/18/86	0000				600	55.50		INSTL 1 100A SER, 12 30A CKT, 2 100A CKT
5356 RIVERVIEW RD				008	002	THORPE BROS MHAHA GROVE					
	F808493	12/05/86	12/15/86	0000				0	44.50	MAJOR ELECTRIC	INSTL 1 100A SER, B 30A CKT, RES
5364 RIVERVIEW RD				010	002	THORPE BROS MHAHA GROVE					
	D803935	08/17/77	08/24/77	0000				50	.00		GAS WTR HTR VENTCO
	F824155	09/16/88	01/09/89	0000				300	29.50	BLAINE HEATING & AIR	INSTL 2 30A CKT, RES
	0054403	09/16/88	10/19/89	0000				0	19.99	BLAINE HEATING	INSTL AC, PA 1 GAS BR, RES
	0054403	09/16/88	10/05/88	0000				1,000	16.08	BLAINE HEATING	INSTL AC, PA 1 GAS BR, RES
	0054934	10/13/88	01/09/89	0000				1,000	21.50	THERMEX CORPORATION	INSTL AC, RES

5336

RIVERVIEW RD

TO: 5364

RIVERVIEW RD

112







RUN DATE: 05/06/89  
 RUN TIME: 19:20

CITY OF MINNEAPOLIS  
 DEPARTMENT OF INSPECTIONS  
 MICROFILMED PERMITS REPORT

PAGE 19256  
 REPORT 440-B1K960

ADDRESS PERMIT NUMBER	ISSUE DATE	COMPL DATE	LOT PLAN FILE	BLOCK USE CODE	ADDITION NAME	ESTIMATED COST	FEE AMOUNT	CONTRACTOR NAME	CONSTRUCTION TYP COMMENTS
5336	RIVERVIEW RD		003	002	THORPE BROS MHAHA GROVE				
DB13948	08/14/78	07/99/80	0000			20	.00		DRYER MINNEGASCO
DB21556	05/17/79	12/07/79	0000			350	.00		W-EXT 100' G-WH OSTROM
5340	RIVERVIEW RD		004	002	THORPE BROS MHAHA GROVE				
B469763	04/22/77	01/10/78	0000			500	.00		REROOF DWLG #123
5344	RIVERVIEW RD		005	002	THORPE BROS MHAHA GROVE				
F670873	06/23/72	00/00/00	0000			500	.00		NEW SERV, 100 AMP, 1 METER, CHG, WIR, FIX
DB54061	09/12/83	01/12/84	0000			200	18.50	SWAGGERT PLUMBING CO	INSTL 1 GW RES
5348	RIVERVIEW RD		006	002	THORPE BROS MHAHA GROVE				
B448256	07/16/74	12/19/74	0000	R3A M1B		200	.00		5N 16X22XB DET GARAGE 4FT YLARD OK BY ZON Y
B482659	08/10/78	02/12/79	0000			800	.00		REROOF DWLG-HO
5352	RIVERVIEW RD		007	002	THORPE BROS MHAHA GROVE				
0011292	01/19/81	05/27/82	0000			990	.00		P-MWA, M-GAS BRNR ** RAY WELTER
F758797	01/29/81	12/18/81	0000			70	.00		WIRE FURNACE-LEIN ELEC
5364	RIVERVIEW RD		010	002	THORPE BROS MHAHA GROVE				
DB03935	08/17/77	08/24/77	0000			50	.00		GAS WTR HTR VENTCO
5372	RIVERVIEW RD		012	002	THORPE BROS MHAHA GROVE				
0771293	05/30/74	10/16/74	0000			5	.00		REPL GAS RANGE MNGSCO
B532851	10/22/84	04/09/85	0000		N	1,000	18.50		INSTL ALUM SIDING GARAGE RES
5384	RIVERVIEW RD		015	002	THORPE BROS MHAHA GROVE				
B503806	03/06/81	03/06/81	0000			800	.00		TEAR OFF & REROOF-H.O.
2505	ROBBINS ST		002	004	SOUTH GATE TERRACE 2ND DIVISION				
B436415	07/18/72	00/00/00	0000			500	.00		REROOF DWLG AND GARAGE
B441023	05/01/73	00/00/00	0000			1,200	.00		5N ENCLOSE EXISTING PORCH
F678471	05/22/73	00/00/00	0000			150	.00		WTR & FIXT
DB43696	01/20/82	07/99/82	0000			50	.00		GPIP METER OUT MNGSCO

5336 RIVERVIEW RD TO: 2505 ROBBINS ST 4256



# INSPECTOR OF BUILDINGS

10

X

River View Road

LOCATION 5351-Smelling Ave.

LOT 12      BLOCK 1      ADD.      Thorpe Bros. Minnehaha Grove  
 6611 3089 0092 0860

PERMIT NO.	CONSTRUCTION	DATE	CONTRACTOR	COST	O. K.
B 181009	14x16 Pri. fr. gar.	7-14-24	J. T. Tompkins	200.	
F 188060	Elect.	11-24-24	E. F. Schultz	20.	
B 192626	22x32 Stu. dwlg.	10-3-25	Elmer H. Long	2500.	
F 205167	Elect.	5-14-26	P. W. Thielman	115.	11-15-26
D 182761	Plbg.	6-3-26	M. Mattson	5.	
D 183011	Plbg.	6-11-26	M. E. Sheridan	300.	6-29-26
D 185884	Plbg.	9-24-26	M. Mattson	70.	2-2-27
K 23537	Plast.	10-8-26	J. H. Erickson	175.	10-26-26
D 274441	Plbg.	8-24-37	M. Mattson	100.	7-11-38
F-361978	Motor for gas furn.	10-27-44	Lyndale E. Co.	20.	
P-5414	Mech. W.A.	10-25-44	National Furnace Co.	645.	
B 295788	6x5 add to dwlg. & 8x8 rear add	9-10-47	Otto L. Wold	500.	
B337787	14x20x7 Det Fr Pvt Gar	10-16-53	Otto L Wold	400.	



RUN DATE: 05/06/89  
 RUN TIME: 19:20

CITY OF MINNEAPOLIS  
 DEPARTMENT OF INSPECTIONS  
 MICROFILMED PERMITS REPORT

PAGE 19256  
 REPORT 440-BJRM40

ADDRESS PERMIT NUMBER	ISSUE DATE	COMPL DATE	LOT PLAN FILE	BLOCK USE CODE	ADDITION NAME	ESTIMATED COST	FEE AMOUNT	CONTRACTOR NAME	CONSTRUCTION TYP COMMENTS
5336	RIVERVIEW RD		003	002	THORPE BROS MHAHA GROVE				
0813948	08/14/78	07/99/80	0000			20	.00		DRYER MINNEGASCO
0821556	05/17/79	12/07/79	0000			350	.00		W-EXT 100' G-WH DSTROM
5340	RIVERVIEW RD		004	002	THORPE BROS MHAHA GROVE				
B489783	04/22/77	01/10/78	0000			500	.00		REROOF DWLG #123
5344	RIVERVIEW RD		005	002	THORPE BROS MHAHA GROVE				
F670873	06/23/72	00/00/00	0000			500	.00		NEW SERV, 100 AMP, 1 METER, CHG, WIR, FIX
D854061	09/12/83	01/12/84	0000			200	18.50	SWAGGERT PLUMBING CO	INSTL 1 GW RES
5348	RIVERVIEW RD		006	002	THORPE BROS MHAHA GROVE				
B448256	07/16/74	12/19/74	0000	R3A M1B		200	.00		5N 16X22X8 DET GARAGE 4FT YLARD OK BY ZON Y
B482659	08/10/78	02/12/79	0000			800	.00		REROOF DWLG-HO
5352	RIVERVIEW RD		007	002	THORPE BROS MHAHA GROVE				
D011292	01/19/81	05/27/82	0000			990	.00		P-MWA, M-GAS BRNR ** RAY WELTER
F758797	01/29/81	12/18/81	0000			70	.00		WIRE FURNACE-LEIN ELEC
5364	RIVERVIEW RD		010	002	THORPE BROS MHAHA GROVE				
D803935	08/17/77	08/24/77	0000			50	.00		GAS WTR HTR VENTCO
5372	RIVERVIEW RD		012	002	THORPE BROS MHAHA GROVE				
D771293	05/30/74	10/16/74	0000			5	.00		REPL GAS RANGE MNGSCO
B532851	10/22/84	04/09/85	0000		N	1,000	18.50		INSTL ALUM SIDING GARAGE RES
5384	RIVERVIEW RD		015	002	THORPE BROS MHAHA GROVE				
B503806	03/06/81	03/06/81	0000			800	.00		TEAR OFF & REROOF-H.O.
2505	ROBBINS ST		002	004	SOUTH GATE TERRACE 2ND DIVISION				
B436415	07/18/72	00/00/00	0000			500	.00		REROOF DWLG AND GARAGE
B441023	05/01/73	00/00/00	0000			1,200	.00		5N ENCLOSE EXISTING PORCH
F678471	05/22/73	00/00/00	0000			150	.00		WIR & FIXT
D843696	01/20/82	07/99/82	0000			50	.00		GPIP METER OUT MNGSCO

1  
2  
3  
4  
5

5336

RIVERVIEW RD

TO: 2505

ROBBINS ST

4256



RUN DATE: 05/05/90  
 RUN TIME: 00:14

CITY OF MINNEAPOLIS  
 DEPARTMENT OF INSPECTIONS  
 MICROFILMED PERMITS REPORT

PAGE 25112  
 REPORT 440-BIXW40

ADDRESS	PERMIT NUMBER	ISSUE DATE	COMPL DATE	PLAN FILE	LOT BLOCK	ADDITION NAME	USE CODE	N B	ESTIMATED COST	FEE AMOUNT	CONTRACTOR NAME	CONSTRUCTION TYP COMMENTS
5336 RIVERVIEW RD				003	002	THORPE BROS MHAHA GROVE						
	D81394B	08/14/78	07/19/80	0000					20	.00		DRYER MINNEGASCO
	D821556	05/31/79	12/07/79	0000					350	.00		W-EXT 100' G-WH OSTRON
	B560086	08/19/88	10/27/88	0000		M1B N			-9,000	81.50	HOME OWNER	CONSTRUCT DETACHED GARAGE RES 24X26 X
5340 RIVERVIEW RD				004	002	THORPE BROS MHAHA GROVE						
	B469763	04/22/77	01/10/78	0000					500	.00		REROOF DWLG #123
5344 RIVERVIEW RD				005	002	THORPE BROS MHAHA GROVE						
	F670873	06/23/72	00/00/00	0000					500	.00		NEW SERV, 100 AMP, 1 METER, CHG, WIR, FIX
	D854061	09/12/83	01/12/84	0000					200	18.50	SWAGGERT PLUMBING CO	INSTL 1 GW RES
5348 RIVERVIEW RD				006	002	THORPE BROS MHAHA GROVE						
	B448256	07/16/74	12/19/74	0000		R3A M1B			200	.00		5N 16X22XB DET GARAGE 4FT YLARD OK BY ZON T
	B482659	08/10/78	02/12/79	0000					800	.00		REROOF DWLG #10
5352 RIVERVIEW RD				007	002	THORPE BROS MHAHA GROVE						
	0011292	01/19/81	05/27/82	0000					990	.00		P-MHA, M-GAS BRNR ** RAY WELTER
	F758797	01/29/81	12/18/81	0000					70	.00		WIRE FURNACE-LEIN ELEC
	F802269	03/05/86	03/18/86	0000					600	55.50		INSTL 1 100A SER, 12 30A CKT, 2 100A CKX
5356 RIVERVIEW RD				008	002	THORPE BROS MHAHA GROVE						
	F808493	12/05/86	12/15/86	0000					0	44.50	MAJOR ELECTRIC	INSTL 1 100A SER, 8 30A CKT, RES
5364 RIVERVIEW RD				010	002	THORPE BROS MHAHA GROVE						
	D803935	08/17/77	08/24/77	0000					50	.00		GAS WTR HTR VENTCO
	F824155	09/16/88	01/09/89	0000					300	29.50	BLAINE HEATING & AIR	INSTL 2 30A CKT, RES
	0054403	09/16/88	10/19/89	0000					0	19.99	BLAINE HEATING	INSTL AC, PA 1 GAS BR, RES
	0054403	09/16/88	10/05/88	0000					1,000	16.08	BLAINE HEATING	INSTL AC, PA 1 GAS BR, RES
	0054934	10/13/88	01/09/89	0000					1,000	21.50	THERMEX CORPORATION	INSTL AC, RES

5336

RIVERVIEW RD

TO: 5364

RIVERVIEW RD

112



CERTIFICATE OF OCCUPANCY

Location 5352 River View Road Building Permit No. B304474

Minneapolis, Minn., 4-15-53 1953

This certifies that we have inspected the building at the above location, situated on Lot 7  
Block 2 Thorpe Bros Naha Gardens Addition to Minneapolis, and find that the same complies, to the  
best of our knowledge and belief, with all the requirements of the Building Ordinances of the City relating  
thereto, and permission is hereby given for the occupancy of said building, in whole or in part, in the  
manner and for the purposes herein below specified. (See Section 206, Minneapolis Building Code.)

1 Floor \_\_\_\_\_ to be occupied for Pr Sgl Dwlg

\_\_\_\_\_ Floor \_\_\_\_\_ to be occupied for \_\_\_\_\_

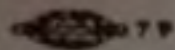
Signed T Inspector of Buildings

D-74-1881

D-4-1948

Mailing Address WITHEP Co. Ltd. Shannon  
5348- River View Road





# INSPECTOR OF BUILDINGS

LOCATION 5352 River View Road

LOT 7 ~~6611 7000 20092 5000~~ BLOCK 20092 ADD: Thorpe Bors. Minnehaha Grove

PERMIT No.	CONSTRUCTION	DATE	CONTRACTOR	COST
D697791	wtr clo, basin, sh, wa tray	1-24-68	LeVahn Bros.	400.
P 57905	Ventl. system	1-24-68	LeVahn Bros,	50.



INSPECTOR OF BUILDINGS

10

X

LOCATION 5352 River View Road

LOT 7

6611 ~~2092~~ ~~2092~~ ~~0851~~ BLOCK ADD.

Thorpe Bros. Minnehaha Grove

PERMIT No.	CONSTRUCTION	DATE	CONTRACTOR	COST	
B 304474	38x32 1 sty fr. sgl. dwlg.	4-11-49	Arthur E. Abrahamson	10,500.	S.
D 415480	Plbg. wat. htr. piping	5-11-49	Spetz & Berg	1,150.	
F 425081	Wiring & fixts.	5-11-49	Edw. F. Seestrom	350.	
P 13781	Mech. W.A. Htg.	5-17-49	Welter Htg.	760.	
K 63594	Int. & Ext. Plast.	5-26-49	Fred Nyberg	1,020.	
	Int. & Ext. Lath	5-26-49	do	190.	
M 49183	Inst. gas burner	8-26-49	Welter Htg.	35.	
B 307965	20x24x8 fr. priv. det. garage	9-12-49	Trinity Luth. Church	600.	S 304474
F 430962	Motor for gas	9-28-49	A. R. Berndt	35.	
B 320617	20x22x8' det. frm. pvt. gar.	6-15-51	Ben Lindahl	600.	S 304474
D 511487	Dryer	11-10-54	Howdeshell Co	15.	
F 515500	Elec. Range	11-30-54	J.M. Christianson Elec.	60.	
D 513066	Plbg.	12-13-54	The Howdeshell Co.	500.	
D 581215	Repl g wtr htr	7-1-59	Gilbert Bros.	135.	
D 598623	conn gas lite	10-10-60	Mpls Gas	5.	





# INSPECTOR OF BUILDINGS

10

X

River View Road

LOCATION 5355 Snelling Ave.

LOT 11

BLOCK - 1 ADD. Thorpe Bros. Minnehaha Grove  
6611 3089 0092 0863

PERMIT NO.	CONSTRUCTION	DATE	CONTRACTOR	COST	O. K.
B-269018	30x26 1 sty.fr.dwlg. & 12x20 garage	10-3-41	Albert H. Broberg	4,400.	
F-348917	Wiring	10-28-41	O. B. Thompson	100.	
L-22966	Int. rock lath	11-5-41	A. T. Lestor	60.	
K-51125	Int. plastering	11-5-41	do	300.	
F-349706	Transf. for gas	11-18-41	Chas. F. Dymoke	15.	
Q-4265	Gravity W.A. Mtg.	11-18-41	Waterbury Co.	265.	
F-350493	Fixts.	12-15-41	O. B. Thompson	45.	
N-16402	Gas burner	12-23-41	Burns P&H Co.	15.	
D-327058	Plbg. & gas	10-28-41	Spetz & Berg	530.	
D 421629	con. rge. & refrig.	9-7-49	M. Mattson	20.	
D 468578	Gas wat. htr.	5-12-52	M. Mattson	160.	
B 349108	Raise dormer; rm in attic	9-19-55	Tony Zilka	1500.	
D 526247	Wtr clos; basin	10-11-55	H B Stone	350.	
M 110643	Inst. gas burner	12-22-55	Lovejoy Htg.	325.	



154  
ORIGINAL

# PERMIT TO BUILD OUTSIDE OF FIRE LIMITS

330640

Owner H. S. Nelson

No. B

Architect \_\_\_\_\_

\$17,000.00

Office of the INSPECTOR OF BUILDINGS,

Builder do.

Minneapolis, Minn., 9-22-33

## PROPOSED LOCATION OF BUILDING

No.	Street	Part of Lot	Lot	Block	Town, Addition or Subdivision
<u>5356</u>	<u>Pines View Rd.</u>		<u>8</u>	<u>2</u>	<u>Thorp Bros. Mhaka Grove</u>

## DESCRIPTION OF BUILDING

Front	Depth	Height	Stories	Built of	Manner of Construction	To be Used as	To be Completed	Estimated Cost
<u>38</u>	<u>28</u>	<u>8</u>	<u>1</u>	<u>fr.</u>	<u>sgl.</u>	<u>dully</u>	<u>4-1-53</u>	<u>12,000</u>
<u>Setback 39.5'</u>								

Ward	Zone
<u>12</u>	<u>1</u>
C-Elev.	
D-Flg.	
E-Moving	
F-Elect.	
G-Flg.	
H-Clm.	
K-Plant.	
M	
N-O	
P-Q	
Eng's Cert.	<u>128012</u>

Permission is hereby granted to H. S. Nelson to erect the building res. foundation described in the above statement. This permit is granted upon the express condition that the person to whom it is granted, and his agents, employes and workmen, in all the work done in, around and upon said building, or any part thereof, shall conform in all respects to the ordinances of the City of Minneapolis, regarding the construction, alteration, maintenance, repair and removal of buildings within the city limits; and this permit may be revoked at any time upon violation of any of the provisions of said ordinances.

Res. 22,000 cost A. C.

Joseph A. Anderson  
Inspector of Buildings

### AGREEMENT AND SWORN STATEMENT

In consideration of the issue and delivery to me by the Inspector of Buildings of the City of Minneapolis of the above permit, I hereby agree to do the proposed work in accordance with the description above set forth and according to the provisions of the ordinances of the City of Minneapolis, and, being first duly sworn, I hereby state and say that the facts stated by me and contained in the above permit are true as therein stated.

Subscribed and sworn to before me at Minneapolis, Minnesota, this 22 day of Sept A. D. 1933

Miriam (Christina) ... Notary Public, Hennepin County, Minnesota. My commission expires 6-23-35

H. S. Nelson  
4509-28 Ave S.



RUN DATE: 05/05/90  
 RUN TIME: 00:44

CITY OF MINNEAPOLIS  
 DEPARTMENT OF INSPECTIONS  
 MICROFILMED PERMITS REPORT

PAGE 25112  
 REPORT 440-BJXW40

ADDRESS	PERMIT NUMBER	ISSUE DATE	COMPL DATE	LOT	BLOCK	ADDITION NAME	USE N	ESTIMATED COST	FEE AMOUNT	CONTRACTOR NAME	CONSTRUCTION TR COMMENTS
				005	002	THORPE BROS MHAHA GROVE					
	D813948	08/14/78	07/99/80	0000				20	.00		DRYER MINNEGABCO
	D821556	05/17/79	12/07/79	0000				350	.00		W-EXT 100' G-WH OSTROM
	B560086	08/19/88	10/27/88	0000		M1B N		-9,000	81.50	HOME OWNER	CONSTRUCT DETACHED GARAGE RES 24X26 X
5340	RIVERVIEW RD			004	002	THORPE BROS MHAHA GROVE					
	B469763	04/22/77	01/10/78	0000				500	.00		REROOF DWLG #123
5344	RIVERVIEW RD			005	002	THORPE BROS MHAHA GROVE					
	F670873	06/23/72	00/00/00	0000				500	.00		NEW SERV. 100 AMP. 1 METER. CHG. WIR. FIX
	D852061	09/12/83	01/12/84	0000				200	18.50	SWAGGERT PLUMBING CO	INSTL 1 GW RES
5348	RIVERVIEW RD			006	002	THORPE BROS MHAHA GROVE					
	B478256	07/16/74	12/19/74	0000		R3A M1B		200	.00		5W 16X22XB DET GARAGE 4FT YLARD OK BY ZON Y
	B482659	08/10/78	02/12/79	0000				800	.00		REROOF DWLG-HO
5352	RIVERVIEW RD			007	002	THORPE BROS MHAHA GROVE					
	0011292	01/19/81	05/27/82	0000				990	.00		P-MHA, M-GAS BRNR ** RAY WELTER
	F758797	01/29/81	12/18/81	0000				70	.00		WIRE FURNACE-LEIN ELEC
	F802269	03/05/86	03/18/86	0000				600	55.50		INSTL 1 100A SER, 12 30A CKT, 2 100A CKX
5356	RIVERVIEW RD			008	002	THORPE BROS MHAHA GROVE					
	F808493	12/05/86	12/15/86	0000				0	44.50	MAJOR ELECTRIC	INSTL 1 100A SER, 8 30A CKT, RES
5364	RIVERVIEW RD			010	002	THORPE BROS MHAHA GROVE					
	D803935	08/17/77	08/24/77	0000				50	.00		GAS WTR HTR VENTCO
	F824155	09/16/88	01/09/89	0000				300	29.50	BLAINE HEATING & AIR	INSTL 2 30A CKT, RES
	0054403	09/16/88	10/19/89	0000				0	19.99	BLAINE HEATING	INSTL AC, PA 1 GAS BR, RES
	0054405	09/16/88	10/05/88	0000				1,000	16.08	BLAINE HEATING	INSTL AC, PA 1 GAS BR, RES
	0054934	10/13/88	01/09/89	0000				1,000	21.50	THERMEX CORPORATION	INSTL AC, RES

5336

RIVERVIEW RD

TO: 5364

RIVERVIEW RD

112



## INSPECTOR OF BUILDINGS

10

X

LOCATION 5356 River View Road

LOT 8 6611 BLOCK 2 ADD. Thorpe Bros Minnehaha Grove

PERMIT NO.	CONSTRUCTION	DATE	CONTRACTOR	COST	
B330640	38x28x8 Fr Sgl Dwlg	9-22-52	A G Nelson	12,000.	S
K 71220	Int-Ext. Plastering	10-21-52	Fred Gustafson	1,080.	
	" " Lathing	10-21-52	do	170.	
D 475917	Plbg. gas piping, wat. htr.	10-21-52	Ostrom Plbg.	1,250.	
F 485564	Wiring, Fixt.	10-23-52	O. B. Thompson Co.	300.	
B331716	14x20 Det Fr Pvt Gar	11-6-52	Albin G Nelson	750.	
P: 23658	Inst. mech w. a. htg.	11-25-52	Cronstroms	1000.	
M-83703	Inst. gas burner	11-24-52	do	300.	
F 492780	Motor Gas F.A.	3-23-53	Henry J. Mester	35.	
D 569142	Washer	8-6-58	O B Strand	15.	
F630349	gas htg. plant	8-7-67	Ace Elec.	25.	
M 145982	I st. Gas Burner	8-8-67	Commercial Air	50.	
P 57069	Inst. Mech. W. A. Htg.	8-8-67	Commercial Air	500.	



INSPECTOR OF BUILDINGS

10

X

LOCATION 5359 Riverview Road

LOT 10 6611 BLOCK 103 ADDRESS 55 Thorpe Bros. Minnehaha Grove

PERMIT No.	CONSTRUCTION	DATE	CONTRACTOR	COST	O.K.
B 312737	32x28x8-1 sty.fr.sgle. dwlg.	5-19-50	Kermit L. Knudsen	8,000.	S.
D-440458	Plbg, wat. htr, piping	8-15-50	Grand P & H Co.	1,200.	
F 449018	Wiring, Fixt.	9-14-50	O. B. Thompson Co.	300.	
M-62466	Gas Burner	12-11-50	Cronstrom's Htg.	300.	
P-18441	Mech. W. A. Htg.	12-11-50	do	700.	
K-67441	Int. Ext. plast.	1-26-51	Ray Ruffenach	1,075.	
	Int. Ext. lath.	1-26-51	do	165.	
D 452148	Disposal	4-12-51	Grand P & H	150.	



01-18-49

ORIGINAL

### PERMIT TO BUILD OUTSIDE OF FIRE LIMITS

No. B 312737

Owner Kenneth L. Knudson

Office of the INSPECTOR OF BUILDINGS,

Architect \_\_\_\_\_

Builders Same

\$15,000

Minneapolis, Minn., 5-19 1950

#### PROPOSED LOCATION OF BUILDING

No.	Street	Part of Lot	Lot	Block	Town, Addition or Subdivision
5354	River View Road	✓	10	1	Shore Park Minneapolis

Ward 12 Plate

C-Elev. \_\_\_\_\_

D-Plat. 440458

E-Moving \_\_\_\_\_

F-Elev. \_\_\_\_\_

G-Use \_\_\_\_\_

H-Sign \_\_\_\_\_

K-Plat \_\_\_\_\_

M \_\_\_\_\_

N-O \_\_\_\_\_

Per's Cert. 124554

#### DESCRIPTION OF BUILDING

Front	Depth	Height	Stories	Built of	Manner of Construction	To be Used as	To be Completed	Estimated Cost
32	28	8	1	frame	single dwelling		1-1-51	9000.00

20160 cu ft Sec. of block 31.5' set back OK Club  
46.5' lot)

Permission is hereby granted to Kenneth L. Knudson erect the building and foundation described in the above statement. This permit is granted upon the express condition that the person to whom it is granted, and his agents, employes and workmen, in all the work done in, around and upon said building, or any part thereof, shall conform in all respects to the ordinances of the City of Minneapolis, regarding the construction, alteration, maintenance, repair and removal of buildings within the city limits; and this permit may be revoked at any time upon violation of any of the provisions of said ordinances.

Ralph A. G. ... Inspector of Buildings

#### AGREEMENT AND SWORN STATEMENT

In consideration of the issue and delivery to me by the Inspector of Buildings of the City of Minneapolis of the above permit, I hereby agree to do the proposed work in accordance with the description above set forth and according to the provisions of the ordinances of the City of Minneapolis, and, being first duly sworn, I hereby state and say that the facts stated by me and contained in the above permit are true as therein stated.

Subscribed and sworn to before me at Minneapolis, Minnesota,  
this 19 day of May, A. D. 19 50  
[Signature] Notary Public, Hennepin  
County, Minnesota. My commission expires 11/27 19 49

Kenneth L. Knudson

3-14-55

5



# CERTIFICATE OF OCCUPANCY

## CITY OF MINNEAPOLIS

BUILDING PERMIT NUMBER:

**BINB 2002906**

BUILDING ADDRESS:

**5360 RIVERVIEW RD**

OWNER INFORMATION:

**RIVERVIEW APTS SENIOR HOUSING  
328 KELLOGG BLVD W  
ST PAUL, MN 55102**

This certifies that we have inspected the building at the above location has been inspected and at the time of inspection has been found to comply with all the requirements of the State of Minnesota Building Code & the Minneapolis Code of Ordinances relating thereto. Permission is hereby given for the occupancy of said building, in whole or in part, in the manner and for the purposes herein specified. This certificate is issued pursuant to the Minneapolis Code of Ordinance 85.20 and the Minnesota State Building Code section 1300.0220

Building to be occupied as: **NEW 3 STORY 42 UNIT WOOD-FRAMED APT BLDG.**

Occupancy Type: **R-2**

Construction Type: **VB**

Building Code used: **2006 IBC**

Sprinkler: **SPRINKLERED**

Other Notes:

# Minneapolis

## City of Lakes

*Annie Sandberg, Dist. Supervisor*

AUTHORIZING SIGNATURE

**OCTOBER 31, 2012**

DATE SIGNED

Under the Authority of Patrick Higgins, City of Minneapolis Building Official

*Minneapolis*

*12*



## INSPECTOR OF BUILDINGS

River View Road

10

X

LOCATION 5360 Smelling Ave.

LOT 9

BLOCK 2 ADD: Thorpe Bros. Minnehaha Grove  
6611 3089 0092 0866

PERMIT NO.	CONSTRUCTION	DATE	CONTRACTOR	COST	O. K.
B-267083	32x36 1 sty. Br. ven. dwlg. & 12x20 priv. fr. garage	5-27-41	Edwin W. Larson	5,000.	
D-322352	Plbg. & water htr.	7-15-41	J.R. Brown	500.	
F-344733	Wiring	7-18-41	O.B. Thompson	120.	
L-22444	Int. rock lath	8-11-41	Erick Johnson	80.	
K-50475	Int. plastering	8-11-41	do	350.	
M-15395	Gas burner	10-3-41	H.O. Soderlin	15.	
F-348724	Fixts.	10-21-41	O.B. Thompson	50.	
F-349004	Motor for gas	10-29-41	Edw. F. Seestrom	20.	
D-327711	Gas plate	11-18-41	J.R. Brown	5.	
D-328840	con. room heater	1-2-42	M. Mattson	5.	
D-329328	Repl. gas range	1-23-42	Jack Rork	50.	
P-4994	Mech. W.A.	7-16-43	Cronstrom Furn. Co.	400.	
F 458900	Wiring, Fixt.	3-7-51	Ted's Elec. Serv.	50.	
B 370763	20x22x7 det. fr. pr. garage	6-14-60	Oscar Kruibits	1,300.	
F 575618	Wir fixt	10-24-60	Ted's Elec.	150.	



## INSPECTOR OF BUILDINGS

10

X

River View Road

LOCATION 5353-Smelling Ave.

LOT -9 BLOCK 1 ADD. Thorpe Bros. Minnehaha Grove  
6611 3089 0092 0867

PERMIT NO.	CONSTRUCTION	DATE	CONTRACTOR	COST	O. K.
B 179368	16x24 Fr. dwlg.	5-17-24	John P. Paulson	500.	
B 180812	9x16 Fr. wd. shed	7-5-24	John P. Paulson	50.	
F 193356	Elect.	5-20-25	P. W. Thielman	25.	
B 230199	26x24 Stu. dwlg.	10-28-31	Oscar Nyberg	2500.	
B 230838	20x18 Pri. st. gar.	12-28-31	Oscar Nyberg	200.	
B 231115	Finish wnd fl. rms. stu. dwlg.	2-26-32	Oscar Nyberg	300.	4-6-32
D 232842	Plbg.	2-29-32	Cedar P. & H. Co.	425.	8-4-32
L 10717	Lathing	3-9-32	Oscar Nyberg	100.	4-19-32
F 253795	Elect.	3-11-32	O. B. Thompson	75.	9-3-32
G 14634	W. A. furn.	3-15-32	R. Hamilton Co.	150.	10-5-32
K 36138	Plast. dwlg & gar.	3-18-32	S. Swanson	450.	9-20-32
L 10751	Lathing	3-21-32	R. E. Bohanan	40.	9-6-32
F 256635	Elect.	8-26-32	O. B. Thompson	75.	9-3-32
F 294856	Elec.	5-11-37	J. O. Sallblad	15.	5-17-37
M 11496	Gas Burner	9-12-40	H.O. Soderlin	15.	
D-346820	Gas range	9-26-44	M. Mattson	150.	
M-24780	Gas burner	1-17-46	H.O. Soderlin	85.	



RUN DATE: 05/05/90  
 RUN TIME: 00:44

CITY OF MINNEAPOLIS  
 DEPARTMENT OF INSPECTIONS  
 MICROFILMED PERMITS REPORT

PAGE 25112  
 REPORT 440-BIXM40

ADDRESS PERMIT NUMBER	ISSUE DATE	COMPL DATE	LOT PLAN FILE	BLOCK	ADDITION NAME	USE CODE	N ESTIMATED COST	FEE AMOUNT	CONTRACTOR NAME	CONSTRUCTION TYP COMMENTS
5336 RIVERVIEW RD			003	002	THORPE BROS MAHA GROVE					
0813948	08/14/78	07/09/80	0000				20	.00		DRYER MINNEGASCO
0821556	05/17/79	12/07/79	0000				350	.00		W-EXT 100' G-WH OSTRON
B560086	08/19/88	10/27/88	0000			M1B N	-9,000	81.50	HOME OWNER	CONSTRUCT DETACHED GARAGE RES 24X26 X
5340 RIVERVIEW RD			004	002	THORPE BROS MAHA GROVE					
B469763	04/22/77	01/10/78	0000				500	.00		REROOF DWLG #123
5344 RIVERVIEW RD			005	002	THORPE BROS MAHA GROVE					
F670873	06/23/72	00/00/00	0000				500	.00		NEW SERV, 100 AMP, 1 METER, CHG, WIR, FIX
B854061	09/12/83	01/12/84	0000				200	18.50	SWAGGERT PLUMBING CO	INSTL 1 GW RES
5348 RIVERVIEW RD			006	002	THORPE BROS MAHA GROVE					
B448256	07/16/74	12/19/74	0000		R3A M1B		200	.00		5N 16X22X8 DET GARAGE 4FT YLARD OK BY ZON Y
B482659	08/10/78	02/12/79	0000				800	.00		REROOF DWLG #10
5352 RIVERVIEW RD			007	002	THORPE BROS MAHA GROVE					
0011292	01/19/81	05/27/82	0000				990	.00		P-MA, M-GAS BRNR ** RAY WELTER
F758797	01/29/81	12/18/81	0000				70	.00		WIRE FURNACE-LEIN ELEC
F802269	03/05/86	03/18/86	0000				600	55.50		INSTL 1 100A SER, 12 30A CKT, 2 100A CKX
5356 RIVERVIEW RD			008	002	THORPE BROS MAHA GROVE					
F808493	12/05/86	12/15/86	0000				0	44.50	MAJOR ELECTRIC	INSTL 1 100A SER, B 30A CKT, RES
5364 RIVERVIEW RD			010	002	THORPE BROS MAHA GROVE					
D803935	08/17/77	08/24/77	0000				50	.00		GAS WTR HTR VENTCD
F824155	09/16/88	01/09/89	0000				300	29.50	BLAINE HEATING & A/P	INSTL 2 30A CKT, RES
0054403	09/16/88	10/19/89	0000				0	19.99	BLAINE HEATING	INSTL AC, PA 1 GAS BR, RES
0054403	09/16/88	10/05/88	0000				1,000	16.08	BLAINE HEATING	INSTL AC, PA 1 GAS BR, RES
0054934	10/13/88	01/09/89	0000				1,000	21.50	THERMEX CORPORATION	INSTL AC, RES

5336

RIVERVIEW RD

TO: 5364

RIVERVIEW RD

112



# INSPECTOR OF BUILDINGS

River View Road

LOCATION 5364 ~~Snelling Ave.~~

10

X

LOT 10

BLOCK 2 ADD. Thorpe Bros. Minnehaha Grove  
6611 3089 0092 0869

PERMIT NO.	CONSTRUCTION	DATE	CONTRACTOR	COST	O. K.
B 172691	18x22 fr dwlg. gar.	9-5-23	O. Nyberg	300.	
B 175342	10x14 pri fr gar.	11-26-23	O. Nyberg	100.	
F 176628	Elec.	12-31-23	L. Pratt	30.	3-6-29
B 177638	22x26 fdn to dwlg. moved on lot	4-8-24	O. Nyberg	800.	
E 15075	Move fr dwlg. on same lot.	5-6-24	W. W. Nordstrom	60.	
F 195757	Elec.	7-24-25	Edw. Hammer	20.	7-27-25
D 181570	Plbg.	4-29-26	Cedar Plbg. Co.	400.	12-28-26
D 285689	Plbg.	9-8-38	M. Mattson	100.	10-17-39
D 310052	Plbg.	8-30-40	M. Mattson	5.	
D 310132	Plbg.	8-30-40	F. C. Baldwin	50.	
P 2799	Grav. W.A. Htg.	9-17-40	Clausen Htg. Co.	380.	
D-412970	Connect gas range	3-28-49	M. Mattson	5.	
D 615254	rge	2-7-62	Mpls Gas	5.	
F 601911	Wir; new serv 100amp	1-10-64	Teds Elec. Serv.	300.	
B 391510	Reroof dwlg	5-5-65	N. E. Bergquist	285.	
B 398946	Rplc. gar. dr. & shingle gar.	9-12-66	Tiger Constr. Co.	340.	



RUN DATE: 05/06/89  
 RUN TIME: 19:20

CITY OF MINNEAPOLIS  
 DEPARTMENT OF INSPECTIONS  
 MICROFICED PERMITS REPORT

PAGE 19256  
 REPORT 440-B1X40

ADDRESS PERMIT NUMBER	ISSUE DATE	COMPL DATE	LOT PLAN FILE	BLOCK USE CODE	ADDITION N B	NAME ESTIMATED COST	FEE AMOUNT	CONTRACTOR NAME	CONSTRUCTION TYP COMMENTS
5336	RIVERVIEW RD		003	002		THORPE BROS MHAHA GROVE			
	DB13948	08/14/78	07/99/80	0000		20	.00		DRYER MINNEGASCO
	DB21556	05/17/79	12/07/79	0000		350	.00		W-EXT 100' G-WH OSTRUM
5340	RIVERVIEW RD		004	002		THORPE BROS MHAHA GROVE			
	B469763	04/22/77	01/10/78	0000		500	.00		REROOF DWLG #123
5344	RIVERVIEW RD		005	002		THORPE BROS MHAHA GROVE			
	F670873	06/23/72	00/00/00	0000		500	.00		NEW SERV. 100 AMP. 1 METER. CHG. WIR. FIX
	D854061	09/12/83	01/12/84	0000		200	18.50	SWAGGERT PLUMBING CO	INSTL 1 GW RES
5348	RIVERVIEW RD		006	002		THORPE BROS MHAHA GROVE			
	B448256	07/16/74	12/19/74	0000	R3A M1B	200	.00		5N 16X22X8 DET GARAGE 4FT YLARD OK BY ZON Y
	B482659	08/10/78	02/12/79	0000		800	.00		REROOF DWLG-HO
5352	RIVERVIEW RD		007	002		THORPE BROS MHAHA GROVE			
	0011292	01/19/81	05/27/82	0000		990	.00		P-MWA, M-GAS BRNR ** RAY WELTER
	F758797	01/29/81	12/18/81	0000		70	.00		WIRE FURNACE-LEIN ELEC
5364	RIVERVIEW RD		010	002		THORPE BROS MHAHA GROVE			
	D803935	08/17/77	08/24/77	0000		50	.00		GAS WTR HTR VENTCO
5372	RIVERVIEW RD		012	002		THORPE BROS MHAHA GROVE			
	D771293	05/30/74	10/16/74	0000		5	.00		REPL GAS RANGE MNGSCO
	B532851	10/22/84	04/09/85	0000	N	1,000	18.50		INSTL ALUM SIDING GARAGE RES
5384	RIVERVIEW RD		015	002		THORPE BROS MHAHA GROVE			
	B503806	03/06/81	03/06/81	0000		800	.00		TEAR OFF & REROOF-H.O.
2505	ROBBINS ST		002	004		SOUTH GATE TERRACE 2ND DIVISION			
	B436215	07/18/72	00/00/00	0000		500	.00		REROOF DWLG AND GARAGE
	B441023	05/01/73	00/00/00	0000		1,200	.00		5N ENCLOSE EXISTING PORCH
	F678471	05/22/73	00/00/00	0000		150	.00		WIR & FIXT
	D843696	01/20/82	07/99/82	0000		50	.00		GPIP METER OUT MNGSCO

5336

RIVERVIEW RD

TO: 2505

ROBBINS ST

4256



# INSPECTOR OF BUILDINGS

River View Road

LOCATION 5367-Smelting Ave.

LOT B BLOCK 1 ADD. Thorpe Bros. Minnehaha Grove  
6611 3089 0092 0870

PERMIT NO.	CONSTRUCTION	DATE	CONTRACTOR	COST	O. K.
B 181191	20x20 Stu. dwlg.	7-18-24	Mrs. Harriet Wickland	1000.	
B 183601	10x18 Fr. pri. gar.				
	12x20 Fr. add. to hse.	10-15-24	Harry J. Carlson	800.	
F 168057	Elect.	11-24-24	E. F. Schultz	30.	
F 193565	Elect.	5-26-25	V. P. Coursolle	25.	7-24-25
B 195776	9x8 Porch to stu. dwlg.	4-8-26	Oscar Nyborg	150.	
D 182241	Plbg.	5-18-26	M. Mattson	5.	
G 4919	W. A. furn.	9-13-26	A. Hendrickson	180.	10-12-26
D 229543	Plbg.	9-1-31	S. Side Plbg. Co.	400.	9-11-31
F-364271	Transfs. for gas furn.	2-26-45	Henry J. Mester	10.	
D 396951	Connect gas range	6-7-48	M. Mattson	5.	
M 91201	gas burner	8-18-53	Minn. Gas Service	200.	
Q 17893	Inst. grav w.a. htg.	9-23-53	Gage Reeves C o.	700.	
B 357593	20x22x7 det fr gar	6-10-57	Philip Doris	1000.	S 181191
D 646018	rpl g s wat htr	6-10-64	Nicollet Plbg	150.	
E 21718	Move gar to 5100 N. Morgan	12-13-66	Semple Hse. Mvrs.	150.	



## INSPECTOR OF BUILDINGS

10

X

River View Road

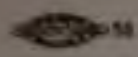
LOCATION 5368 Snelling Ave.

LOT 11

BLOCK 2 ADD: Thorpe Bros. Minnehaha Grove  
6611 3089 0092 0872

PERMIT NO.	CONSTRUCTION	DATE	CONTRACTOR	COST	O. K.
B 189358	22x28 stu dwlg.	6-15-25	Otto Thorsten	600.	
B-280522	30x29 1 sty.fr.dwlg.	11-28-44	Eugene M. Smith	5,200.	
F-363259	Wiring	12-26-44	A.R. Berndt	135.	
Q-7079	Gravity W.A.	1-15-45r	Twin City F&Appl.Co.	285.	
D-34904 <sup>2</sup>	Plbg. & gas	1-30-45	V.E. Beaudry	625.	
F-364163	Transf. for gas furn.	2-20-45	Henry J. Mester	10.	
M-19458	Gas burner	2-9-45	Mpls. Gas Lt. Co.	20.	
F-365859	Fixts.	5-29-45	A.R. Berndt	35.	
B-323102	16x22x8' det. frm. pvt. gar.	9-14-51	Geo. A. Benson	500.	S-280522
D 645904	gas yard lite	6-8-64	Mpls Gas	10.	
B 422608	Reroof dwlg.	6-25-70	Geo. Benson	450.	
E 22684	Move 16x22x13 garage out of city	11-20-74	Acme Bldg. Movers	250.	
E 22690	Move 29x30x19 dwlg to: 4227 29th Ave. So.	1-2-75	Ernst Movers'	2500.	





# INSPECTOR OF BUILDINGS

10 X

LOCATION 5100-E 54th St.

LOT 20 BLOCK 2 ADD. Thörpe bros. Winnehaha Grove  
1701 0890 0129 2404

PERMIT NO	CONSTRUCTION	DATE	CONTRACTOR	COST	O K
B 208650	30x26 Stu. Dwlg.	2-2-28	Andrew Butler	4000.	
F 222691	Elec.	5-5-28	H. C. Hanson	80.	6-27-28
D 198225	Plbg.	5-7-28	Sacks & Karkhoff	455.	11-3-28
G 8653	W. A. Htg. Plt.	5-12-28	Gold Seal Furn. Co.	225.	12-18-28
L 2630	Lathing	5-23-28	Andrew Butler	15.	10-17-28
F 223805	Elec.	6-20-28	H. C. Hanson	50.	6-27-28
K 28742	Plastering	9-27-28	J. J. Senogles	400.	9-28-28
L 3808	Lathing	9-27-28	J. J. Senogles	45.	9-25-28
F 302017	Elec.	10-25-37	Delp. Elec. Co.	35.	11-4-37
F 327356	Elec.	12-20-39	Mpls. Gen. Elec. Co.	25.	2-16-40
B 264004	20x20 Pri Fr Gar	8-27-40	A Gustafson	240.	
D 311474	Plbg	10-1-40	Eric Pehrson	100.	
D 311625	Plbg	10-3-40	M Mattson	150.	
M 12886	Gas burn	12-27-40	Mpls Gas Co	70.	
F-340233	Transf. for gas furn.	2-10-41	Collins E. Co.	15.	6-25-41 N
F 571466	Wir	5-13-60	Vic's Elec.	50.	
M 126834	1 gas design, piping	5-13-60	Heating Service	40.	
P 42009	Inst. Mech. W.A.	5-13-60	do	720.	
F 571565	Gas mtr	5-18-60	R C Plant	25.	
D 593675	repl sink g rge	5-23-60	Lake St rlbq	65.	



RUN DATE: 05/06/89  
 RUN TIME: 19:20

CITY OF MINNEAPOLIS  
 DEPARTMENT OF INSPECTIONS  
 MICROFICHERD PERMITS REPORT

PAGE 8165  
 REPORT 440-BIXM40

ADDRESS PERMIT NUMBER	ISSUE DATE	COMPL DATE	LOT PLAN FILE	BLOCK USE CODE	ADDITION NAME ESTIMATED COST	FEE AMOUNT	CONTRACTOR NAME	CONSTRUCTION TYP COMMENTS
5100 0011949	E 54TH ST 03/10/81	09/22/81	020	002	THORPE BROS MHAHA GROVE 1,300	.00		
F759751	03/13/81	03/99/82	0000		70	.00		P-MWA, M-GAS BRNR, PIP ** CENTRAL A/C 1-30AMP CKT FURNACE ROSSOW
5118 B476140	E 54TH ST 11/16/77	02/16/78	016	002	THORPE BROS MHAHA GROVE 450	.00		REROOF #601
500 0010998	W 54TH ST 12/24/80	02/10/83	070	000	AUDITORS SUBD NO 148 117	.00		
F789393	08/29/84	09/20/84	0000		1,200	43.50	NORTH SIDE ELECTRIC	P-HUMIDIFIER ** FRED VOGT INSTL 1 100A SER, 10 30A CKT. RES
501 F686018	W 54TH ST 04/15/74	05/10/74	83-	JJJ	AUDITORS SUBD NO 149 300	.00		
D771624	06/11/74	07/11/74	0000		1,000	.00		FEEDER 60AMP 2MOTORZ WIR FIXT BATZLI BSMT BSN SNK DRINK FTN GRAND
506 D780697	W 54TH ST 06/12/75	10/28/75	069	000	AUDITORS SUBD NO 148 209	.00		GAS WTR HTR LINDMAN
509 N028761	W 54TH ST 04/13/77	06/22/77	83-	JJJ	AUDITORS SUBD NO 149 25,000	.00		
B523070	08/04/83	03/02/84	0000		N 22,567	172.28	DALSIN, BERNARD L CO	2 OIL BRNR LOUIS DEGIDIO RPL REROOF W/TEAROFF COMRCL
B525480	11/07/83	05/22/84	0000		N 3,800	48.90		RPRS 2 TUCKPOINT MASONRY CHIMNEY, COMRCL
F786642	05/11/84	05/03/84	0000		0	30.50	OLYMPIC ELECTRIC	RPR 2 30A CKT, 1 100A CKT, COMRCL
D867731	08/30/85	09/24/85	0000		1,000	90.50	RICHFIELD PLUMBING CO	INSTL 2 SK, 1 FD, 1 DW, 1 DP, 1 EW, COMX
0036578	09/18/85	11/20/85	0000		3,000	41.50	COMMERCIAL AIR COND	ALT PV COMRCL
510 D842129	W 54TH ST 10/29/81	02/24/83	068	000	AUDITORS SUBD NO 148 1,500	.00		WC BSN SNK SHWR MF RICHFIELD PLBG
0015115	10/30/81	02/28/83	0000		1,500	.00		P-MWA, M-GAS BRNR, PIP ** DEL-AIR
0015238	11/05/81	02/17/82	0000		200	.00		L-A/C ** THERMEX CORPORATION
F766322	11/25/81	10/12/82	0000		1,000	.00		100A SER 7-30A CKT BBC ELEC

MINN 10-4

5100

E 54TH ST

TO: 510

W 54TH ST

3165



RUN DATE: 05/05/90  
 RUN TIME: 00:44

CITY OF MINNEAPOLIS  
 DEPARTMENT OF INSPECTIONS  
 MICROFICED PERMITS REPORT

PAGE 10681  
 REPORT 440-BIXM40

ADDRESS PERMIT NUMBER	ISSUE DATE	COMPL DATE	LOT PLAN FILE	BLOCK USE CODE	ADDITION NAME ESTIMATED COST	FEE AMOUNT	CONTRACTOR NAME	CONSTRUCTION TYP COMMENTS
5006	E 54TH ST		010	003	THORPE BROS MHAHA GROVE			
F713552	02/08/77	05/09/77	0000		150	.00		2-30A CKT ALT-REP ACE
B472143	07/08/77	10/24/77	0000	R3A	MTB	2,100	.00	5N 14X20XB DET PRIV GARAGE-HO
5012	E 54TH ST		009	003	THORPE BROS MHAHA GROVE			
B437052	08/11/72	00/00/00	0000		1,200	.00		RESIDE DWLG
D788199	03/15/76	03/22/76	0000		249	.00		GAS WTR HTR LINDMAN
F825829	09/06/88	09/13/88	0000		815	65.50	SOUTH SIDE ELECTRIC IN	INSTR 1 100A SER, 11 30A CKT, RES
5016	E 54TH ST		008	003	THORPE BROS MHAHA GROVE			
G020581	11/13/82	11/17/82	0000		1,100	37.80	STANDARD HEATING	RPL PW, 1<2" GP, 1 GAS BR, RES
F773714	11/17/82	01/17/84	0000		70	10.50		RPL FU RES
B558445	06/14/88	07/08/88	1275	N	12,000	124.75		CONST REAR 3-SEASON PORCH&DECK AT REAR, N
F821997	07/05/88	07/18/88	0000		400	30.50	MASTER ELECTRIC	INSTR WIRING FOR 3-SEASON PORCH ADDN
G058584	05/15/89	11/20/89	0000		100	1.62	STANDARD HEATING	INSTR AC, PA RES
5100	E 54TH ST		020	002	THORPE BROS MHAHA GROVE			
G011949	05/10/81	09/22/81	0000		1,300	.00		P-HVA, M-GAS BRNR, PIP ** CENTRAL A/C
F759751	03/13/81	03/99/82	0000		70	.00		1-30AMP CKT FURNACE ROSSOW
D874895	09/18/86	01/22/87	0000		915	26.50	WELD, DON PLUMBING	INSTR 5-1BN, 90LF, RES
5118	E 54TH ST		016	002	THORPE BROS MHAHA GROVE			
B476140	11/16/77	02/16/78	0000		450	.00		REROOF #601
D876614	12/31/86	01/05/87	0000		400	18.00	BOEDEKER PLBG & HTG	RPL 1 GAS WTR HTR RES
500	W 54TH ST		070	000	AUDITORS SUBD NO 148			
G010998	12/24/80	02/10/83	0000		117	.00		P-HUMIDIFIER ** FRED VOGT
F789393	08/29/84	09/20/84	0000		1,200	43.50	NORTH SIDE ELECTRIC	INSTR 1 100A SER, 10 30A CKT, RES
501	W 54TH ST		83-	003	AUDITORS SUBD NO 149			
B445849	03/11/74	07/01/74	1094	MTB	6,300	.00		5N DETACHED GARAGE 52X22X9FT
F686018	04/15/74	05/10/74	0000		300	.00		FEEDER 60AMP 2MOTORZ WIR FIXT BATZLI

5006

E 54TH ST

TO: 501

W 54TH ST

681



# INSPECTOR OF BUILDINGS

LOCATION 5106 East 54th St.

LOT 19

1701 BLOCK 2 ADD. Thorpe Bros. M'haha Grove  
0890 0129 2406

PERMIT NO	CONSTRUCTION	DATE	CONTRACTOR	COST	O K
D 60520	2 repl g rge	4-10-61	Mpls Gas Co	10.	
K 82446	Ext. plast & lath	4-5-61	Carl A. Johnson	375.	
B 375008	16x22x7det.fr.pr.garage	6-28-61	Leonard Dongoski	995.	372376
D 608502	dryer	7-21-61	Ventco Inc	10	
D 654924	gas lite	1-12-65	Mpls Gas Co.	10.	
D 654924	gas lite	1-12-65	Mpls Gas Co.	10.	
D 730049	repl gas wtr.htr.	6-25-70	Nicollet Plbg.	150.	
E 22668	Move garage across alley	9-24-74	Safeway House Movers	250.	



INSPECTOR OF BUILDINGS

10 X

LOCATION 5110 E. 54th Street

LOT 18

BLOCK 2

ADD. Thorpe Bros. M'haha Grove

PERMIT NO	CONSTRUCTION	DATE	CONTRACTOR	COST		
B 372132	26x42.5x8-1styfr.sgle.dwlg.	9-19-60	Z A E Anderon & Son	16,000.	S	
D 599164	Plbg; pip; gw htr	10-21-60	Grand Plbg Co.	1,450.		
P 43108	Inst. Mech.W.A.	10-26-60	Fred Vogt & Co.	450.		
K 82221	Ext. plast. & lath	10-31-60	Carl A. Johnson	350.		
F 575887	Wir fixt 100 amp	10-31-60	A & A Elec	300.		
M 128162	1 gas design	11-2-60	Fred Vogt & Co.	400.		
F 577149	Mtr gas burner	12-13-60	Elec. Repr & Const.	35.		
P 43698	Vent. Sys.	2-9-61	Fred Vogt & Co.	30.		
D 603434	wat met	2-15-61	Grand	25.		
D 603461	wato washer	2-17-61	Grand	10.		
D 606396	wash & dryer	5-16-61	Klatke Plbg	45.		
B 374665	22x22x7det.fr.pr.garage	6-6-61	Suburban Garages	1,300.		372132
E22607	To raise & hold dwlg & pri gar above exist. fndation on same lot.	11-29-73	Wm. B. Otting	100.		
E 22626	Move out of city	2-13-74	Wm. Otting	2,800		





# INSPECTOR OF BUILDINGS

110 X

LOCATION 5114 E. 54th St.

LOT 17

BLOCK 2 ADD. Thorpe Bros. Minnehaha Grove  
1701 0890 0129 2407

PERMIT NO	CONSTRUCTION	DATE	CONTRACTOR	COST	O K
B-280451	30x26 1 sty. fr. dwlg.	11-20-44	Edith O. Ware	1,000.	
D-349074	Plbg. & gas	1-31-45	F. S. Lamson	500.	
F-363874	Wiring	1-31-45	A. R. Berndt	150.	
Q-7169	Gravity W.A.	2-1-45	Plehol Htg. Co.	300.	
M-19474	Gas burner	2-13-45	H. O. Soderlin	20.	
F-364383	Transf. for gas furn.	3-5-45	Henry J. Mester	10.	
D-350243	Gas range	4-6-45	Eric Pehrson	5.	
F-365334	Fixts.	5-1-45	A. R. Berndt	35.	
F-375948	Range	4-1-46	V. E. Frykman	25.	
B-299193	14x20 fr. pvt. garage	5-4-48	Geo. J. Peterson	500.	S-280451
D 566634	Rpl sink	5-27-58	Paragon P&H	75.	
E 22529	Raise & Hold 26x30x18 (1 1/2) Dwlg above fdn	10-18-72	William Otting	100.	
E 22534	MOVE 26x30x20 dwlg & 14 x22x12 garage to Glencoe, Minnesota	11-6-72	William Otting	1500.	

WRECKING



01-1944  
ORIGINAL

Owner

*Carl C. Ware*

Architect

Builders

*4*

*4*

# PERMIT TO BUILD OUTSIDE OF FIRE LIMITS

Office of the INSPECTOR OF BUILDINGS,

Minneapolis, Minn.,

No. B200150

3390 11/20 1944

## PROPOSED LOCATION OF BUILDING

No.	Street	Part of Lot	Lot	Block	Ward, Addition or Subdivision
5118	E. 54th St.		16	2	Sharpey Truss Minneapolis Truss

## S-F DESCRIPTION OF BUILDING

Front	Depth	Height	Stories	Build of	Manner of Construction	To be Used as	To be Completed	Estimated Cost
30	26	8	1	Frame	single dwelling		4/45	5,500
17,550 c.f. <i>Carl C. Ware</i>								of Rca \$13,258

- Ward 12 Field 32-36
- No. C. Elevator Permit
- No. D. *340075* Permit
- No. E. Moving Permit
- No. F. Electrical Permit
- No. G. *102472* Heat and Power Plant Permit
- No. H. *7219* Sign Permit
- No. I. Plastering Permit
- No. J. Lathing Permit
- No. K. Gas Burner Permit
- No. L. Oil Burner Permit
- No. M. Stump Permit
- No. N. *11277* Equipment Permit

Permission is hereby granted to *Carl C. Ware* to *erect* the building *erect* foundation described in the above statement. This permit is granted upon the express condition that the person to whom it is granted, and his agents, employees and workmen, in all the work done in, around and upon and building, or any part thereof, shall conform in all respects to the ordinances of the City of Minneapolis, regarding the construction, alteration, maintenance, repair and removal of buildings within the city limits; and this permit may be revoked at any time upon violation of any of the provisions of said ordinances.

*John C. Nelson* Inspector of Buildings

### AGREEMENT AND SWORN STATEMENT

In consideration of the issue and delivery to me by the Inspector of Buildings of the City of Minneapolis of the above permit, I hereby agree to do the proposed work in accordance with the description above set forth and according to the provisions of the ordinances of the City of Minneapolis, and, being first duly sworn, I hereby state and say that the facts stated by me and contained in the above permit are true as therein stated.

*Carl C. Ware*

Subscribed and sworn to before me at Minneapolis, Minnesota, this *20* day of *April*, A. D. 1944

My commission expires *4-1-1948* 1948

*John C. Nelson*  
Notary Public, Hennepin County, Minn.



DO-1000

ORIGINAL

# PERMIT TO BUILD OUTSIDE OF FIRE LIMITS

No. B 383601

Owner Louis Larson

Office of the INSPECTOR OF BUILDINGS,

Architect \_\_\_\_\_  
Builder Suburban Garage Bldg. Inc.

Minneapolis, Minn., 6-12-1963

### PROPOSED LOCATION OF BUILDING

No.	Street	Part of Lot	Lot	Block	Town, Addition or Subdivision
5118	E. 54 Street				

Ward	12	Plate
Lot Width		
zoning		
Setback		
Survey	28080	
Type & Class		
Approved	[Signature]	
Volume	3000 Cu Ft.	
Alta. #		
Engr's Cert.		

### DESCRIPTION OF BUILDING

Front	Depth	Height	Stories	Description	To be Completed	Estimated Cost
14	20	7	1	FRAME PRIVATE GARAGE det 2" x 4" STUDS 16" O.C. CENTERS 1" x 4" CORNER BRACING over 6 ft from side lot line, over 6 ft from rear of driveway	8-15-63	\$2500

Permission is hereby granted to Suburban Garage Bldg. Inc. to construct the building foundation described in the above statement. This permit is granted upon the express condition that the person to whom it is granted, and his agents, employees and workmen, in all the work done in, around and upon said building, or any part thereof, shall conform in all respects to the ordinances of the City of Minneapolis, regarding the construction, alteration, maintenance, repair and removal of buildings within the city limits; and this permit may be revoked at any time upon violation of the provisions of said ordinances.

Donald A. Erickson  
Inspector of Buildings.

### AGREEMENT AND SWORN STATEMENT

In consideration of the issue and delivery to me by the Inspector of Buildings of the City of Minneapolis of the above permit, I hereby agree to do the proposed work in accordance with the description above set forth and according to the provisions of the ordinances of the City of Minneapolis, and, being first duly sworn, I hereby state and say that the facts stated by me and contained in the above permit are true as therein stated.

Subscribed and sworn to before me at Minneapolis, Minnesota  
this 12th day of June, A. D. 1963  
[Signature]  
County, Minnesota. My commission expires 6-10-1964

Signed Suburban Garage Bldg. Inc.  
By Daniel S. Schmeimer  
Address 728 E 28 St.

JUN 12 1963 9 14 15  
 8 0004 (11)  
 Permit Fee Paid



# INSPECTOR OF BUILDINGS

10 X

LOCATION 5118 E. 54th St.

LOT 16

BLOCK 2 ADD. Thorpe Bros. Minnehaha Grove  
1701 0820 0129 2408

PERMIT NO	CONSTRUCTION	DATE	CONTRACTOR	COST	O K
B-280450	30x26 1 sty. fr. dwlg.	11-20-44	Earl C. Ware	5,500.	
D-349075	Plbg. & gas	1-31-45	F. S. Lamson	500.	
F-363873	Wiring	1-31-45	A. R. Berndt	150.	8-24-45
F-364384	Transf. for gas furn.	3-5-45	Henry J. Mester	10.	
Q-7259	Gravity W.A.	3-7-45	Plehal Htg. Co.	290.	
F-365225	Fixts.	4-26-45	A. R. Berndt	35.	8-24-45
D-353115	con. gas range	8-13-45	M. Mattson	10.	
M-35509	Gas Burner	2-20-47	H. O. Soderlin	30.	
D 585254	Washer	10-16-59	Ventco Inc.	10.	
D 623108	dryer	8-31-62	Ventco Inc	10.	
B 383601	14x20x7 det fr pri gar	6-12-63	Suburban Garage Bldrs.	825.	



RUN DATE: 05/06/89  
 RUN TIME: 19:20

CITY OF MINNEAPOLIS  
 DEPARTMENT OF INSPECTIONS  
 MICROFILMED PERMITS REPORT

PAGE 8165  
 REPORT 440-81X60

ADDRESS PERMIT NUMBER	ISSUE DATE	COMPL DATE	LOT PLAN FILE	BLOCK USE CODE	ADDITION NAME	ESTIMATED COST	FEE AMOUNT	CONTRACTOR NAME	CONSTRUCTION TYP COMMENTS
5100	E 54TH ST		020	002	THORPE BROS MHAHA GROVE				
0011949	03/10/81	09/22/81	0000			1,300	.00		
F759751	03/13/81	03/99/82	0000			70	.00		P-MWA, M-GAS BRNR, PIP ** CENTRAL A/C 1-30AMP CKT-FURNACE ROSSOW
5118	E 54TH ST		016	002	THORPE BROS MHAHA GROVE				
B476140	11/16/77	02/16/78	0000			450	.00		REROOF #601
500	W 54TH ST		070	000	AUDITORS SUBD NO 148				
0010998	12/24/80	02/10/83	0000			117	.00		
F789393	08/29/84	09/20/84	0000			1,200	43.50	NORTH SIDE ELECTRIC	P-HUMIDIFIER ** FRED VOGT INSTL 1 100A SER, 10 30A CKT, RES
501	W 54TH ST		83-	]]]	AUDITORS SUBD NO 149				
F686018	04/15/74	05/10/74	0000			300	.00		
D771624	06/11/74	07/11/74	0000			1,000	.00		FEEDER 60AMP 2MOTORZ WIR FIXT BATZLI BSMT BSN SNK DRINK FTN GRAND
506	W 54TH ST		069	000	AUDITORS SUBD NO 148				
D780697	06/12/75	10/28/75	0000			209	.00		GAS WTR HTR LINDMAN
509	W 54TH ST		83-	]]]	AUDITORS SUBD NO 149				
N028761	04/13/77	06/22/77	0000			25,000	.00		2 OIL BRNR LOUIS DEGIDIO
B523070	08/04/83	03/02/84	0000		N	22,567	172.28	DALSIN, BERNARD L CO	RPL REROOF W/TEAROFF COMRCL
B525480	11/07/83	05/22/84	0000		N	3,800	48.90		RPRS & TUCKPOINT MASONRY CHIMNEY, COMRCL
F786642	05/11/84	05/03/84	0000			0	30.50	OLYMPIC ELECTRIC	RPR 2 30A CKT, 1 100A CKT, COMRCL
D867731	08/30/85	09/24/85	0000			1,000	90.50	RICHFIELD PLUMBING CO	INSTL 2 SK, 1 FD, 1 DW, 1 DP, 1 EW, COMRCL
0036578	09/18/85	11/20/85	0000			3,000	41.50	COMMERCIAL AIR COND	ALT PV COMRCL
510	W 54TH ST		068	000	AUDITORS SUBD NO 148				
D842129	10/29/81	02/24/83	0000			1,500	.00		WC BSN SNK SHWR MF RICHFIELD PLBG
0015115	10/30/81	02/28/83	0000			1,500	.00		P-MWA, M-GAS BRNR, PIP ** DEL-AIR
0015238	11/05/81	02/17/82	0000			200	.00		L-A/C ** THERMEX CORPORATION
F766322	11/25/81	10/12/82	0000			1,000	.00		100A SER 7-30A CKT B&C FLEC

5100

E 54TH ST

TO: 510

W 54TH ST

3165



RUN DATE: 05/05/90  
 RUN TIME: 00:44

CITY OF MINNEAPOLIS  
 DEPARTMENT OF INSPECTIONS  
 MICROFILMED PERMITS REPORT

PAGE 10687  
 REPORT 440-B1XW40

ADDRESS PERMIT NUMBER	ISSUE DATE	COMPL DATE	LOT PLAN FILE	BLOCK USE CODE	ADDITION NAME B	ESTIMATED COST	FEE AMOUNT	CONTRACTOR NAME	CONSTRUCTION TYP COMMENTS
5006	E 54TH ST		010	003	THORPE BROS MHAHA GROVE				
F713552	02/08/77	05/09/77	0000			150	.00		2-30A CKT ALT-REP ACE
B472143	07/08/77	10/24/77	0000	R3A	MTB	2,100	.00		5N 14X20XB DET PRIV GARAGE-HD
5012	E 54TH ST		009	003	THORPE BROS MHAHA GROVE				
B437052	08/11/72	00/00/00	0000			1,200	.00		RESIDE DWLG
0788199	03/15/76	03/22/76	0000			249	.00		GAS WTR HTR LINDMAN
F823829	09/06/88	09/13/88	0000			815	65.50	SOUTH SIDE ELECTRIC IN	INSTL 1 100A SER, 11 30A CKT, RES
5016	E 54TH ST		008	003	THORPE BROS MHAHA GROVE				
0020381	11/13/82	11/17/82	0000			1,100	37.80	STANDARD HEATING	RPL PW, 1<2" GP, 1 GAS BR, RES
F773714	11/17/82	01/17/84	0000			70	10.50		RPL FU RES
B558445	06/14/88	07/08/88	1273		N	12,000	124.75		CONST REAR 3-SEASON PORCH/DECK AT REAR, R
F821997	07/05/88	07/18/88	0000			400	30.50	MASTER ELECTRIC	INSTL WIRING FOR 3-SEASON PORCH ADDN
0058584	05/15/89	11/20/89	0000			100	1.62	STANDARD HEATING	INSTL AL, PA RES
5100	E 54TH ST		020	002	THORPE BROS MHAHA GROVE				
0011949	03/10/81	09/22/81	0000			1,300	.00		P-HWA, M-GAS BRNR, PIP ** CENTRAL A/C
F759751	03/13/81	03/99/82	0000			70	.00		1-30AMP CKT FURNACE ROSSOW
0874695	09/18/86	01/22/87	0000			915	26.50	WELD, DON PLUMBING	INSTL 5-1BN, 90LF, RES
5118	E 54TH ST		016	002	THORPE BROS MHAHA GROVE				
B476140	11/16/77	02/16/78	0000			450	.00		REROOF #601
0876614	12/31/86	01/05/87	0000			400	18.00	BOEDEKER PLBG & HTG	RPL 1 GAS WTR HTR RES
500	W 54TH ST		070	000	AUDITORS SUBD NO 148				
0010998	12/24/80	02/10/83	0000			117	.00		P-HUMIDIFIER ** FRED VOGT
F789993	08/29/84	09/20/84	0000			1,200	43.50	NORTH SIDE ELECTRIC	INSTL 1 100A SER, 10 30A CKT, RES
501	W 54TH ST		83-	003	AUDITORS SUBD NO 149				
B445849	03/11/74	07/01/74	1094	MTB		6,300	.00		3N DETACHED GARAGE 32X22X9FT
F686078	04/15/74	05/10/74	0000			300	.00		FEEDER 60AMP 2MOTORZ WIR FIXT BATZLI

510784 106

5006 E 54TH ST TO: 501 W 54TH ST 681



## GEOTECHNICAL EXPLORATION AND ENGINEERING REVIEW

*Minnehaha Townhomes*

*Riverview Road*

*Minneapolis*

*Minnesota*

*NTI Project No. 17.61872.100*

***Prepared For:***

Minneapolis Public Housing Authority  
1001 Washington Avenue North  
Minneapolis, Minnesota 55401

---



**NTI**<sup>™</sup>  
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TECHNOLOGIES, LLC

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[www.NTIgeo.com](http://www.NTIgeo.com)

Unearthing confidence<sup>™</sup>

March 10, 2017

Minneapolis Public Housing Authority  
Attention: Mr. Dean Carlson  
1001 Washington Avenue North  
Minneapolis, Minnesota 55401

Subject: Geotechnical Exploration and Engineering Review  
**Minnehaha Townhomes**  
Minneapolis, Minnesota  
NTI Project No. 17.61872.100

Dear Mr. Carlson,

In accordance to your request and subsequent authorization, Northern Technologies, LLC (NTI) conducted a Geotechnical Exploration for the above referenced project. Our services included advancement of exploration borings and preparation of an engineering report with recommendations developed from our geotechnical services. Our work was performed in general accordance with our proposal dated December 23, 2016.

Soil samples obtained at the site will be held for 60 days at which time they will be discarded. Please advise us in writing if you wish to have us retain them for a longer period. You will be assessed an additional fee if soil samples are retained beyond 60 days.

We appreciate the opportunity to have been of service on this project. If there are any questions regarding the soils explored or our review and recommendations, please contact us at your convenience at (651) 389-4191.

Northern Technologies, LLC

Steven D. Gerber, P.E.  
Senior Engineer

Debra A. Schroeder, P.E.  
Senior Engineer

Precision · Expertise · Geotechnical · Materials



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## GEOTECHNICAL EXPLORATION AND ENGINEERING REVIEW

*Minnehaha Townhomes*

*NTI Project No. 17.61872.100*

### 1.0 EXECUTIVE SUMMARY

We briefly summarize below our geotechnical recommendations for the proposed project. The summary must be read in complete context with our report.

- We conclude you may support the proposed structures upon standard perimeter strip and spread column footings on competent, non-organic natural soil(s), engineered fill, or competent bedrock as recommended within our report.
- Topsoil ranging from approximately 3.0 to 24.0 inches thick over undocumented fill soils were encountered at the structure and parking lot borings extending to depths ranging from approximately 4.5 to 9.5 feet below the existing ground surface. Practical auger refusal on apparent weathered bedrock was encountered at depth ranging from approximately 3.3 to 12.5 feet below the existing ground surface (approximately elevations ranging from 806.8 to 800.8 feet).
- Without documentation of the placement of this undocumented fill, the proposed foundations should not be supported on the existing fill soils. In order to reduce the risk of settlement and subsequent structural damage, a complete soil correction to remove the existing undocumented fill should be performed or the foundation should be lowered to bear upon the underlying apparent bedrock.
- Building linear strip footings and interior column footings (if required) may be proportioned using the maximum net allowable soil bearing pressures of 2,500 pounds per square foot (psf) if founded on competent, non-organic natural soil(s) or engineered fill. For foundations cast on the apparent weathered bedrock, this value may be increased to 10,000 psf.
- Individual buildings' foundations should bear upon either bedrock or soil to help reduce potential differential settlements.
- Measurable groundwater was not encountered at the time of the field exploration. However, the on-site clay and silt based soils along with the underlying bedrock have the potential to be somewhat impervious and conducive to the development of zones of perched water at varying elevations and locations across the project site.
- Overall, the site soils are conducive to movement of groundwater both laterally and vertically. The moisture content of such soils can vary annually and per recent precipitation. Such soils and other regional dependent conditions may produce groundwater entry of project excavations. We direct your attention to other report sections and appendices attachments concerning groundwater issues and subsurface drainage.



## 2.0 INTRODUCTION

### 2.1 Site / Project Description

The proposed Minnehaha Townhomes project is to be constructed as defined within Table 1.

**Table 1: Project & Site Description**

<b>Item</b>	<b>Description</b>
Building Type	Four, 16 unit, one to two story, slab on grade townhomes.
Floor Elevation	Assumed to be within 2 feet of existing grades
Maximum Change in Site Elevation	Site grades within 3 feet of existing grades.
<b>Site Description</b>	
Location of Project	Riverview Road in Minneapolis, Minnesota
Existing Land Use / Improvements to Parcel	Vacant Lots
Current Ground Cover	Landscaping, maintained lawn, and a few mature trees.
Topography at Site	There is about 10 feet of elevation change in our recently completed soil borings.

### 2.2 Scope of Services

The purpose of this report is to present a summary of our geotechnical exploration and provide generalized opinions and recommendations regarding the soil conditions and design parameters for founding of the project. Our “scope of services” was limited to the following:

1. Explore the project subsurface by means of seventeen (17) standard penetration test (SPT) borings to depths of approximately 30 feet below existing grade and conduct laboratory test(s) on representative samples for characterizing the index and engineering properties of soils strata at site.
2. Prepare a report presenting our findings from our field exploration, laboratory testing, and engineering recommendations for foundation types, footing depths, allowable bearing capacity, estimated settlements, floor slab support, excavation, engineered fill, backfill, compaction and potential construction difficulties related to excavation, backfilling and drainage, and pavement design.



### 3.0 EXPLORATION PROGRAM RESULTS

#### 3.1 Exploration Scope

Site geotechnical drilling occurred on January 31, 2017 with individual borings advanced at approximate locations as presented on the diagram within the appendices. Due to encountering practical auger refusal in apparent shallow bedrock, the borings were terminated at depths ranging from approximately 3.3 to 12.5 feet below the existing ground surface (approximately elevations ranging from 806.8 to 800.8 feet)

NTI located the borings relative to existing site features. NTI estimated the elevation of the majority boring utilizing a Trimble GeoXH600 GPS unit referencing NAD 1983 CONUS Datum or estimated the elevations for MnTOPO LiDAR information. Please refer to the “Boring Location Diagram” in the appendix for additional information.

The boreholes were backfilled with auger cuttings or were abandoned using high solids bentonite or neat cement grout as per appropriate local and state statutes. Minor settlement of the boreholes may occur. The Owner is responsible for final closure of the boreholes.

#### 3.2 Subsurface Conditions

Please refer to the boring logs within the appendices for a detailed description and depths of stratum at each boring. Based on results of the current geotechnical exploration, Table 2 provides a general depiction of subsurface conditions at the project site. Additional comment on the evaluation of recovered soil samples is presented within the report attachments.

**Table 2: Typical Subsurface Stratigraphy at Project Site<sup>1</sup>**

Stratum	Depth to Base of Stratum below existing grade	Material Description	Notes
Surface	3.0 to 24.0 inches	Topsoil	Topsoil designation by visual observation only and not intended to confer conformance with DOT or other municipal standards.
Undocumented Fill	4.5 to 9.5 feet below the existing ground surface.	Undocumented fill primarily composed of clayey sand (SC), poorly graded sand with silt (SP-SM), and poorly graded sand (SP).	Variably compacted. As exceptions, fill materials were not encountered at Borings SB-5, SB-7, SB-8, SB-10, SB-11 and SB-17.
Native Soils	3.3 to 12.5 feet below the existing ground surface.	Clayey sand (SC), sandy lean clay (CL), and poorly graded sand (SP)	The relative density of the sand soils ranged from very loose to medium dense. The consistency of the clay soils ranged from soft to rather stiff.
Apparent Bedrock	Termination depth of the borings at 7.2 to 10.0 feet.	Weathered Clayey Shale and Weathered Clayey Dolostone.	Completely to highly weathered. Encountered at Borings SB-5, SB-8, SB-12 and SB-16.

<sup>1</sup> Table summary is a generalization of subsurface conditions and may not reflect variation in subsurface strata occurring on site. The general geologic origin of retained soil samples is listed on the boring logs.



### **3.3 Groundwater Conditions**

The drill crew observed the borings for groundwater during and at the completion of drilling activities. Groundwater was not observed in our soil borings. However, the on-site clay and silt based fill soils are relatively impervious and are conducive to the development of zones of perched water at varying elevations and locations across the project site. However, the on-site clay and silt based soils along with the underlying bedrock have the potential to be somewhat impervious and conducive to the development of zones of perched water at varying elevations and locations across the project site.

Overall, the site soils are conducive to movement of groundwater both laterally and vertically. The moisture content of such soils can vary annually and per recent precipitation. Such soils and other regional dependent conditions may produce groundwater entry of project excavations.

We direct your attention to other report sections and appendices attachments concerning groundwater issues and subsurface drainage.

### **3.4 Laboratory Test Program**

Our analysis and recommendations of this report are based upon our interpretation of the standard penetration test resistance determined while sampling soils, laboratory test results and experience with similar soils from other sites near the project. The results of such tests are summarized on the boring logs or attached test reports.

## **4.0 ENGINEERING REVIEW AND RECOMMENDATIONS**

The following recommendations are based on our present knowledge of the project. We ask that you or your design team notify us immediately if significant changes are made to project size, location or design as we would need to review our current recommendations and provide modified or different recommendations with respect to such change(s).

### **4.1 Project Scope**

We understand the four proposed structures will include concrete footings and foundation walls for support of above grade construction. NTI's assumed foundation loads and change in grade is summarized within Table 3. Our assessment of project soils, opinions, and report recommendations are based directly on application of estimated structural loads to site soils.





**Table 3: Foundation Loads / Change in Grade / Footing Elevation**

<b>Building Element</b>	<b>Load / Condition</b>
Perimeter Strip Footings	3 kips per lineal foot or less
Interior Strip Footings	3 kips per lineal foot or less
Isolated Interior Column Footings	100 kips or less
Exterior Column Footings	100 kips or less
Change in Overall Site Grade (from original ground surface)	5 feet or less
Free Standing Retaining Walls	None anticipated
Below grade structures	Basement not anticipated

## 4.2 Site Preparation

The undocumented, previously placed fill encountered in the soil borings is not considered suitable for direct support of the foundation systems. In addition, dependent upon the Owner's tolerance for risk the undocumented fill may also not be suitable for support of the proposed floor slabs. Please refer to Section 4.7 Slab on Grade Floors below for additional details in regard to interior floor slab support.

If suitable documentation is made available to NTI that demonstrates that the existing fill is engineered, it may be suitable for direct support of the proposed foundation and floor slab. Further review and evaluation by NTI would be required for this scenario prior to modifying the recommendations herein.

It should be noted that the top of the apparent shallow bedrock varied at the proposed structure boring locations from approximately 3.3 to 12.5 feet below the existing ground surface (elevations ranging from approximately 806.2 to 800.8 feet). It is very likely that shallow bedrock could be exposed during footing excavations. The proposed foundation elements should be founded upon a uniform stratum of either bedrock or documented engineered fill in order to minimize differential settlement between foundation elements. Mixed bearing materials have the potential for increased differential settlement of the structure.

### 4.2.1 Soil Correction (Option 1)

One method available to the design team for preparation of the building pads would be to perform a soil correction.

We recommend removal of all topsoil, organic soils, undocumented fill, very loose soils, man-made structures (if encountered) and/or any unsuitable material(s) be removed from within the proposed building pads. In pavement areas, after stripping the vegetative root zone, we recommend that, at a minimum, soils with high organic content and other deleterious substances be removed from beneath parking areas.

We recommend that you oversize all earthwork improvements and excavations where fill materials are placed below foundations. The minimum excavation oversize should extend per the requirements outlined in Appendix B. Additional localized excavations may be necessary or the removal of unsuitable materials occurring below base of footing construction. Table 4 provides a summary of excavation necessary to remove unsuitable materials at respective borings.



**Table 4: Summary of Soil Correction / Excavation<sup>1</sup>**

Boring Number	Existing Ground Elevation <sup>2</sup> (feet)	Unsuitable Soil / Material	Estimated Depth to Bottom of Unsuitable Materials (feet)	Estimated Bottom of Unsuitable Materials Elevation (feet)
<b>Building 1<sup>3</sup></b>				
SB-1	818.5	Topsoil / Undocumented Fill	9.5	808.5
SB-2	818.0	Topsoil / Undocumented Fill	9.5	808.5
SB-3	819.0	Topsoil / Undocumented Fill	9.5	809.5
SB-4	818.0	Topsoil / Undocumented Fill	7.0	811.0
<b>Building 2<sup>3</sup></b>				
SB-5	815.5	Topsoil / Very Loose Soils	6.0	809.5
SB-6	816.0	Topsoil / Undocumented Fill	7.0	809.0
<b>Building 3<sup>3</sup></b>				
SB-7	812.0	Topsoil / Very Loose Soils	4.5	807.5
SB-8	809.0	Topsoil	0.5	808.5
SB-9	812.5	Topsoil / Undocumented Fill	4.5	808.0
SB-10	809.5	Topsoil	0.5	809.0
<b>Building 4<sup>3</sup></b>				
SB-11	809.0	Topsoil / Very Loose Soils	4.5	804.5
SB-12	812.0	Topsoil / Undocumented Fill	7.0	805.0
SB-13	810.5	Topsoil / Undocumented Fill	4.5	806.0
SB-14	812.5	Topsoil / Undocumented Fill	7.0	805.5
<b>Parking<sup>4</sup></b>				
SB-15	812.0	Topsoil / Undocumented Fill	4.5	807.5
SB-16	814.0	Topsoil / Undocumented Fill	7.0	807.0
SB-17	812.5	Topsoil	0.5	812.0

1. Borings contained trace organic materials and/or apparent fill / possible fill materials within the collected samples. These areas and other areas exposed during the site grade may require deeper corrections dependent upon the materials encountered during the site grading activities.
2. Based on elevations at the boring locations as noted above in Section 3.1, Exploration Scope.
3. See Boring Location Plan for building designation.
4. Boring completed outside the proposed building pads within the in-ground stormwater management area. Included within the table for general information only

The Geotechnical Engineer of Record or their designated representative should review project excavations to verify removal of unsuitable material(s) and adequate bearing support of exposed soils. All such observations should occur prior to the placement of engineering fill, or construction of footings and floor slabs.

Following the removal of the unsuitable soils, NTI recommends that native soils at the exposed grade (i.e. base of excavations) be compacted with a large vibratory roller until such materials achieve no less than 98 percent of the maximum dry density as determined by the standard Proctor test (ASTM: D 698-96).



All excavations should be in conformance with OSHA 1926 Subpart P. The grading contractor should provide a “competent person” as defined in the regulations, to determine the requirements for sloping and benching based on the soil types and groundwater seeps encountered.

Portions of the existing on-site previously placed fill soils have the potential to be re-used as engineered fill for preparation of the building pads when such soils are conditioned and placed as presented within this report.

However, NTI cautions that due to the undocumented nature of the undocumented fill soils there is the potential that zones of debris laden soils may be encountered as well. Any organic or debris laden soils would need to be sorted and are not considered to be suitable for reuse.

Considering that the composition and compaction effort of existing fill soils are not documented, the prediction of the percent of re-usable material is difficult. In addition, the exact delineation of native versus undocumented fill is difficult due to the limited sample size and soil disturbance due to the sampling technique. For this reason, the design team should be aware that there is the potential that there may be some variation in the depth of fill encountered during site excavations as compared to the boring logs.

If cleaner granular soils are placed over the relatively impervious soils such as clayey sand (SC) or sandy lean clay (CL) soils then these areas with granular engineered fill should be provided with a drainage or weep system to prevent a “bathtub affect” from developing. If these zones are not drained they have the potential to collect water within the void spaces and may undergo significant volumetric change during periods of freeze thaw. This change in volume has the potential to cause distress within the proposed structure.

All engineered fill for site corrective earthwork and for support of project footings should be tempered for moisture content, placed, and be compacted to the criteria presented within Appendix B.

#### **4.2.1 Lower Foundation Elements to Bear Upon Underlying Bedrock (Option 2)**

As an alternative to the option above, the design team may wish to drop the foundation elements down to the underlying apparent dolomite bedrock strata. This option would likely require additional foundation wall and/or column heights. For this alternative the existing undocumented fill and/or very loose soils should be removed down the apparent bedrock layer. In addition any highly weather zones of rock should be removed prior to placing forms or concrete. The implementation of a mud mat may be helpful if the resulting surface is highly irregular and not conducive to the placement of forms and concrete. Alternatively, foundation trenches may extend to bedrock and be backfilled with lean concrete (minimum 2,000 psi (pounds per square inch), 28 day, compressive strength). The lean concrete foundation trench should be oversized by a minimum of 6 inches and placed in maximum 3-foot thick lifts.

Dependent upon the Owner’s tolerance for risk of future differential settlement, a complete soil correction may be required below the floor slab. Please refer to the floor slab recommendations below for more information.



### 4.3 Shallow Foundations

The following bearing recommendations are based on our understanding of the project. You should notify us of any changes made to the project size, location, design or site grades so we can assess how such changes impact our recommendations. We assume foundation elements will impose maximum vertical loads as previously noted within this report.

In our opinion, you may support the proposed structures by founding strip footings and interior column footings on competent, non-organic native soils, or engineered fill, or competent bedrock providing such construction complies with the criteria established within this report. Design of footings may be based on the Table 5 maximum net allowable soil bearing pressures.

**Table 5: Recommended Maximum Net Allowable Soil Bearing Pressure<sup>1</sup>  
 - Conventional Shallow Foundation Construction**

Location	Criteria
<b>Perimeter Strip Footings, Perimeter Columns:</b> Perimeter strip footings and perimeter column footing supported on documented fill or competent native soils below depth of frost penetration.	Maximum 2,500 psf if founded on documented fill or competent native soils.
<b>Interior Strip Footings:</b> Interior strip footings supported on documented fill or competent native soils at a depth that provides no less than 6 inches of clearance between the top of footing and underside of floor slab (for sand cushion).	Maximum 10,000 psf if founded on dolomitic bedrock. <sup>2</sup>
<b>Interior Column Footings:</b> Supported on documented fill or competent native soils at a depth that provides no less than 6 inches of clearance between the top of footing and underside of floor slab (for sand cushion).	(All foundations)

1. Maximum net allowable soil bearing pressure recommendations predicated on footing design and construction complying with recommendations presented within this report. To minimize local failure of supporting soils, it is our opinion footing construction should comply with the International Building Code (IBC) requirements.
2. The bottom of the foundation excavation should extend to weathered or fresh bedrock, which is generally approximately 1 to 2 feet beneath rippable, highly weathered, bedrock typically encountered in the area.

Foundations in unheated buildings or unheated building areas such as stoops and canopies should be based at least 5 feet below the proposed finished grade for frost protection. Footings below structures anticipated to be heated (greater than 60 degrees F) in winter should be constructed at least 3.5 feet below proposed finished grade.

Continuous strip footings under bearing walls should be at least 1 foot wider than the walls they support and be a minimum of 18 inches wide. Interior footings should be based at least 2 feet below design floor elevation and be a minimum of 36 inches wide.





#### 4.4 Bearing Factor of Safety and Estimate of Settlement

We estimate that the native soils, properly compacted backfill, or competent bedrock will provide a theoretical factor of safety of 3 against localized bearing failure when construction complies with report criteria and recommendations and the structural design of the foundations uses the Table 5 maximum net allowable soil bearing recommendation(s).

We estimate that footings loaded per report recommendations may experience long term, total settlement of approximately 1/2 to 1 inch. Differential settlement will be on the order of 25 to 50 percent of total settlement. Generally, the greatest differential settlement occurs between lightly loaded and heavily loaded footings, particularly if heavily loaded footings are located adjacent to lightly loaded strip footings. Most of the settlement will occur on first loading, as the structure is erected.

To help reduce the potential for differential settlement between foundations bearing upon soil or rock, we recommend that foundations proportioned for soil bearing pressures (2,500 psf) bear on at least 1 foot of soil. If shallow bedrock is encountered, we recommend that the bedrock be cut at least 1 foot below the bottom of foundation and backfilled with sand with less than 20 percent material passing the No. 200 sieve. For foundations proportion for rock (10,000 psf), in areas with deeper soil deposits, we recommend that either the foundations be dropped to rock level or that the foundation excavation be backfilled with lean concrete that extends to bedrock.

Furthermore, total and differential movement of footings and floor slabs could be significantly greater than the above estimates if you support construction on frozen soils. The moisture content of the bearing soils significantly changes from in-situ conditions when snow or ice lenses are incorporated into site earthwork.

#### 4.5 Subsurface Drainage

NTI considers the installation of a subsurface drain system at the interior base of foundation walls to be a preferred practice of construction. The subsurface drain system will help to limit moisture accumulation within granular soils placed below interior floors. You should also consider placement of a separate subsurface drainage system exterior to perimeter foundation walls.

As a general guideline, subsurface drainage consists of a geotextile and coarse drainage encased slotted or perforated pipe extending to sump basin(s) We recommend that exterior drainage be separated from interior drainage to reduce risk of cross flow and moisture infiltration below structure interior. The Owner with consultation from the design team should weigh the cost versus potential risks associated with the elimination of the drainage system to determine actual need for subsurface drainage. Please contact NTI for additional consultation regarding the potential benefits and risks associated with the installation or elimination of the subsurface drainage system.



## 4.6 Utilities

Utility trenches should be backfilled in 6-inch maximum depth loose lifts. It is especially important that you compact trench backfill of underground utilities to minimize future settlement of green space and pavement areas. Please refer to Appendix B for compaction specifications.

The stability of embankments along utility excavations is dependent on soil strength, site geometry, moisture content, and any surcharge load for excavated soils and equipment. Cautionary comment on excavation stability is provided within other report sections.

Dependent upon the depth of utility installation, pipe bedding may be required to provide a uniform bearing stratum and for protection of the utility piping when bearing upon the underlying bedrock soils. In addition, there is the potential that mechanical rock removal techniques may be required dependent upon the proposed utility installation depth. This may include controlled blasting, air rotary tooling or mechanical percussive tooling.

***We herein note that the Contractor is solely responsible for assessing the stability of and executing underground utility and project excavations using safe methods. Contractor is also responsible for naming the “competent individual” as per Subpart P of 29 CFR 1926.6 (Federal Register - OSHA).***

## 4.7 Slab-on-Grade Floors

### Option 1 - Floor Slab Supported on Engineered Fill (Partial Soil Correction)

If the Owner is willing to accept some risk, the design team may elect to perform a partial soil correction. This would consist of subcutting the existing undocumented subgrade fill soils to a pre-determined depth and replacing them with non-organic engineered fill similar in composition to the existing subgrade soils. For this alternative, NTI recommends that a minimum of two feet of subgrade correction be performed. The material exposed after the cut should be observed for obvious soft spots or debris pockets. Any of these should be removed.

With this option every additional foot of correction would have a corresponding increase in cost and anticipated reduction in risk. This option may result in increased maintenance costs as compared to Option 2.

For floor slabs constructed directly over a zone of documented engineered fill overlying undocumented fill soils as part of a partial soil correction, the design of the floor slab may be based on an estimated modulus of subgrade reaction (k) of 150 pci.

### Option 2 - Floor Slab Supported Engineered Fill (Complete Soil Correction)

For floor slabs constructed directly over documented engineered fill as part of a complete soil correction of the building pads, the design of the floor slabs may be based on an estimated modulus of subgrade reaction (k) of 200 pci.



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### The Following Applies to All Options

The final 6 inches of fill below the concrete floor slabs should consist of pit run or processed sand (sand cushion) with 100 percent material passing the 1 inch sieve, no more than 40 percent passing the No. 40 sieve and no more than 5 percent material passing the No. 200 U.S. Sieve. The moisture content of the sand cushion should be within plus or minus 2 percent of the optimum moisture content determined by the standard Proctor test.

All interior at-grade floors with impervious or near impervious surfacing such as, but not limited to, paint, hardening agent, vinyl tile, ceramic tile, or wood flooring, should include provision for installation of a vapor barrier system. Historically, vapor barrier systems can consist of many different types of synthetic membrane, and can be placed either below sand cushion materials or at the underside of the concrete floor.

All such issues are contentious and have both positive and negative aspects associated with long term performance of the floor. Overall, we recommend you install some form of vapor barrier below the project floor (for at-grade and basement construction, as appropriate).

We recommend that you isolate floor slabs from other building components by placement of a nominal ½ inch thick expansion joint between the floor and walls, and/or columns. This construction must also apply a compatible sealant after curing of the floor slab to reduce moisture penetration through the expansion joint. As a minimum, you should install a bond breaker to isolate and reduce binding of building components.

#### 4.8 Exterior Backfill

Exterior backfill of at-grade foundations walls which do not retain soil should consist of non-organic, debris free soils. Placement of exterior backfill against at-grade non-earth retaining foundation walls should be performed concurrent with interior backfill to minimize differential loading, rotation and/or movement of the wall system.

The final one foot of exterior backfill for green areas may consist of clay or silt based topsoil. The final exterior backfill for areas supporting sidewalks and/or pavements should consist of a free draining aggregate base as recommended for the respective construction.

Backfill should be tempered for correct moisture content, then placed and compacted in individual lifts of exterior backfill per criteria presented within Appendix B of our report.

#### 4.9 Surface Drainage

You should maintain positive drainage during and after construction of project and eliminate ponding of water on site soils. We recommend that you include provisions within construction documents for positive drainage of site. You should install sumps at critical areas around project excavations to assist in removal of seepage and runoff from site.



We recommend that sidewalks, curbing, pavements, and green space be designed to direct drainage away from the structure. We recommend that you provide a 5 percent gradient within 10 feet of building for drainage from lawn, and 2 percent minimum gradient from building for drainage of sidewalks / pavements. All pavements should drain to on-site storm collection, municipal collection system, or roadside ditching.

Roof runoff should be directed away from the building by a system of interior roof and scupper drains, or rain gutters, down spouts and splash pads. It is our opinion interior roof drains plumbed directly to the storm water piping system provide the most favorable method of conveying drainage from the roof as interior drains do not freeze or discharge runoff onto exterior sidewalks and pavements.

#### 4.10 Pavement Construction

We assume project traffic will be separated into two distinct classes; heavy duty traffic comprised of refuse and moving trucks and light duty traffic comprised of passenger vehicles. Our pavement recommendations are predicated on separation of this traffic.

The resulting subgrade following site grading should first be scarified and re-compacted to a depth of 12 inches. A proof roll test should then be performed to determine soft or unstable subgrade areas. If rutting or localized unstable subgrade areas are observed, those areas should be subcut, moisture-conditioned, and re-compacted or removed to a stable depth. Excavations for soil corrections (if any) in paved areas should allow for a 2 foot oversize beyond the edges of the pavement.

The proof roll should be performed with a tandem axle dump truck loaded to gross capacity (at least 20 tons). Acceptance criteria of the proof roll shall be limited to rut formation no more than one inch (1") depth (front or rear axles) and no pumping (rolling) observed during the visual inspection. Proof roll tests should be observed by an experienced technician or geotechnical engineer prior to placement of the subbase and aggregate base course to verify the subgrade will provide adequate pavement support.

The soils on the site, if properly compacted, are stable when dry. When wet, however, they are unstable to dynamic loading, such as construction traffic. In order help maintain a stable subgrade, we recommend that, at a minimum, a 12 inch layer of select granular borrow (sand with less than 12 percent passing the No. 200 sieve) be placed between the subgrade and aggregate base. The subgrade should be sloped to drain to site drainage features to help prevent a "bathtub" effect within the sand.

Engineered fill should consist of non-organic debris free soils of similar composition to the existing exposed subgrade soils. Individual lifts of engineered fill in proposed paved areas should be tempered for moisture content, placed and compacted as listed in the Compaction Guidelines table in Appendix B.

The following minimum thicknesses were estimated based upon our estimated traffic loading, limited soils information, variation across the project area, and experience with similar projects and soil conditions. The performance of stabilometer or similar tests, were beyond the scope of this report; however, they may be performed, upon request, for an additional fee. We estimate that a properly prepared sand subgrade would have an average stabilometer R-value of 50 and a properly prepared clayey sand subgrade would have an average stabilometer R-value of 25.

For a 20-year design pavement life and light commercial traffic volumes, Table 6 presents our thickness recommendations for flexible (bituminous) pavement.





**Table 6: Recommended Flexible Pavement Thickness Design Alternative**

<b>Pavement Section</b>	<b>Light Duty (Parking Stalls)</b>	<b>Heavy Duty (Drive Lanes / Truck Areas)</b>
Bituminous Wear Course (inches)	1.5	2.0
Bituminous Base Course (inches)	2.0	2.0
Class 5 or 7 Aggregate Base (inches)	6.0	8.0
Select Granular Borrow	12.0	12.0

We recommend rigid Portland cement concrete pavements be constructed at driveway aprons, trash enclosures, loading and unloading areas, and other areas where point loads and turning stresses are more likely to damage the pavement. Based on the performance of concrete pavements at similar sites, we recommend the concrete pavement design alternative listed in Table 7.

**Table 7: Recommended Rigid Pavement Thickness Design Alternative**

<b>Pavement Section</b>	<b>Heavy Duty (Drive Lanes / Truck Areas)</b>	<b>Static Loading Areas (Dumpsters)</b>
Unreinforced Concrete (inches)	6.0	7.0
Class 5 or 7 Aggregate Base (inches)	6.0	6.0

Pavement recommendations assume the subgrade soils and aggregate section below paved surfaces will drain to subsurface piping for eventual discharge into storm sewer, or above grade to ditching, or similar acceptable systems. Lack of surface and subsurface drainage will significantly reduce the capacity and longevity of the pavement systems indicated above.

We recommend pavements receive annual maintenance, as a minimum, to correct damages to the pavement structure, clean and infill cracks which develop, and repair or resurface areas which exhibit reduced subgrade performance. The lack of maintenance can lead to moisture infiltration of the pavement structure and softening of the subgrade soils. This, in turn, can degrade the performance of the pavement system and result in poorly performing pavements with shortened life expectancy.

#### **4.11 Frost Considerations**

The soils on this site are highly frost susceptible, and small amounts of groundwater can be detrimental to the performance of the slabs and pavements. Exterior slabs and pavements should be expected to heave. If frost action needs to be eliminated in critical areas, then we recommend the use of structural slabs (e.g., as structural stoops in front of building doors), as is common practice in the state of Minnesota. It is our opinion that placing non-frost susceptible material in large areas under exterior pavements and sidewalks would be exceedingly expensive and an unusual design and construction procedure in Minnesota.

However, in entrances with concrete plaza areas and ADA accessible ramps where structural support is not practical, we recommend placing clean sand (SP) or sand with silt (SP-SM) soils with less than 10 percent material passing the No. 200 sieve beneath these areas. This area should be connected to drain tile connected to the site drainage system if it is surrounded by clay or clayey sand. A 3H: 1V (Horizontal: Vertical) transition zone between non or low frost susceptible soils (SP, SP-SM) and other soils to help prevent differential frost movement.



Non-frost susceptible fill should consist of poorly graded sand or gravel with less than 5 percent material passing the number 200 sieve (SP) and less than 50 percent passing the No. 40 sieve.

## **5.0 CONSTRUCTION CONSIDERATIONS**

### **5.1 Excavation Stability**

Excavation depth and sidewall inclination should not exceed those specified in local, state or federal regulations. Excavations may need to be widened and sloped, or temporarily braced, to maintain or develop a safe work environment. Also, contractors should comply with local, state, and federal safety regulations including current OSHA excavation and trench safety standards. Temporary shoring must be designed in accordance with applicable regulatory requirements.

### **5.2 Engineered Fill & Winter Construction**

The Geotechnical Engineer of Record or their designated representative should observe and evaluate excavations to verify removal of uncontrolled fills, topsoil and/or unsuitable material(s), and adequacy of bearing support of exposed soils. Such observation should occur prior to construction of foundations or placement of engineered fill supporting excavations.

Engineered fill should be approved by the Geotechnical Engineer of Record prior to placement. In addition, the engineered fill should be tempered for correct moisture content and then place and compact individual lifts of engineered fill to criteria established within the appendices attachment.

Frozen soil should never be used as engineered fill or backfill nor should you support foundations on frozen soils. Moisture freezing within the soil matrix of fine grained and/or cohesive soils produces ice lenses. Such soils gain moisture from capillary action and, with continued growth, heave with formation of ice lenses within the soil matrix. Foundations constructed on frozen soils have the potential to settle once ice lenses thaw.

You should protect excavations and foundations from freezing conditions or accumulation of snow, and remove frozen soils, snow, and ice from within excavations, fill section or from below proposed foundations. Replacement soils should consist of similar materials as those removed from the excavation with moisture content, placement and compaction conforming to report criteria.

## **6.0 CLOSURE**

As the widely spaced, small diameter borings provide only a limited amount of data regarding the existing fill, the existing fill may contain soft zones, debris or significantly greater amounts of unsuitable materials than could be reasonably inferred from the boring information. Unsuitable materials may not be discovered during construction and may remain buried within the fill below the slabs and pavements, resulting in greater than anticipated settlements of the slabs and pavements. These risks cannot be eliminated without completely removing the fill, but can be reduced by thorough exploration and testing during site preparation and construction.



Our conclusions and recommendations are predicated on observation and testing of the earthwork directed by Geotechnical Engineer of Record. Our opinions are based on data assumed representative of the site. However, the area coverage of borings in relation to the entire project is very small. For this and other reasons, we do not warrant conditions below the depth of our borings, or that the strata logged from our borings are necessarily typical across the site. Deviations from our recommendations by plans, written specifications, or field applications shall relieve us of responsibility unless our written concurrence with such deviations has been established.

The scope of services for this project does not include either specifically or by implication any environmental or biological assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of Minneapolis Public Housing Authority and their agents, for specific application to the proposed Minnehaha Townhomes project in Minneapolis, Minnesota. Northern Technologies, LLC has endeavored to comply with generally accepted geotechnical engineering practice common to the local area. Northern Technologies, LLC makes no other warranty, expressed or implied.

**Northern Technologies, LLC**

Debra A. Schroeder, P.E.  
Senior Engineer

Steven D. Gerber, P.E.  
Senior Engineer

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a Duly Licensed Professional Engineer under the Laws of the State of Minnesota.

Debra A. Schroeder

Date: 03/10/2017 Reg. No. 52743

DAS/sdg



## APPENDIX A

**GEOTECHNICAL EVALUATION OF RECOVERED SOIL SAMPLES**

**FIELD EXPLORATION PROCEDURES**

**GENERAL NOTES**

**WATER LEVEL SYMBOL**

**DESCRIPTIVE TERMINOLOGY**

**RELATIVE PROPORTIONS**

**PARTICLE SIZES**

**CLASSIFICATION of SOILS for ENGINEERING PURPOSES**

**EXCAVATION OVERSIZE**

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## GEOTECHNICAL EVALUATION OF RECOVERED SOIL SAMPLES

We visually examined recovered soil samples to estimate distribution of grain sizes, plasticity, consistency, moisture condition, color, presence of lenses and seams, and apparent geologic origin. We then classified the soils according using the Unified Soil Classification System (ASTM D2488). A chart describing this classification system and general notes explaining soil sampling procedures are presented within appendices attachments.

The stratification depth lines between soil types on the logs are estimated based on the available data. In-situ, the transition between type(s) may be distinct or gradual in either the horizontal or vertical directions. The soil conditions have been established at our specific boring locations only. Variations in the soil stratigraphy may occur between and around the borings, with the nature and extent of such change not readily evident until exposed by excavation. These variations must be properly assessed when utilizing information presented on the boring logs.

We request that you, your design team or contractors contact NTI immediately if local conditions differ from those assumed by this report, as we would need to review how such changes impact our recommendations. Such contact would also allow us to revise our recommendations as necessary to account for the changed site conditions.

### FIELD EXPLORATION PROCEDURES

#### ***Soil Sampling – Standard Penetration Boring:***

Soil sampling was performed according to the procedures described by ASTM D-1586. Using this procedure, a 2 inch O.D. split barrel sampler is driven into the soil by a 140 pound weight falling 30 inches. After an initial set of six inches, the number of blows required to drive the sampler an additional 12 inches is recorded (known as the penetration resistance (i.e. “N-value”) of the soil at the point of sampling. The N-value is an index of the relative density of cohesionless soils and an approximation of the consistency of cohesive soils.

#### ***Soil Sampling – Power Auger Boring:***

The boring(s) was/were advanced with a 6 inch nominal diameter continuous flight auger. As a result, samples recovered from the boring are disturbed, and our determination of the depth, extend of various stratum and layers, and relative density or consistency of the soils is approximate.

#### ***Soil Classification:***

Soil samples were visually and manually classified in general conformance with ASTM D-2488 as they were removed from the sampler(s). Representative fractions of soil samples were then sealed within respective containers and returned to the laboratory for further examination and verification of the field classification. In addition, select samples were submitted for laboratory tests. Individual sample information, identification of sampling methods, method of advancement of the samples and other pertinent information concerning the soil samples are presented on boring logs and related report attachments.

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**GENERAL NOTES**

<i>DRILLING and SAMPLING SYMBOLS</i>		<i>LABORATORY TEST SYMBOLS</i>	
<b>SYMBOL</b>	<b>DEFINITION</b>	<b>SYMBOL</b>	<b>DEFINITION</b>
C.S.	Continuous Sampling	W	Moisture content-percent of dry weight
P.D.	2-3/8" Pipe Drill	D	Dry Density-pounds per cubic foot
C.O.	Cleanout Tube	LL, PL	Liquid and plastic limits determined in accordance with ASTM D 423 and D 424
3 HSA	3 1/4" I.D. Hollow Stem Auger	Q <sub>U</sub>	Unconfined compressive strength-pounds per square foot in accordance with ASTM D 2166-66
4 FA	4" Diameter Flight Auger		
6 FA	6" Diameter Flight Auger		
2 1/2 C	2 1/2" Casing		
4 C	4" Casing		
D.M.	Drilling Mud	Pq	Penetrometer reading-tons/square foot
J.W.	Jet Water	S	Torvane reading-tons/square foot
H.A.	Hand Auger	G	Specific Gravity – ASTM D 854-58
NXC	Size NX Casing	SL	Shrinkage limit – ASTM 427-61
BXC	Size BX Casing	Ph	Hydrogen ion content-meter method
AXC	Size AX casing	O	Organic content-combustion method
SS	2" O.D. Split Spoon Sample	M.A.	Grain size analysis
2T	2" Thin Wall Tube Sample	C*	One dimensional consolidation
3T	3" Thin Wall Tube Sample	Q <sub>C</sub>	Triaxial Compression
* See attached data Sheet and/or graph			

**WATER LEVEL SYMBOL**

Water levels shown on the boring logs were determined at the time and under the conditions indicated. In sand, the indicated levels can be considered relatively reliable for most site conditions. In clay soils, it is not possible to determine the ground water level within the normal scope of a test boring investigation, except where lenses or layers of more pervious water bearing soil are present; and then a long period of time may be necessary to reach equilibrium. Therefore, the position of the water level symbol for cohesive or mixed soils may not indicate the true level of the ground water table. The available water level information is given at the bottom of the log sheet.

**DESCRIPTIVE TERMINOLOGY**

<i>RELATIVE DENSITY</i>		<i>CONSISTENCY</i>	
<b>TERM</b>	<b>N<sub>60</sub> Value (corrected)</b>	<b>TERM</b>	<b>N<sub>60</sub> Value (corrected)</b>
Very Loose	0 – 4	Soft	0-4
Loose	5 – 8	Medium	5-8
Medium Dense	9 – 16	Rather Stiff	9 – 15
Dense	16 – 30	Stiff	16 – 30
Very Dense	Over 30	Very Stiff	Over 30

**RELATIVE PROPORTIONS**

<b>TERMS</b>	<b>RANGE</b>
Trace	0 – 5%
A little	5 – 15%
Some	15 – 30%

**PARTICLE SIZES**

<b>MATERIAL</b>	<b>DESCRIPTION</b>	<b>U.S. SIEVE SIZE</b>
Boulders		Over 3"
Gravel	Coarse	3" to 3/4"
	Medium	3/4" to #4
Sand	Coarse	#4 to #10
	Medium	#10 to #40
	Fine	#40 to #200
Silt and Clay	Determined by Hydrometer Test	

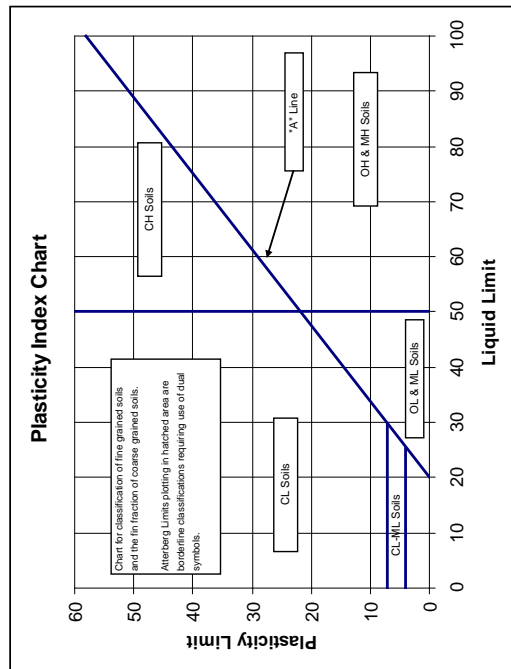


**CLASSIFICATION of SOILS for ENGINEERING PURPOSES**

ASTM Designation D-2487 and D2488 (Unified Soil Classification System)

Major Divisions	Group Symbol	Typical Name	Classification Criteria				
<b>Course Grained Soils</b> More than 50% retained on No. 200 sieve *	Gravels	Clean Gravels	<b>GW</b> Well –graded gravels and gravel-sand mixtures, little or no fines.	$Cu = D60 / D10$ greater than 4. $Cz = (D30)^2 / (D10 \times D60)$ between 1 & 3.			
					Gravels with Fines	<b>GP</b> Poorly graded gravels and gravel-sand mixtures, little or no fines.	Not meeting both criteria for GW materials.
						<b>GM</b> Silty gravels, gravel-sand-silt mixtures.	Atterberg limits below "A" line, or P.I. less than 4.
						<b>GC</b> Clayey gravels, gravel-sand-clay mixtures.	Atterberg limits above "A" line with P.I. greater than 7.
	Sands	Clean Sands	<b>SW</b> Well-graded sands and gravelly sands, little or no fines.	$Cu = D60 / D10$ greater than 6. $Cz = (D30)^2 / (D10 \times D60)$ between 1 & 3.			
			<b>SP</b> Poorly-graded sands and gravelly sands, little or no fines.	Not meeting both criteria for SW materials.			
			<b>SM</b> Silty sands, sand-silt mixtures.	Atterberg limits below "A" line, or P.I. less than 4.			
		Sands with Fines	<b>SC</b> Clayey sands, sand-clay mixtures.	Atterberg limits above "A" line with P.I. > 7.			
				Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols.			
				Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols.			
<b>Fine Grained Soils</b> More than 50% passes No. 200 sieve *	Sands and Clays	Liquid Limit of 50% or less	<b>ML</b> Inorganic silts, very fine sands, rock flour, silty or clayey fine sands.				
			<b>CL</b> Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.				
			<b>OL</b> Organic silts and organic silty clays of low plasticity.				
	Sands and Clays	Liquid Limit greater than 50%.	<b>MH</b> Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts.				
			<b>CH</b> Inorganic clays of high plasticity, fat clays.				
			<b>OH</b> Organic clays of medium to high plasticity.				
			<b>Pt</b> Peat, muck and other highly organic soils.				

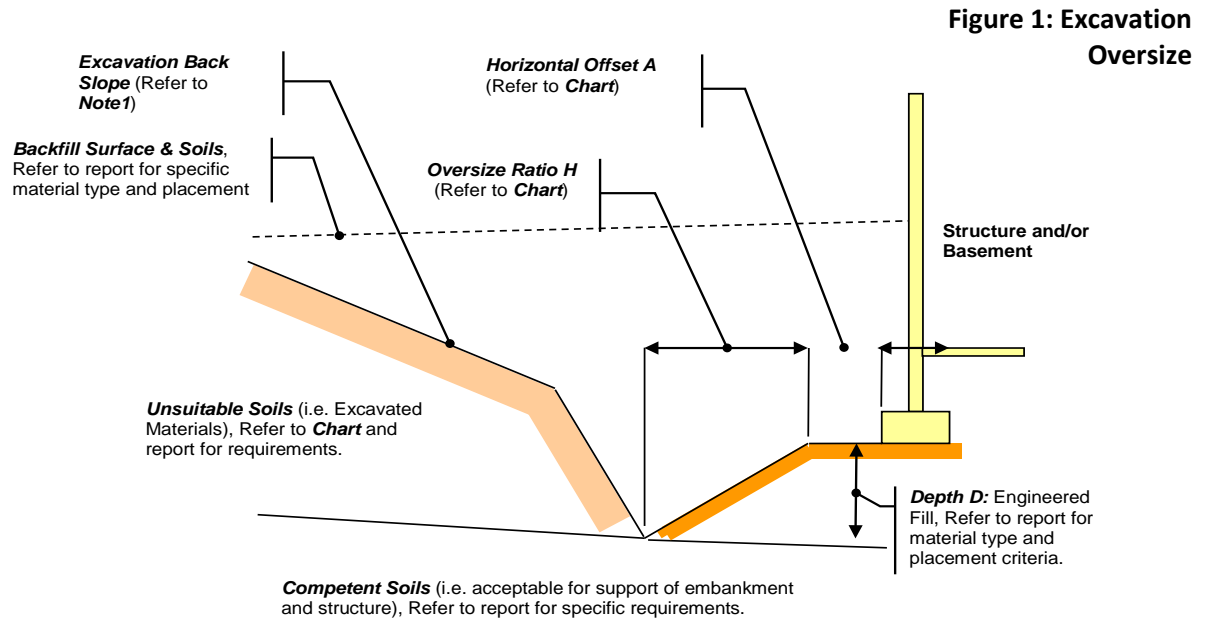
**Classification on basis of percentage of fines.**  
 Less than 5% passing No. 200 Sieve: GW, GP, SW, SP  
 More than 12% passing No. 200 Sieve: GM, GC, SM, SC  
 From 5% to 12% passing No. 200 Sieve: Borderline Classification requiring use of dual symbols.





## EXCAVATION OVERSIZE

Excavation oversize facilitates distribution of load induced stress within supporting soils. Unless otherwise superseded by report specific requirements, all construction should conform to the minimum oversize and horizontal offset requirements as presented within the diagram and associated chart.



### Definitions

**Oversize Ratio H:** The ratio of the horizontal distance divided by the engineered fill depth (i.e. # Horizontal / Depth D). Refer to Chart for specific requirements.

**Horizontal Offset A:** The horizontal distance between the outside edge of footing or critical position and the crest of the engineered fill section. Refer to Chart for specific requirements.

**Note 1:** Excavation depth and sidewall inclination should not exceed those specified in local, state or federal regulations including those defined by Subpart P of Chapter 27, 29 CFR Part 1926 (of Federal Register). Excavations may need to be widened and sloped, or temporarily braced, to maintain or develop a safe work environment. Contractor is solely responsible for assessing stability under “means and methods”.

<b>Condition</b>	<b>Unsuitable Soil Type</b>	<b>Horizontal Offset A</b>	<b>Oversize Ratio H</b>
Foundation Unit Load equal to or less than 3,000 psf.	SP, SM soils, CL & CH soils with cohesion greater than 1,000 psf	NA	Equal to or greater than one (1) times Depth D
Foundation Unit Load greater than 3,000 psf	SP, SM soils, CL & CH soils with cohesion less than 1,000 psf	NA	Equal to or greater than one (1) times Depth D
Foundation Unit Load equal to or less than 3,000 psf.	Topsoil or Peat	2 feet or width of footing, whichever is greater	Equal to or greater than two (2) times Depth D
Foundation Unit Load greater than 3,000 psf	Topsoil or Peat	5 feet or width of footing, whichever is greater	Equal to or greater than two (3) times Depth D





## **APPENDIX B**

**GROUNDWATER ISSUES**

**PLACEMENT and COMPACTION OF ENGINEERED FILL**

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## GROUNDWATER ISSUES

***The following presents additional comment and soil specific issues related to measurement of groundwater conditions at your project site.***

Note that our groundwater measurements, or lack thereof, will vary depending on the time allowed for equilibrium to occur in the borings. Extended observation time was not available during the scope of the field exploration program and, therefore, groundwater measurements as noted on the borings logs may or may not accurately reflect actual conditions at your site.

Seasonal and yearly fluctuations of the ground water level, if any, occur. Perched groundwater may be present within sand and silt lenses bedded within cohesive soil formations. Groundwater typically exists at depth within cohesive and cohesionless soils.

Documentation of the local groundwater surface and any perched groundwater conditions at the project site would require installation of temporary piezometers and extended monitoring. We have not performed such groundwater evaluation due to the scope of services authorized for this project.

We anticipate that a system of sump pits and pumps located outside of the foundation areas would be suitable for control if perched groundwater were to be encountered. However, a well point system would be more suitable for control of groundwater if excavations were to be advanced into the ground water table at depth in free draining granular soils.

We caution such seepage from such formations and any water entry from excavations below the groundwater table may be heavy and will vary based on seasonal and annual precipitation, and ground related impacts in the vicinity of the project.

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## PLACEMENT and COMPACTION OF ENGINEERED FILL

***Unless otherwise superseded within the body of the Geotechnical Exploration Report, the following criteria shall be utilized for placement of engineered fill on project. This includes, but is not limited to earthen fill placement to improve site grades, fill placed below structural footings, fill placed interior of structure, and fill placed as backfill of foundations.***

Engineered fill placed for construction, if necessary should consist of natural, non-organic, competent soils native to the project area. Such soils may include, but are not limited to gravel, sand, or clays with Unified Soil Classification System (ASTM D2488) classifications of GW, SP, or SM. Use of silt or clayey silt as project fill will require additional review and approval of project Geotechnical Engineer of Record. Such soils have USCS classifications of ML, MH, ML-CL, MH-CH. Use of topsoil, marl, peat, other organic soils construction debris and/or other unsuitable materials as fill is not allowed. Such soils have USCS classifications of OL, OH, Pt.

Engineered fill, classified as clay, should be tempered such that the moisture content at the time of placement is equal to and no more than 3 percent above the optimum content for as defined by the appropriate proctor test. Likewise, engineered fill classified as gravel or sand should be tempered such that the moisture content at the time of placement is within 3 percent of the optimum content.

All engineered fill for construction should be placed in individual 8 inch maximum depth lifts. Each lift of fill should be compacted by large vibratory equipment until the in-place soil density is equal to or greater than the criteria established within the following tabulation.

Type of Construction	Compaction Criteria (% respective Proctor) <sup>1</sup>	
	Clay	Sand or Gravel
General Embankment Fill	Min. 95	Min. 95
Engineered Fill below Foundations	Min. 98	Min. 98
Engineered Fill below Floor Slabs	Min. 98	Min. 95
Engineered Fill placed as Pavement Aggregate Base	NA	Min. 100
Engineered Fill placed to within 3 feet of pavement aggregate base	Min. 95	Min. 95
Engineered Fill placed within 3 feet of pavement aggregate base	Min. 100	Min. 100

Note 1 Unless otherwise required, compaction shall be based on the Standard Proctor Test (ASTM D698).

Density tests should be taken during engineered fill placement to document earthwork has achieved necessary compaction of the material(s). Recommendations for interior fill placement and backfill of foundation walls are presented within other sections of this report.

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## **APPENDIX C**

**SOIL BORING DIAGRAM**

**SOIL BORING LOGS**

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Boring Location Diagram  
 Minnehaha Townhomes  
 Minneapolis, Minnesota  
 NTI Project #: 17.61872.100

NOTE: Boring locations are approximate.

Completed Soil Borings: ●



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# BORING NUMBER SB-1

**CLIENT** Minneapolis Public Housing Authority **PROJECT NAME** Minnehaha Townhomes  
**PROJECT NUMBER** 17.61872.100 **PROJECT LOCATION** Minneapolis, MN  
**DATE STARTED** 1/31/17 **COMPLETED** 1/31/17 **GROUND ELEVATION** 818.5 ft **HOLE SIZE** 6 1/2 in.  
**DRILLING CONTRACTOR** NTI **GROUND WATER LEVELS:**  
**DRILLING METHOD** 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.  
**LOGGED BY** Robert Hawkins **CHECKED BY** Steve Gerber **AT END OF DRILLING** ---  
**CAVE IN (ft)** 3 **FROST DEPTH (ft)** --- **AFTER DRILLING** ---  
**NOTES** Elevation determined using Trimble GeoXH 6000. (NAD 1983 (Conus) CORS 96 datum.)

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (18.0 Inches)	AU 1									
1.5		CLAYEY SAND, (SC) brown, fine to medium grained, moist, trace gravel (Fill)	SS 2	33	3-4-2 (6)			21				13
4.5		POORLY GRADED SAND, (SP) light brown, fine to medium grained, moist, loose, trace gravel (Glacial Outwash)	SS 3	56	3-3-2 (5)			2				
7.0		CLAYEY SAND, (SC) brown to gray, fine to medium grained, moist, medium dense to loose, trace gravel (Glacial Till)	SS 4	22	5-4-6 (10)							
10			SS 5	33	3-3-5 (8)			11				
12.5		NOTE: Gray below 12.0 feet. Encountered practical auger refusal on apparent bedrock. Bottom of borehole at 12.5 feet.	SS 6		3-50/0"							

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**BORING NUMBER SB-2**

**CLIENT** Minneapolis Public Housing Authority **PROJECT NAME** Minnehaha Townhomes  
**PROJECT NUMBER** 17.61872.100 **PROJECT LOCATION** Minneapolis, MN  
**DATE STARTED** 1/31/17 **COMPLETED** 1/31/17 **GROUND ELEVATION** 818 ft **HOLE SIZE** 6 1/2 in.  
**DRILLING CONTRACTOR** NTI **GROUND WATER LEVELS:**  
**DRILLING METHOD** 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.  
**LOGGED BY** Robert Hawkins **CHECKED BY** Steve Gerber **AT END OF DRILLING** ---  
**CAVE IN (ft)** 2.5 **FROST DEPTH (ft)** --- **AFTER DRILLING** ---  
**NOTES** Elevation determined using Trimble GeoXH 6000. (NAD 1983 (Conus) CORS 96 datum.)

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (18.0 Inches)	AU 1									
1.5		816.5										
		POORLY GRADED SAND WITH SILT, (SP-SM) dark brown, fine to medium grained, moist, trace gravel, trace organics (Fill)	SS 2	56	2-2-1 (3)							
5			SS 3	11	2-2-3 (5)							
		NOTE: Organic content at 7.0 feet = 1.0%.	SS 4	33	2-6-6 (12)			8				5
9.5		808.5										
10		SANDY LEAN CLAY, (CL) gray, fine to medium grained, moist, rather stiff, trace gravel (Glacial Till)	SS 5	89	4-4-5 (9)			13				
12.5		805.5	SS 6		2-50/0"							
		Encountered practical auger refusal on apparent bedrock. Bottom of borehole at 12.5 feet.										

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**BORING NUMBER SB-3**

**CLIENT** Minneapolis Public Housing Authority **PROJECT NAME** Minnehaha Townhomes  
**PROJECT NUMBER** 17.61872.100 **PROJECT LOCATION** Minneapolis, MN  
**DATE STARTED** 1/31/17 **COMPLETED** 1/31/17 **GROUND ELEVATION** 819 ft **HOLE SIZE** 6 1/2 in.  
**DRILLING CONTRACTOR** NTI **GROUND WATER LEVELS:**  
**DRILLING METHOD** 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.  
**LOGGED BY** Robert Hawkins **CHECKED BY** Steve Gerber **AT END OF DRILLING** ---  
**CAVE IN (ft)** 3 **FROST DEPTH (ft)** --- **AFTER DRILLING** ---  
**NOTES** Elevation determined using MnTOPO LiDAR data.

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (12.0 Inches)										
1.0		CLAYEY SAND, (SC) brown to dark brown, fine to medium grained, moist, trace gravel (Fill)	AU 1									
			SS 2	33	1-2-2 (4)							
5.0		POORLY GRADED SAND, (SP) brown to dark brown, fine to medium grained, moist, trace gravel (Fill)	SS 3	44	1-2-1 (3)							
			SS 4	44	2-8-13 (21)			11				3
9.5		SANDY LEAN CLAY, (CL) brown to gray, moist, medium, trace gravel (Glacial Till)	SS 5	56	2-3-2 (5)			13				
12.5		Encountered practical auger refusal on apparent bedrock. Bottom of borehole at 12.5 feet.	SS 6		3-50/0"							





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**BORING NUMBER SB-4**

**CLIENT** Minneapolis Public Housing Authority **PROJECT NAME** Minnehaha Townhomes  
**PROJECT NUMBER** 17.61872.100 **PROJECT LOCATION** Minneapolis, MN  
**DATE STARTED** 1/31/17 **COMPLETED** 1/31/17 **GROUND ELEVATION** 818 ft **HOLE SIZE** 6 1/2 in.  
**DRILLING CONTRACTOR** NTI **GROUND WATER LEVELS:**  
**DRILLING METHOD** 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.  
**LOGGED BY** Robert Hawkins **CHECKED BY** Steve Gerber **AT END OF DRILLING** ---  
**CAVE IN (ft)** 5 **FROST DEPTH (ft)** --- **AFTER DRILLING** ---  
**NOTES** Elevation determined using MnTOPO LiDAR data.

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (18.0 Inches)	AU 1									
1.5		CLAYEY SAND, (SC) dark brown, fine to medium grained, moist, trace gravel, trace organics (Fill) NOTE: Organic content at 2.0 feet = 1.6%.	SS 2	67	5-4-4 (8)			8				
5			SS 3	56	1-2-1 (3)							
7.0		SANDY LEAN CLAY, (CL) brown, moist, soft to medium, trace gravel (Glacial Till)	SS 4	33	1-1-2 (3)	2.3		28				
10		NOTE: Light brown below 9.5 feet.	SS 5	78	4-2-5 (7)	1.5						
12.0			SS 6	100	3-50/0"			15				
12.5		CLAYEY SAND, (SC) gray, fine to medium grained, moist, trace gravel (Glacial Till)										

Encountered practical auger refusal on apparent bedrock.  
 Bottom of borehole at 12.5 feet.



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**BORING NUMBER SB-5**

**CLIENT** Minneapolis Public Housing Authority **PROJECT NAME** Minnehaha Townhomes  
**PROJECT NUMBER** 17.61872.100 **PROJECT LOCATION** Minneapolis, MN  
**DATE STARTED** 1/31/17 **COMPLETED** 1/31/17 **GROUND ELEVATION** 815.5 ft **HOLE SIZE** 6 1/2 in.  
**DRILLING CONTRACTOR** NTI **GROUND WATER LEVELS:**  
**DRILLING METHOD** 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.  
**LOGGED BY** Robert Hawkins **CHECKED BY** Steve Gerber **AT END OF DRILLING** ---  
**CAVE IN (ft)** 3 **FROST DEPTH (ft)** --- **AFTER DRILLING** ---  
**NOTES** Elevation determined using Trimble GeoXH 6000. (NAD 1983 (Conus) CORS 96 datum.)

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (12.0 Inches)										
1.0		814.5	AU 1									
		POORLY GRADED SAND, (SP) light brown, fine to medium grained, moist, medium dense to very loose, trace gravel (Glacial Outwash)	SS 2	67	3-5-4 (9)			3				2
5			SS 3	67	1-1-1 (2)							
7.0		808.5	SS 4	67	1-2-1 (3)			15				32
9.5		806.0										
10.0		805.5	SS 5		2-50/0"			20				

Encountered practical auger refusal on apparent bedrock.  
 Rock classification are based on highly weathered and disturbed samples. A petrographic analysis may yield different results.  
 Bottom of borehole at 10.0 feet.



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**BORING NUMBER SB-6**

**CLIENT** Minneapolis Public Housing Authority **PROJECT NAME** Minnehaha Townhomes  
**PROJECT NUMBER** 17.61872.100 **PROJECT LOCATION** Minneapolis, MN  
**DATE STARTED** 1/31/17 **COMPLETED** 1/31/17 **GROUND ELEVATION** 816 ft **HOLE SIZE** 6 1/2 in.  
**DRILLING CONTRACTOR** NTI **GROUND WATER LEVELS:**  
**DRILLING METHOD** 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.  
**LOGGED BY** Robert Hawkins **CHECKED BY** Steve Gerber **AT END OF DRILLING** ---  
**CAVE IN (ft)** 2.5 **FROST DEPTH (ft)** --- **AFTER DRILLING** ---  
**NOTES** Elevation determined using Trimble GeoXH 6000. (NAD 1983 (Conus) CORS 96 datum.)

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6.0 Inches)		815.5								
		CLAYEY SAND, (SC) dark brown to black, fine to medium grained, moist, trace gravel, trace organics (Fill)	AU 1									
			SS 2	67	2-3-2 (5)							
5		NOTE: Organic content at 4.5 feet = 1.5%.	SS 3	11	5-6-12 (18)			10				
7.0		SANDY LEAN CLAY, (CL) brown, moist, medium, trace gravel (Glacial Till)	SS 4	56	4-3-3 (6)			11				
10			SS 5		5-7-50/0"							
10.5				805.5								

Encountered practical auger refusal on apparent bedrock.  
 Bottom of borehole at 10.5 feet.



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**BORING NUMBER SB-7**

**CLIENT** Minneapolis Public Housing Authority **PROJECT NAME** Minnehaha Townhomes  
**PROJECT NUMBER** 17.61872.100 **PROJECT LOCATION** Minneapolis, MN  
**DATE STARTED** 2/1/17 **COMPLETED** 2/1/17 **GROUND ELEVATION** 812 ft **HOLE SIZE** 6 1/2 in.  
**DRILLING CONTRACTOR** NTI **GROUND WATER LEVELS:**  
**DRILLING METHOD** 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.  
**LOGGED BY** Robert Hawkins **CHECKED BY** Steve Gerber **AT END OF DRILLING** ---  
**CAVE IN (ft)** 3 **FROST DEPTH (ft)** 1 **AFTER DRILLING** ---  
**NOTES** Elevation determined using Trimble GeoXH 6000. (NAD 1983 (Conus) CORS 96 datum.)

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6.0 Inches)										
		POORLY GRADED SAND, (SP) light brown, fine to medium grained, moist, very loose, trace gravel (Glacial Outwash)	AU 1									
			SS 2	28	1-1-1 (2)			2				1
5			SS 3		1-1-50/1"							
5.6												

Encountered practical auger refusal on apparent bedrock.  
 Bottom of borehole at 5.6 feet.







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**BORING NUMBER SB-9**

**CLIENT** Minneapolis Public Housing Authority **PROJECT NAME** Minnehaha Townhomes  
**PROJECT NUMBER** 17.61872.100 **PROJECT LOCATION** Minneapolis, MN  
**DATE STARTED** 2/1/17 **COMPLETED** 2/1/17 **GROUND ELEVATION** 812.5 ft **HOLE SIZE** 6 1/2 in.  
**DRILLING CONTRACTOR** NTI **GROUND WATER LEVELS:**  
**DRILLING METHOD** 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.  
**LOGGED BY** Robert Hawkins **CHECKED BY** Steve Gerber **AT END OF DRILLING** ---  
**CAVE IN (ft)** 4 **FROST DEPTH (ft)** 1 **AFTER DRILLING** ---  
**NOTES** Elevation determined using Trimble GeoXH 6000. (NAD 1983 (Conus) CORS 96 datum.)

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		0.3 TOPSOIL (3.0 Inches) 812.3	AU 1									
		CLAYEY SAND, (SC) dark brown to black, fine to medium grained, moist, trace gravel, trace organics (Fill)  NOTE: Organic content at 4.5 feet = 1.1%.	SS 2	44	2-5-4 (9)			25				
5		4.5 CLAYEY SAND, (SC) brown to light brown, fine to medium grained, moist, trace dolostone gravel (Glacial Till) 808.0	SS 3		4-6-50/3"			16				
		5.8										

Encountered practical auger refusal on apparent bedrock.  
 Bottom of borehole at 5.8 feet.



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**BORING NUMBER SB-10**

**CLIENT** Minneapolis Public Housing Authority **PROJECT NAME** Minnehaha Townhomes  
**PROJECT NUMBER** 17.61872.100 **PROJECT LOCATION** Minneapolis, MN  
**DATE STARTED** 2/1/17 **COMPLETED** 2/1/17 **GROUND ELEVATION** 809.5 ft **HOLE SIZE** 6 1/2 in.  
**DRILLING CONTRACTOR** NTI **GROUND WATER LEVELS:**  
**DRILLING METHOD** 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.  
**LOGGED BY** Robert Hawkins **CHECKED BY** Steve Gerber **AT END OF DRILLING** ---  
**CAVE IN (ft)** 1 **FROST DEPTH (ft)** 1 **AFTER DRILLING** ---  
**NOTES** Elevation determined using MnTOPO LiDAR data.

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6.0 Inches)										
		CLAYEY SAND, (SC) brown to light brown, fine to medium grained, moist, trace gravel (Glacial Till)	AU 1									
			SS 2		6-4-50/4"		15					
3.3												

Encountered practical auger refusal on apparent bedrock.  
 Bottom of borehole at 3.3 feet.



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**BORING NUMBER SB-11**

**CLIENT** Minneapolis Public Housing Authority **PROJECT NAME** Minnehaha Townhomes  
**PROJECT NUMBER** 17.61872.100 **PROJECT LOCATION** Minneapolis, MN  
**DATE STARTED** 2/1/17 **COMPLETED** 2/1/17 **GROUND ELEVATION** 809 ft **HOLE SIZE** 6 1/2 in.  
**DRILLING CONTRACTOR** NTI **GROUND WATER LEVELS:**  
**DRILLING METHOD** 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.  
**LOGGED BY** Robert Hawkins **CHECKED BY** Steve Gerber **AT END OF DRILLING** ---  
**CAVE IN (ft)** 3 **FROST DEPTH (ft)** 1 **AFTER DRILLING** ---  
**NOTES** Elevation determined using Trimble GeoXH 6000. (NAD 1983 (Conus) CORS 96 datum.)

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6.0 Inches)	808.5									
		CLAYEY SAND, (SC) brown to gray, fine to medium grained, moist, very loose, trace gravel (Glacial Till)	AU 1									
			SS 2	100	2-2-2 (4)			17				31
5			SS 3	100	2-2-2 (4)							
6.0			803.0									

Encountered practical auger refusal on apparent bedrock.  
 Bottom of borehole at 6.0 feet.







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**BORING NUMBER SB-13**

**CLIENT** Minneapolis Public Housing Authority **PROJECT NAME** Minnehaha Townhomes  
**PROJECT NUMBER** 17.61872.100 **PROJECT LOCATION** Minneapolis, MN  
**DATE STARTED** 2/1/17 **COMPLETED** 2/1/17 **GROUND ELEVATION** 810.5 ft **HOLE SIZE** 6 1/2 in.  
**DRILLING CONTRACTOR** NTI **GROUND WATER LEVELS:**  
**DRILLING METHOD** 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.  
**LOGGED BY** Robert Hawkins **CHECKED BY** Steve Gerber **AT END OF DRILLING** ---  
**CAVE IN (ft)** 6 **FROST DEPTH (ft)** 1 **AFTER DRILLING** ---  
**NOTES** Elevation determined using MnTOPO LiDAR data.

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.4		TOPSOIL (5.0 Inches) 810.1	AU 1									
		CLAYEY SAND, (SC) black, fine to medium grained, moist, trace gravel, trace organics (Fill)										
		NOTE: Organic content at 2.0 feet = 8.7%.										
			SS 2	56	4-6-8 (14)			19				
4.5		CLAYEY SAND, (SC) brown, fine to medium grained, moist, loose, trace gravel (Glacial Till) 806.0	SS 3	67	5-5-2 (7)							
7.0		SANDY LEAN CLAY, (CL) brown, moist, medium, trace gravel (Glacial Till) 803.5	SS 4	100	4-3-4 (7)	2.0		15				
9.7		800.8	SS 5		50/2"							

Encountered practical auger refusal on apparent bedrock.  
 Bottom of borehole at 9.7 feet.



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**BORING NUMBER SB-14**

**CLIENT** Minneapolis Public Housing Authority **PROJECT NAME** Minnehaha Townhomes  
**PROJECT NUMBER** 17.61872.100 **PROJECT LOCATION** Minneapolis, MN  
**DATE STARTED** 2/1/17 **COMPLETED** 2/1/17 **GROUND ELEVATION** 812.5 ft **HOLE SIZE** 6 1/2 in.  
**DRILLING CONTRACTOR** NTI **GROUND WATER LEVELS:**  
**DRILLING METHOD** 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.  
**LOGGED BY** Robert Hawkins **CHECKED BY** Steve Gerber **AT END OF DRILLING** ---  
**CAVE IN (ft)** 6 **FROST DEPTH (ft)** 1 **AFTER DRILLING** ---  
**NOTES** Elevation determined using MnTOPO LiDAR data.

NTI GEOTECH COLUMNS WINOTES - NTL\2016-08-10.GDT - 3/10/17 13:39 - \\NTI\DATA\RAMSEY\PROJECTS\2017 PROJECTS\MINNEHAHA TOWNHOMES - GEO - 117.61872.100\ENGINEERING\ENGINEERING REPORTS\GINT\MINNEHAHA TOWNHOMES.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6.0 Inches)										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel, occasional buried topsoil (Fill)	AU 1									
3.0		CLAYEY SAND, (SC) brown to dark brown, fine to medium grained, moist, trace gravel (Fill)	SS 2	33	2-2-0 (2)			8				
5			SS 3	33	0-1-1 (2)							
7.0		CLAYEY SAND, (SC) brown, fine to medium grained, moist, medium dense, trace gravel (Glacial Till)	SS 4	100	3-5-6 (11)			12				29
9.7		Encountered practical auger refusal on apparent bedrock. Bottom of borehole at 9.7 feet.	SS 5		50/2"							



**Inver Grove Heights**  
 6160 Carmen Avenue East  
 Inver Grove Heights, MN 55076  
 P: 651-389-4191  
 www.NTIgeo.com

**BORING NUMBER SB-15**

**CLIENT** Minneapolis Public Housing Authority **PROJECT NAME** Minnehaha Townhomes  
**PROJECT NUMBER** 17.61872.100 **PROJECT LOCATION** Minneapolis, MN  
**DATE STARTED** 2/1/17 **COMPLETED** 2/1/17 **GROUND ELEVATION** 812 ft **HOLE SIZE** 6 1/2 in.  
**DRILLING CONTRACTOR** NTI **GROUND WATER LEVELS:**  
**DRILLING METHOD** 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.  
**LOGGED BY** Robert Hawkins **CHECKED BY** Steve Gerber **AT END OF DRILLING** ---  
**CAVE IN (ft)** 4 **FROST DEPTH (ft)** 2 **AFTER DRILLING** ---  
**NOTES** Elevation determined using Trimble GeoXH 6000. (NAD 1983 (Conus) CORS 96 datum.)

NTI GEOTECH COLUMNS WINOTES - NTI\2016-08-10.GDT - 3/10/17 13:40 - \\NTIDATA\RAMSEY\PROJECTS\2017 PROJECTS\MINNEHAHA TOWNHOMES - (GEO - 117.61872.100)\ENGINEERING\ENGINEERING REPORTS\GINT\MINNEHAHA TOWNHOMES.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (4.0 Inches)										
0.3		811.7	AU 1									
		CLAYEY SAND, (SC) dark brown to black, fine to medium grained, moist, trace gravel (Fill)										
			SS 2	44	4-3-2 (5)							
4.5		807.5										
5		CLAYEY SAND, (SC) brown, fine to medium grained, moist, very loose, trace gravel (Glacial Till)						13				
6.0		806.0	SS 3	56	2-2-2 (4)							

Encountered practical auger refusal on apparent bedrock.  
 Bottom of borehole at 6.0 feet.







**Inver Grove Heights**  
 6160 Carmen Avenue East  
 Inver Grove Heights, MN 55076  
 P: 651-389-4191  
 www.NTIgeo.com

**BORING NUMBER SB-17**

**CLIENT** Minneapolis Public Housing Authority **PROJECT NAME** Minnehaha Townhomes  
**PROJECT NUMBER** 17.61872.100 **PROJECT LOCATION** Minneapolis, MN  
**DATE STARTED** 2/1/17 **COMPLETED** 2/1/17 **GROUND ELEVATION** 812.5 ft **HOLE SIZE** 6 1/2 in.  
**DRILLING CONTRACTOR** NTI **GROUND WATER LEVELS:**  
**DRILLING METHOD** 3 1/4 in H.S.A **AT TIME OF DRILLING** ---  
**LOGGED BY** Robert Hawkins **CHECKED BY** Steve Gerber **AT END OF DRILLING** ---  
**CAVE IN (ft)** 3 **FROST DEPTH (ft)** 1 **AFTER DRILLING** ---  
**NOTES** Elevation determined using Trimble GeoXH 6000. (NAD 1983 (Conus) CORS 96 datum.)

NTI GEOTECH COLUMNS WINOTES - NTI 2016-08-10.GDT - 3/10/17 13:40 - \\NTIDATA\RAMSEY\1-PROJECTS\MINNEHAHA TOWNHOMES - GEO - 117.61872.100\ENGINEERING\ENGINEERING REPORTS\GINT\MINNEHAHA TOWNHOMES.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6.0 Inches) 812.0	AU 1									
		CLAYEY SAND, (SC) brown to light brown, moist, loose to medium dense, trace gravel (Glacial Till)	SS 2	61	2-3-4 (7)			16				41
5			SS 3	100	4-5-7 (12)							
6.0		806.5										

Encountered practical auger refusal on apparent bedrock.  
 Bottom of borehole at 6.0 feet.

**SECTION 00 10 50 – OWNER FUNDING REQUIREMENTS**

I.1 GENERAL

I.2 INFORMATION

- A. The following bidding information related to Civil Rights rules and regulations, and Minneapolis' Small Underutilized Business Program (SUBP) program are incorporated in the Project Manual and Drawings is information supplied by the Owner.
- B. This Project will receive public funds and is, therefore, subject to requirements of the City of Minneapolis' Small Underutilized Business Program (SUBP). The bidder must comply with the Small and Underutilized Business Enterprise Program (SUBP), as outlined in the Minneapolis City Ordinance Chapter 423 (the "SUBP Ordinance") and MBE/WBE requirements found at 40 CFR 31.36(e) or 40 CFR 30.44(b), and as outlined in the document appended to this Section.
- C. This project will receive public funds, therefore, is subject to Affirmative Action requirements established by the City of Minneapolis. The bidder must comply with the Affirmative Action requirements as outlined in Chapter 139.50 of the City of Minneapolis Ordinance. Any Contractor receiving City of Minneapolis funds (\$50,000 threshold) must have a currently approved Affirmative Action Plan registered with the City of Minneapolis Civil Rights Department prior to approval to do business with the City, and shall comply with the rules and regulations as outlined in the document appended to this Section.

PART 2 – PRODUCTS - NOT USED

PART 3 – EXECUTION - NOT USED

END OF SECTION 00 10 50

## Notice of Civil Rights Rules and Regulations

### Minnehaha Townhomes Project

This notice advises City of Minneapolis developers and general contractors (“contractors”), working on City funded development projects, of their commitments under Minneapolis Code of Ordinances section 139.50. All contractors must comply with all provisions of Minneapolis Code of Ordinances Title 7 and with all rules and regulations issued by the Minneapolis Department of Civil Rights (“MDCR”) director. Contractors will be subject to a pre-award compliance review. Failure to cooperate may preclude use of City funds.

1. **Non-Discrimination:**<sup>1</sup> The contractor will not discriminate against any employee or applicant for employment because of race, color, creed, religion, ancestry, national origin, sex, sexual orientation, gender identity, disability, age (over the age of 25), marital status, or status with regard to public assistance. The contractor will take affirmative action to ensure that all employment practices are free of such discrimination. Such employment practices include but are not limited to the following: Hiring, upgrading, demotion, transfer, recruitment or recruitment advertising, layoff, termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.
2. **Equal Employment Opportunity/Affirmative Action Employer:** The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that it is an equal opportunity or affirmative action employer.
3. **Affirmative Action Plan:** The contractor must have an Affirmative Action Plan approved by MDCR before it may enter into a contract over \$100,000 with the City.
4. **Small and Underutilized Business Program (SUBP):** Contractor must comply with the SUBP program, including, but not limited to, making a good faith effort to meet the Minority-Owned Business Enterprises and Women-Owned Business Enterprises goals established on the project.
5. **Employment Goals:**<sup>2</sup> The contractor must make a good faith effort to meet the City’s aspirational construction workforce goals of **6%** female participation and **32%** minority participation.
6. **Prevailing Wage:**<sup>3</sup> Contractor must comply with prevailing wage laws on the project.
7. **HUD Section 3:**<sup>4</sup> Contractor must comply with Section 3 of the Housing and Urban Development Act of 1968, as amended. Contractors must incorporate the Section 3 Clause into all subcontracts and to the greatest extent feasible, ensure that employment and other economic activities be directed to low income persons.
8. **Posting Requirement:** The contractor must provide this notice to its trade and labor union or representative of workers and shall post the notice in conspicuous places available to employees and applicants for employment.

<sup>1</sup> Acts of discrimination are defined in the Minneapolis Code of Ordinances, Chapter 139.

<sup>2</sup> See Request for City Council Committee Action, Adopted March 21, 2012; incorporated into section 139.50 as a rule issued by the MDCR director.

<sup>3</sup> See Minneapolis Code of Ordinances section 24.220, CPED Prevailing Wage Policy (adopted by City Council June 8, 2004), and Davis-Bacon and Related Acts; enforcement authority has been delegated to MDCR.

<sup>4</sup> See 24 CFR Section 135.38; enforcement authority has been delegated to MDCR.



CITY OF MINNEAPOLIS  
SMALL AND UNDERUTILIZED BUSINESS PROGRAM (SUBP)

## REQUEST FOR SUBP GOALS

**INSTRUCTIONS:**

- Please allow 7-10 business days for this request to be completed.
- **Please attach a description of the Scope of Services** to be performed under the contract, the estimated dollar value of each scope, and the type of business needed to complete the work. This request will be returned if the scope of services is not sufficiently described.
  - The Scopes of Services Form can be found on the CityTalk Forms page.
  - Attach additional documentation if available (draft plans & specifications, draft RFP, etc...)
- Submit completed form to: [contractcompliance@minneapolismn.gov](mailto:contractcompliance@minneapolismn.gov)

<b>Project Name:</b>	Minnehaha Townhomes
<b>Duties to be Performed/ Goods to be purchased:</b>	New construction of a 16-unit townhouse development on City owned land.
<b>Contract Type:</b>	<input checked="" type="checkbox"/> Construction/Development [over \$100,000 ] <input type="checkbox"/> Commodities and Supplies [over \$400,000 ] <input type="checkbox"/> Professional Services [over \$100,000 ] <input type="checkbox"/> Technical Services [over \$100,000 ]
<b>Selection Process:</b>	<input checked="" type="checkbox"/> Public Bid <input type="checkbox"/> Request for Proposals <input type="checkbox"/> PRC Presentation Date: _____
<b>Date Request Submitted:</b>	June 8, 2017
<b>Department:</b>	CPED – Housing Finance Department
<b>Department Contact:</b>	Theresa Cunningham
<b>Department Contact Phone &amp; Email:</b>	612.673.5237 – <a href="mailto:theresa.cunningham@minneapolismn.gov">theresa.cunningham@minneapolismn.gov</a>
<b>Estimated Contract Value<sup>1</sup>:</b>	\$3,551,637 – edited by L. Woyee <b>\$3,611,904</b>
<b>Estimated Contract Start Date:</b>	December 31, 2017
<b>Estimated Contract Length:</b>	12 months

Notes/comments: \_\_\_\_\_

## SUBP GOAL DETERMINATION

To be completed by Department of Civil Rights

<b>SUBP Goals:</b>	8% <b>Minority Business Enterprise (MBE)</b> 9% <b>Women Business Enterprise (WBE)</b>
<b>Date Goals Calculated:</b>	June 12, 2017
<b>Goals Calculated By:</b>	Leslie Woyee
<b>MBE/WBE List Attached:</b>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
<b>Goals Approved By &amp; Date*:</b>	<i>S. Gill</i> 6/12/17

\*Goals expire one year after they are approved and must be re-requested

Notes/Comments: Attached to this document is a list of MnUCP certified firms, capable of performing the relevant scopes of work. Please incorporate this list into all subcontractor solicitations.

<sup>1</sup> For construction projects, only list the total construction cost.  
This amount should match the total value entered on the Scopes of Services Form.

**City of Minneapolis**  
**Small and Underutilized Business Enterprise Program**  
**Special Provisions for Development Projects**  
**Minnehaha Townhomes**

**I. Overview**

The City of Minneapolis policy is to provide equal opportunities to all businesses, with an effort to redress discrimination in the City's marketplace and in public contracting against minority-owned business enterprises ("MBEs") and women-owned business enterprises ("WBEs"). This is accomplished through the Small and Underutilized Business Program ("SUBP") as detailed in the Minneapolis Code of Ordinances Chapter 423. SUBP applies to any development project receiving a subsidy through the City of over \$100,000. SUBP goals are set on projects based on the project scope, subcontracting opportunities and availability of eligible MBEs/WBEs.

The City has set the following SUBP goals to facilitate participation of MBEs/WBEs on this project:

**8% MBE and 9% WBE**

Only eligible and available MBEs/WBEs count towards the SUBP goals. An eligible and available MBE/WBE is:

1. Certified under the Minnesota Uniform Certification Program (MNUCP).
2. Located within the City's marketplace.<sup>1</sup>
3. Certified within the scope of work in which they will be performing.
4. Performing a commercially useful function on the contract.

**II. Good Faith Efforts Evaluation**

The developer's contractor must either meet the goals listed above or demonstrate a Good Faith Effort to do so. A Good Faith Effort means that the developer's contractor made *every necessary and reasonable effort* to subcontract with MBEs/WBEs prior to subcontractor bidletting.

To determine if the developer's contractor solicited MBEs/WBEs in good faith, the following list of *seven factors* may be considered:

1. Soliciting through all reasonable and available means (attendance at pre-bid meetings, advertising and/or written notices) the interest of all MBEs/WBEs certified in the scopes of work of the contract. The developer's contractor must solicit MBEs/WBEs in sufficient time prior to bid opening or the proposal deadline to allow MBEs/WBEs to respond to solicitations. The developer's contractor must determine with reasonable certainty if the MBEs/WBEs are interested by taking appropriate steps to follow up on initial solicitations.
2. Selecting portions of the work to be performed by MBEs/WBEs in order to increase the likelihood that the project goals will be achieved. This includes, where appropriate, breaking out contract work into smaller units to facilitate MBE/WBE participation, even when a developer's contractor might otherwise prefer to perform these work items with its own forces.
3. Providing interested MBEs/WBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.
4. The developer's contractor must negotiate in good faith with interested MBEs/WBEs and provide written documentation of such negotiation with each such business. In determining whether the developer's

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<sup>1</sup> Minnesota counties of Anoka, Carver, Chisago, Dakota, Hennepin, Isanti, Ramsey, Scott, Sherburne, Washington, and Wright.

contractor negotiated in good faith, the City of Minneapolis Department of Civil Rights (“MDCR”) may consider a number of factors including price, scheduling and capabilities as well as the contract goal.

5. The fact that there may be some additional costs involved in finding and using MBEs/WBEs is not itself sufficient reason for the developer’s contractor’s failure to meet the project goals as long as such costs are reasonable.
6. If requested by a solicited MBE/WBE, the developer’s contractor must make reasonable efforts to assist such MBEs/WBEs in obtaining bonding, lines of credit or insurance as required by the developer or by the developer’s contractor, provided that the developer’s contractor need not provide financial assistance toward this effort.
7. Effectively using the services of minority/woman community organizations; minority/woman contractors’ groups; local, state and federal business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the solicitation and placement of MBEs/WBEs.

### III. Required Documentation

The developer’s contractor must thoroughly document its efforts to solicit and incorporate MBE/WBE participation to meet the SUBP goals. The following documents must be submitted after subcontractor bidletting and prior to closing on the City subsidy:

1. *Bidders and Solicitation List*: Must include all subcontractors, sub-consultants, service providers or suppliers that were solicited. It also indicates which MBE/WBE firms the developer’s contractor intends to use.
2. *Supporting Documentation to Demonstrate Good Faith Efforts*: The developer’s contractor must submit documentation evidencing the efforts taken to achieve the SUBP goals. The information may include, but is not limited to, copies of solicitation emails, bids received, faxes, and phone call logs.
3. *Good Faith Efforts Checklist*: A checklist based on the *seven factors* that may be considered in determining whether MBE and WBE participation was solicited in good faith. The developer’s contractor must use the checklist during subcontractor bid solicitation to demonstrate the efforts that were made.
4. *Pre-Construction Book*: Collects information related to subcontracts, employment participation, construction schedules, and required wages. The developer’s contractor must ensure that the MBEs and WBEs they intend to contract with and their respective subcontract amounts are within the Pre-Construction Book and are accurate.

### IV. Post-Award Substitutions

The developer’s contractor shall not substitute any MBE/WBE subcontractor listed in the Pre-Construction Book without the prior written approval of MDCR. The developer’s contractor must make good faith efforts to replace an MBE/WBE subcontractor that is unable to perform with another MBE/WBE to perform the same scope of work.

### V. Penalties for Non-Compliance

Compliance with SUBP is a material condition of the City’s subsidy contract. The City may take the following actions wholly, partly, or in any combination:

- a) Temporarily withhold disbursements of City-provided funds pending correction of the deficiency.
- b) Disallow the use of funds for all or part of the cost of the activity or action not in compliance.
- c) Suspend or debar the noncompliant developer, developer’s contractor, subcontractor, supplier or vendor as ineligible for all current or potential contracts with the City or supported by City funds.
- d) Designate the noncompliant developer, developer’s contractor, subcontractor, supplier or vendor as high-risk for future contracts and require of the developer, developer’s contractor, subcontractor, supplier or vendor increased reporting requirements, mandatory audits and similar measures.

Please review Minneapolis Code of Ordinances Chapter 423 for more information or contact the City of Minneapolis Department of Civil Rights at (612) 673-3012 or [contractcompliance@minneapolismn.gov](mailto:contractcompliance@minneapolismn.gov)

**SECTION 01 10 00 - SUMMARY****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section includes:
  - 1. Project information.
  - 2. Work covered by Contract Documents.
  - 3. Access to site.
  - 4. Coordination with occupants.
  - 5. Work restrictions.
  - 6. Specification and drawing conventions.
- B. Related Section:
  - 1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
  - 2. Division 01 "Green Communities Design Requirements" for Enterprise Green Communities checklist for mandatory construction requirements that may or may not be included otherwise in these documents.
    - a. Project must meet all requirements of the items selected in this list

**1.3 PROJECT INFORMATION**

- A. Project Identification:
  - 1. Project Location: 5348, 5364 & 5368 River View Road, Minneapolis, MN 55417
- B. Owner: Minneapolis Public Housing Authority, 1001 Washington Avenue North, Minneapolis, MN 55401
- C. Architect: MSR Design, Paul Mellblom (Principal in Charge) and Patrick Lynch (Project Manager), 710 S 2<sup>nd</sup> St, 8<sup>th</sup> Floor, Minneapolis, MN 55401, 612-375-0336.

**1.4 WORK COVERED BY CONTRACT DOCUMENTS**

- A. The Work of the Project is defined by the Contract Documents and consists of the following:
  - 1. Construction of four new 2-storey townhome buildings, each containing four dwelling units. Project includes all site work, on site parking, and utility work to connect to city services.
- B. Type of Contract
  - 1. Project will be constructed under a single prime contract.
- C. Work shall comply with items noted in the "Yes" column on the Method for Satisfying Green Communities Criteria and Certification that is included in the Appendix. Contractor is responsible for compliance with the document.

**1.5 PHASED CONSTRUCTION**

- A. The Work shall be conducted in a single phase.



## 1.6 ACCESS TO SITE

- A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited by Owner's right to perform work or to retain other Contractors on portions of Project.
- B. Use of Site: Contractor shall have full use of Project site. Do not disturb portions of Project site beyond areas in which the Work is indicated.
- C. Coordination with Existing Apartment Building: Do not block access to and maintain access to existing Riverview Apartments always. Riverview Apartments is owned by Beacon Interfaith Housing Collaborative. Coordinate with Owner for prior approval to any operations that will inhibit access to or operations of adjacent, existing building. Repair any and all damage caused by construction operations.

## 1.7 COORDINATION WITH OCCUPANTS

- A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
  - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
  - 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
  - 3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational and required tests, inspections and Commissioning of systems shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
  - 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

## 1.8 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
  - 1. Comply with limitations on use of public streets, public rights of way, and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours:
  - 1. Limit work in the existing building to normal business working hours of 7:00 a.m. to 6:00 p.m., Monday through Friday, except as otherwise indicated.
  - 2. Weekend Hours: 8:00 a.m. to 5:00 p.m.
  - 3. Contractor to confirm on-site work hours with Authority Having Jurisdiction.
  - 4. Early Morning Hours: Comply with regulations by authorities having jurisdiction for restrictions on noisy work.
- C. Existing Utility Interruptions: Do not interrupt utilities serving site, neighbors, or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
  - 1. Obtain Owner's written permission at least 7 days before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner, neighbors, or others.
  - 1. Obtain Owner's written permission at least 7 days before proceeding with disruptive operations.

- E. Nonsmoking Site: Smoking and tobacco products are not permitted on the entire Project site and on adjacent private property.
- F. Controlled Substances: Use of controlled substances on the Project site is not permitted.

I.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (;) is used within a sentence or phrase.
  - 2. Specification requirements are to be performed by Design-Builder unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:
  - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  - 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
  - 3. Materials Acronyms: Materials and products are identified by reference acronyms found in Section 00 00 20 of this Project Manual

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**END OF SECTION 01 10 00**

## SECTION 01 23 00 - ALTERNATES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for add alternates. Deduct alternates are not permitted.

## 1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
  - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

## 1.4 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
  - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

## 3.1 SCHEDULE OF DEDUCT ALTERNATES

- A. **Deduct Alternate No. 1:** Soffits
  - 1. Base Bid: Furnish and install Fiber Cement Soffit and Fascia (TRIM-1) throughout. See Section 07 46 01.
  - 2. Deduct Alternate: Furnish and install Aluminum Soffit and Fascia (TRIM-2) throughout. See Section 07 71 00.
- B. **Deduct Alternate No. 2:** Windows
  - 1. Base Bid: Furnish and install Fiberglass windows (FGWIN-1) at all windows. See Section 08 54 14.
  - 2. Deduct Alternate: Furnish and install Vinyl windows (VWIN-1) at all windows. See Section 08 53 13.

END OF SECTION 01 23 00

**SECTION 01 25 00 - SUBSTITUTION PROCEDURES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Section:
  - 1. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

**1.2 DEFINITIONS**

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

**1.3 SUBMITTALS**

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. There will be no substitutions of single source specification products that are identified within the specification without prior Owner approval.
  - 2. Substitution Request Form: In Project Manual.
  - 3. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - e. Samples, where applicable or requested.
    - f. Certificates and qualification data, where applicable or requested.
    - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
    - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
    - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
    - k. Cost information, including a proposal of change, if any, in the Contract Sum.
    - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.



- m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- 4. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
  - a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

#### 1.4 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

### PART 2 - PRODUCTS

#### 2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
  - I. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:
    - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - b. Requested substitution will not adversely affect Contractor's construction schedule.
    - c. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - d. Requested substitution is compatible with other portions of the Work.
    - e. Requested substitution has been coordinated with other portions of the Work.
    - f. Requested substitution provides specified warranty.
    - g. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed.
- C. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice of Award.
  - I. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:
    - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    - b. Requested substitution does not require extensive revisions to the Contract Documents.
    - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - d. Requested substitution will not adversely affect Contractor's construction schedule.
    - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - f. Requested substitution is compatible with other portions of the Work.
    - g. Requested substitution has been coordinated with other portions of the Work.
    - h. Requested substitution provides specified warranty.

- i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

**END OF SECTION 01 25 00**

**SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES****PART I - GENERAL****I.1 SUMMARY**

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

**I.2 MINOR CHANGES IN THE WORK**

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions" or Architect's equivalent form.

**I.3 PROPOSAL REQUESTS**

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor and supervision directly attributable to the change.
    - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    - e. Quotation Form: Use CSI Form 13.6B "Proposal Worksheet Summary" and 13.6C "Proposal Worksheet Detail" or other forms acceptable to Architect.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
  - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  - 4. Include costs of labor and supervision directly attributable to the change.
  - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
  - 6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
  - 7. Proposal Request Form: Use CSI Form 13.6A "Change Order Request (Proposal)" with attachments CSI Form 13.6B "Proposal Worksheet Summary" and 13.6C "Proposal Worksheet Detail" or a form acceptable to Architect.

I.4 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on Owner's Change Order form.

I.5 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  - I. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  - I. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00



**SECTION 01 29 00 - PAYMENT PROCEDURES****PART I - GENERAL****I.1 SUMMARY**

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

**I.2 SCHEDULE OF VALUES**

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
    - a. Application for Payment forms with continuation sheets.
    - b. Submittal schedule.
    - c. Items required to be indicated as separate activities in Contractor's construction schedule.
  2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the schedule of values:
    - a. Project name and location.
    - b. Name of Architect.
    - c. Architect's project number.
    - d. Contractor's name and address.
    - e. Date of submittal.
  2. Arrange schedule of values consistent with format of AIA Document G703.
  3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.
    - a. Include separate line items under Contractor and principal subcontracts for project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
  4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
  5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
  6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
  7. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
    - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
  8. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

## I.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
  2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  2. When an application shows completion of an item, submit conditional final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
  2. Schedule of values.
  3. Contractor's construction schedule (preliminary if not final).
  4. Submittal schedule (preliminary if not final).
  5. List of Contractor's staff assignments.
  6. List of Contractor's principal consultants.
  7. List of individual testing requirements, noted as which are to be by Owner and which are part of the Work.
  8. Copies of building permits.
  9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  10. Initial progress report.
  11. Report of preconstruction conference.
  12. Certificates of insurance and insurance policies.

- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
  - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
  - 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
  
- I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
  - 1. Evidence of completion of Project closeout requirements.
  - 2. Evidence of Project Commissioning requirements being properly executed and all identified concerns/issues having been resolved.
  - 3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  - 4. Updated final statement, accounting for final changes to the Contract Sum.
  - 5. AIA Document G706-I 994, "Contractor's Affidavit of Payment of Debts and Claims."
  - 6. AIA Document G706A-I 994, "Contractor's Affidavit of Release of Liens."
  - 7. Evidence that claims have been settled.
  - 8. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**END OF SECTION 01 29 00**

## SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

### PART I - GENERAL

#### I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### I.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General project coordination procedures.
  - 2. Administrative and supervisory personnel.
  - 3. Coordination drawings.
  - 4. Requests for Information (RFIs).
  - 5. Project Web site.
  - 6. Project meetings.
- B. Related Sections:
  - 1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
  - 2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

#### I.3 DEFINITIONS

- A. RFI: Request from Owner, Architect, or Contractor seeking information from each other during construction.

#### I.4 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  - 1. Prepare similar memoranda for Contractor if coordination of their Work or Work by Owner is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's construction schedule.
  - 2. Preparation of the schedule of values.
  - 3. Installation and removal of temporary facilities and controls.



4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

## I.5 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    - b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    - d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    - e. Indicate required installation sequences.
    - f. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
  2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
  3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
  4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
  5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
  6. Mechanical and Plumbing Work: Show the following:

- a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
  - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
  - c. Fire-rated enclosures around ductwork.
  - 7. Electrical Work: Show the following:
    - a. Runs of vertical and horizontal conduit 1-1/4 inch diameter and larger.
    - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.
    - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
  - 8. Fire Protection System: Show the following:
    - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
  - 9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Architect determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Architect will so inform the Contractor, who shall make changes as directed and resubmit.
- C. Coordination Digital Data Files: Prepare coordination digital data files in accordance with the following requirements:
- 1. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
  - 2. Architect will furnish Contractor one set of digital data files of the Drawings for use in preparing coordination digital data files.
    - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to the Drawings.
    - b. Digital Data Software Program: The Drawings are available in Revit version 2009.
    - c. Contractor shall execute a data licensing agreement in the form of AIA Document C106.

#### I.6 KEY PERSONNEL

- A. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
  - 1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

#### I.7 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
  - 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
  - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of Subcontractors.
  - 3. Architect and/or Owner have the right to return RFIs submitted that are frivolous in nature. Frivolous is defined as requiring the Architect's or Owner's time in drafting a response that notably exceeds the value of the item in question by the Contractor.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
  2. Project number.
  3. Date.
  4. Name of Contractor.
  5. Name of Architect and Owner.
  6. RFI number, numbered sequentially.
  7. RFI subject.
  8. Specification Section number and title and related paragraphs, as appropriate.
  9. Drawing number and detail references, as appropriate.
  10. Field dimensions and conditions, as appropriate.
  11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  12. Contractor's signature.
  13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: AIA Document G716 or Software-generated form with substantially the same content as indicated above, acceptable to Architect.
- D. Architect's and Owner's Action: Architect and Owner will review each RFI, determine action required, and respond. Allow five working days for Architect's response for each RFI. RFIs received by Architect or Owner after 3:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for coordination information already indicated in the Contract Documents.
    - d. Requests for adjustments in the Contract Time or the Contract Sum.
    - e. Requests for interpretation of Architect's actions on submittals.
    - f. Incomplete RFIs or inaccurately prepared RFIs.
  2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
  3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to procedure established by the Owner.
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Owner in writing within 5 days of receipt of the RFI response.
- E. On receipt of Architect's and Owner's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Owner within five days if Contractor disagrees with response.
- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use CSI Log Form 13.2B or equivalent format. Include the following:
1. Project name.
  2. Name and address of Contractor.
  3. RFI number including RFIs that were dropped and not submitted.
  4. RFI description.
  5. Date the RFI was submitted.
  6. Date Architect's and Owner's response was received.
  7. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

## I.8 PROJECT MEETINGS

- A. General: Contractor will schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner's Representative and Architect, within three days of the meeting.
- B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Owner of scheduled meeting dates.
  2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Contract Documents.
    - b. Options.
    - c. Related RFIs.
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility problems.
    - k. Time schedules.
    - l. Weather limitations.
    - m. Manufacturer's written recommendations.
    - n. Warranty requirements.
    - o. Compatibility of materials.
    - p. Acceptability of substrates.
    - q. Temporary facilities and controls.
    - r. Space and access limitations.
    - s. Regulations of authorities having jurisdiction.
    - t. Testing and inspecting requirements.
    - u. Installation procedures.
    - v. Coordination with other work.
    - w. Required performance results.
    - x. Protection of adjacent work.
    - y. Protection of construction and personnel.
  3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
  5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- C. Project Closeout Conference: Schedule and conduct a Project closeout conference, at a time convenient to Owner's Rep and Architect, but no later than 60 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.



2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major Subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    - a. Preparation of record documents.
    - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    - c. Submittal of written warranties.
    - d. Requirements for preparing sustainable design documentation.
    - e. Requirements for preparing operations and maintenance data.
    - f. Requirements for demonstration and training.
    - g. Preparation of Contractor's punch list.
    - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    - i. Submittal procedures.
    - j. Owner's partial occupancy requirements.
    - k. Installation of Owner's furniture, fixtures, and equipment.
    - l. Responsibility for removing temporary facilities and controls.
  4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- D. Progress Meetings: Conduct progress meetings at weekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
  2. Attendees: In addition to representatives of Owner, and Architect, each Contractor, Subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site utilization.
      - 8) Temporary facilities and controls.
      - 9) Progress cleaning.
      - 10) Quality and work standards.
      - 11) Status of correction of deficient items.
      - 12) Field observations.
      - 13) Status of RFIs.
      - 14) Status of proposal requests.
      - 15) Pending changes.
      - 16) Status of Change Orders.

- 17) Pending claims and disputes.
- 18) Documentation of information for payment requests.
- 4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
  - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

**SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION**

## PART I - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## I.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Start-up construction schedule.
  - 2. Contractor's construction schedule.
  - 3. Daily construction reports.
  - 4. Material location reports.
  - 5. Field condition reports.
  - 6. Special reports.
- B. Related Sections:
  - 1. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
  - 2. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

## I.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
  - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
  - 2. Predecessor Activity: An activity that precedes another activity in the network.
  - 3. Successor Activity: An activity that follows another activity in the network.

## I.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
  - 1. PDF electronic file.
- B. Start-up construction schedule.
- C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- D. Field Condition Reports: Submit at time of discovery of differing conditions.
- E. Special Reports: Submit at time of unusual event.

## I.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate Contractors.

- B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
  - 1. Secure time commitments for performing critical elements of the Work from entities involved.
  - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

## PART 2 - PRODUCTS

### 2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for commencement of the Work to date of final completion.
  - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
  - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
  - 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing fabrication, and delivery.
  - 3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
  - 4. Startup and Testing Time: Include not less than 15 days for startup and testing.
  - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Owner's administrative procedures necessary for certification of Substantial Completion.
  - 6. Punch List and Final Completion: Include not more than 30 days for punch list and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
  - 1. Phasing: Arrange list of activities on schedule by phase.
  - 2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
  - 3. Work Restrictions: Show the effect of the following items on the schedule:
    - a. Coordination with existing construction.
    - b. Limitations of continued occupancies.
    - c. Uninterruptible services.
    - d. Partial occupancy before Substantial Completion.
    - e. Seasonal variations.
    - f. Environmental control.
  - 4. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    - a. Subcontract awards.
    - b. Submittals.
    - c. Purchases.
    - d. Mockups.
    - e. Fabrication.
    - f. Sample testing.
    - g. Deliveries.
    - h. Installation.
    - i. Tests and inspections.
    - j. Adjusting.
    - k. Curing.



- I. Startup and placement into final use and operation.
    5. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
      - a. Completion of Site Work
      - b. Structural completion.
      - c. Permanent space enclosure.
      - d. Completion of mechanical installation.
      - e. Completion of electrical installation.
      - f. Substantial Completion.
    6. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
  - D. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
    1. Unresolved issues.
    2. Unanswered RFIs.
    3. Rejected or unreturned submittals.
    4. Notations on returned submittals.
  - E. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
  - F. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
    - I. Utilize Microsoft Project, Visio, Primavera, or Prolog
- 2.2 START-UP CONSTRUCTION SCHEDULE
- A. Bar-Chart Schedule: Submit start-up horizontal bar-chart-type construction schedule within seven days of date established for commencement of the Work.
  - B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- 2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)
- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's construction schedule within 30 days of date established for commencement of the Work. Base schedule on the start-up construction schedule and additional information received since the start of Project.
  - B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
    - I. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.
- 2.4 REPORTS
- A. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include

a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

## 2.5 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule at each regularly scheduled progress meeting.
  - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  - 3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
  - 1. Post copies in Project meeting rooms and temporary field offices.
  - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

**END OF SECTION 01 32 00**

**SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for the following:
  - 1. Preconstruction photographs.
  - 2. Periodic construction photographs.
  - 3. Final Completion construction photographs.
  - 4. Preconstruction videotapes.
  - 5. Periodic construction videotapes.
  - 6. Time-lapse sequence construction videotapes.
- B. Related Sections include the following:
  - 1. Division 01 Section "Submittal Procedures" for submitting photographic documentation.
  - 2. Division 01 Section "Closeout Procedures" for submitting digital media as Project Record Documents at Project closeout.
  - 3. Division 01 Section "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of Owner's personnel.
  - 4. Division 02 Section "Selective Demolition" for photographic documentation before selective demolition operations commence.

**1.3 SUBMITTALS**

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same label information as corresponding set of photographs.
- B. Construction Photographs: Submit one set of digital images of each photographic view within seven days of taking photographs.
  - 1. Digital Images: Submit a complete set of digital image electronic files as a Project Record Document on CD-ROM. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, uncropped.

**1.4 COORDINATION**

- A. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities, including temporary lighting required to produce clear, well-lit photographs without obscuring shadows.

**1.5 USAGE RIGHTS**

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

## PART 2 - PRODUCTS

## 2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1024 by 768 pixels.

## PART 3 - EXECUTION

## 3.1 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
1. Date and Time: Include date and time in filename for each image.
  2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Architect.
- C. Preconstruction Photographs: Before commencement of demolition, take color, digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
1. Flag construction limits before taking construction photographs.
  2. Take at least eight photographs to show existing conditions adjacent to property before starting the Work.
  3. Take at least eight photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
  4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Periodic Construction Photographs: Take 12 color, digital photographs weekly. Select vantage points to show status of construction and progress since last photographs were taken.
- E. Architect-Directed Construction Photographs: From time to time, Architect will instruct photographer about number and frequency of color, digital photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.
- F. Time-Lapse Sequence Construction Photographs: Take five color, digital photographs as indicated, to show status of construction and progress since last photographs were taken.
1. Frequency: Take photographs weekly.
  2. Vantage Points: Following suggestions by Architect and Contractor, photographer to select vantage points. During each of the following construction phases, take not less than two of the required shots from same vantage point each time to create a time-lapse sequence as follows:
    - a. Commencement of the Work, through completion of subgrade construction.
    - b. Above-grade structural framing.
    - c. Exterior building enclosure.
    - d. Interior Work, through date of Substantial Completion.
- G. Final Completion Construction Photographs: Take at least eight color photographs after date of Substantial Completion for submission as Project Record Documents. Architect will direct photographer for desired vantage points.



- H. Additional Photographs: Architect may issue requests for additional photographs, in addition to periodic photographs specified.
  - 1. Three days' notice will be given, where feasible.
  - 2. In emergency situations, take additional photographs within 24 hours of request.
  - 3. Circumstances that could require additional photographs include, but are not limited to, the following:
    - a. Special events planned at Project site.
    - b. Immediate follow-up when on-site events result in construction damage or losses.
    - c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
    - d. Substantial Completion of a major phase or component of the Work.
    - e. Extra record photographs at time of final acceptance.
    - f. Owner's request for special publicity photographs.

END OF SECTION 01 32 33

**SECTION 01 33 00 - SUBMITTAL PROCEDURES****PART I - GENERAL****I.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

**I.2 SUMMARY**

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. There are special submittal requirements related to materials complying with Living Building Challenge requirements. These are noted in the specification sections for these materials. These must be strictly adhered to: no deviations permitted.
- C. Related Sections:
  - 1. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
  - 2. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
  - 3. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  - 4. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

**I.3 DEFINITIONS**

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as informational submittals.
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

**I.4 ACTION SUBMITTALS**

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
  - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
  - a. Scheduled date for first submittal.
  - b. Specification Section number and title.
  - c. Submittal category: Action, informational.
  - d. Name of subcontractor.
  - e. Description of the Work covered.
  - f. Scheduled date for Architect's final release or approval.

#### 1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
  1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.
    - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    - b. Digital Drawing Software Program: The Contract Drawings are available in Revit, Version 2009.
    - c. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement or an Agreement form acceptable to the Owner and Architect.
    - d. The following plot files will be furnished for each appropriate discipline:
      - 1) Floor plans.
      - 2) Reflected ceiling plans.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing including resubmittals.
  1. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 14 days for review of each resubmittal.
  4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
- D. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
  2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
  3. Include the following information for processing and recording action taken:
    - a. Project name.
    - b. Date.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Name of subcontractor.
    - f. Name of supplier.
    - g. Name of manufacturer.
    - h. Submittal number or other unique identifier, including revision identifier.
      - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
    - i. Number and title of appropriate Specification Section.
    - j. Drawing number and detail references, as appropriate.
    - k. Location(s) where product is to be installed, as appropriate.
    - l. Other necessary identification.
- E. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
  2. Name file with submittal number or other unique identifier, including revision identifier.
    - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
  3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
  4. Include the following information on an inserted cover sheet:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name of Contractor.
    - e. Name of firm or entity that prepared submittal.
    - f. Name of subcontractor.
    - g. Name of supplier.
    - h. Name of manufacturer.
    - i. Number and title of appropriate Specification Section.
    - j. Drawing number and detail references, as appropriate.
    - k. Location(s) where product is to be installed, as appropriate.
    - l. Related physical samples submitted directly.
    - m. Other necessary identification.
  5. Include the following information as keywords in the electronic file metadata:
    - a. Project name.
    - b. Number and title of appropriate Specification Section.



- c. Manufacturer name.
  - d. Product name.
- F. Options: Identify options requiring selection by the Architect.
- G. Deviations: Identify deviations from the Contract Documents on submittals.
- H. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
- I. Transmittal Form: Provide locations on form for the following information:
    - a. Project name.
    - b. Date.
    - c. Destination (To:).
    - d. Source (From:).
    - e. Names of subcontractor, manufacturer, and supplier.
    - f. Category and type of submittal.
    - g. Submittal purpose and description.
    - h. Specification Section number and title.
    - i. Indication of full or partial submittal.
    - j. Drawing number and detail references, as appropriate.
    - k. Transmittal number, numbered consecutively.
    - l. Submittal and transmittal distribution record.
    - m. Remarks.
    - n. Signature of transmitter.
  - 2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
- 1. Note date and content of previous submittal.
  - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- J. Distribution: Furnish copies of final submittals to manufacturers, subcontractor, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- K. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

## PART 2 - PRODUCTS

### 2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
- 1. Post electronic submittals as PDF electronic files directly to Architect's FTP site specifically established for Project or submit electronic submittals via email as PDF electronic files.
    - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
  - 2. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    - a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated, or provide a notarized statement on original paper copy certificates and certifications where indicated.
  4. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams showing factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  5. Submit Product Data before or concurrent with Samples.
  6. Submit Product Data in the following format:
    - a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based upon Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
  2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 42 inches (750 by 1067 mm).
  3. Submit Shop Drawings in the following format:
    - a. PDF electronic file.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of applicable Specification Section.
  3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: Submit two full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return one set with submittal with options selected.
  5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    - a. Number of Samples: Submit two sets of Samples. Architect will retain one Sample sets; remainder will be returned.
      - 1) Submit two Samples where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include the unique identifier for each product as indicated in the Contract Documents.
  2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.
  5. Submit product schedule in the following format:
    - a. PDF electronic file.
- F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- G. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
  2. Number and title of related Specification Section(s) covered by subcontract.
  3. Drawing number and detail references, as appropriate, covered by subcontract.
  4. Submit subcontract list in the following format:
    - a. PDF electronic file.

- H. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- I. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- J. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.
- K. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- L. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- M. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- N. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- O. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- P. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- Q. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.
  - 4. Product and manufacturers' names.
  - 5. Description of product.
  - 6. Test procedures and results.
  - 7. Limitations of use.
- R. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."
- S. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

- T. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- U. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- V. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- W. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

## 2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - I. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally-signed PDF electronic file signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - I. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### 3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.



- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

**END OF SECTION 01 33 00**

SECTION 01 33 10 - SUBMITTAL TRANSMITTAL FORM

To: Meyer, Scherer & Rockcastle, Ltd.
Attn: Patrick Lynch
710 South 2nd Street, 8th Floor
Minneapolis, MN 55401-2282
Phone: (612) 375-0336
patrick@mrsrdesign.com

Project: Minnehaha Townhomes

Project No.: 2016015

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

Attached is the following submittal, made in conformance with the requirements of Section 01 33 00, for your review as required by the Contract Documents.

- 1. We understand a separate transmittal form is required for each Specification Section for which a submittal is required.
2. If a submittal contains material not applicable for review, all text that is not applicable shall be deleted prior to submission.
3. We further understand that submittals not dated and signed in compliance with the Contract Documents will be returned without a review and must be resubmitted.
4. We have clearly indicated any and all changes and/or deviations from the Contract Document requirements.

PRODUCT DATA, QUALITY CONTROL, CLOSEOUT SUBMITTALS (\_\_\_\_\_)

Section Number & Title: \_\_\_\_\_
Article & Paragraph: \_\_\_\_\_
Description of Item: \_\_\_\_\_
Manufacturer's Name: \_\_\_\_\_
Supplier's Name: \_\_\_\_\_ Date: \_\_\_\_\_

SHOP DRAWING SUBMITTAL (\_\_\_\_\_)

Section Number & Title: \_\_\_\_\_
Article & Paragraph: \_\_\_\_\_
Description of Item: \_\_\_\_\_
Manufacturer's Name: \_\_\_\_\_
Supplier's Name: \_\_\_\_\_ Date: \_\_\_\_\_

SAMPLES (\_\_\_\_\_)

Section Number & Title: \_\_\_\_\_
Article & Paragraph: \_\_\_\_\_
Description of Item: \_\_\_\_\_
Manufacturer's Name: \_\_\_\_\_
Supplier's Name: \_\_\_\_\_ Date: \_\_\_\_\_

Submitted by:

Subcontractor's signature and date: \_\_\_\_\_

Contractor signature and date: \_\_\_\_\_

**SECTION 01 40 00 - QUALITY REQUIREMENTS****PART I - GENERAL****I.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

**I.2 SUMMARY**

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner's Representative or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections:
  - 1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
  - 2. Divisions 02 through 49 Sections for specific test and inspection requirements.

**I.3 DEFINITIONS**

- A. **Quality-Assurance Services:** Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. **Quality-Control Services:** Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. **Mockups:** Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
  - 1. **Laboratory Mockups:** Full-size, physical assemblies constructed at testing facility to verify performance characteristics.
  - 2. **Integrated Exterior Mockups:** Mockups of the exterior envelope erected separately from the building but on the project site, consisting of multiple products, assemblies and subassemblies.
- D. **Preconstruction Testing:** Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
  - I. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

#### I.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

#### I.5 INFORMATIONAL SUBMITTALS

- A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Entity responsible for performing tests and inspections.
  - 3. Description of test and inspection.
  - 4. Identification of applicable standards.
  - 5. Identification of test and inspection methods.
  - 6. Number of tests and inspections required.
  - 7. Time schedule or time span for tests and inspections.
  - 8. Requirements for obtaining samples.
  - 9. Unique characteristics of each quality-control service.

## I.6 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections as the responsibility of the Contractor. Include the following
1. Date of issue.
  2. Project title and number.
  3. Name, address, and telephone number of testing agency.
  4. Dates and locations of samples and tests or inspections.
  5. Names of individuals making tests and inspections.
  6. Description of the Work and test and inspection method.
  7. Identification of product and Specification Section.
  8. Complete test or inspection data.
  9. Test and inspection results and an interpretation of test results.
  10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  12. Name and signature of laboratory inspector.
  13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
  2. Statement on condition of substrates and their acceptability for installation of product.
  3. Statement that products at Project site comply with requirements.
  4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
  2. Statement that equipment complies with requirements.
  3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  4. Statement whether conditions, products, and installation will affect warranty.
  5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

## I.7 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.



- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
  - I. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
  - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
  - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
  - 1. Contractor responsibilities include the following:
    - a. Provide test specimens representative of proposed products and construction.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    - d. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    - e. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
  - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Owner's Representative, and Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
  - I. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.

2. Notify Architect and Owner's representative seven days in advance of dates and times when mockups will be constructed.
  3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
  4. Demonstrate the proposed range of aesthetic effects and workmanship.
  5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
    - a. Allow seven days for initial review and each re-review of each mockup.
  6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  7. Demolish and remove mockups when directed, unless otherwise indicated.
- L. Integrated Exterior Mockups: Construct integrated exterior mockup in accordance with approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual specification sections, along with supporting materials.

#### 1.8 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
  2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
  4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

- F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  4. Facilities for storage and field curing of test samples.
  5. Delivery of samples to testing agencies.
  6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

#### I.9 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Conducted by a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
  2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
  4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
  5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
  6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
  - 1. Date test or inspection was conducted.
  - 2. Description of the Work tested or inspected.
  - 3. Date test or inspection results were transmitted to Architect.
  - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

## SECTION 01 41 00 - REGULATORY REQUIREMENTS

## PART I - GENERAL

## I.1 SUMMARY

- A. Section Includes:
  - 1. Applicable codes and regulations.
  - 2. Building element ratings/UL assemblies.

## I.2 APPLICABLE CODES AND REGULATIONS

- A. Contract Documents incorporate and Project is governed by requirements of the regulatory agencies summarized in this Section.
- B. Do not perform Work which is known to be, or which the Contractor or subcontractor is in a position to know, is contrary to applicable regulatory requirements which include, but may not be limited to the following:
  - 1. Building Code: Minnesota State Building Code
  - 2. Life Safety Code: Minnesota State Building Code
  - 3. Barrier Free Regulations: Minnesota State Building Code
  - 4. Mechanical Code: Minnesota Mechanical and Fuel Gas Code
  - 5. Energy Code: Minnesota Commercial Energy Code
  - 6. Plumbing Code: Minnesota Plumbing Code
  - 7. Electrical Code: Minnesota Electrical Code
  - 8. Fire Code: Minnesota State Fire Code
  - 9. Elevator Code: Minnesota State Building Code
- C. Applicable Governing Standards
  - 1. Building Code: Minnesota State Building Code
    - a. Adopts and amends the International Building Code.
  - 2. Fire Code: Minnesota State Fire Code
    - a. Adopts and amends the International Building Code.
  - 3. Mechanical Code: Minnesota Mechanical and Fuel Gas Code
  - 4. Energy Code: Minnesota Commercial Energy Code
  - 5. Plumbing Code: Minnesota Plumbing Code
  - 6. Electrical Code: Minnesota Electrical Code
  - 7. Elevator Code: Minnesota State Building Code
  - 8. Handicapped Code: Minnesota State Accessibility Code
  - 9. OSHA: Minnesota OSHA Statutes
  - 10. Life Safety Code: Minnesota State Building Code

## I.3 BUILDING ELEMENT FIRE RATINGS AND UL ASSEMBLY DESIGNATION

- A. Assembly/Product Qualification: Do not substitute for specified products of manufacturers which have been tested and listed in UL assemblies, unless otherwise approved by the code official having jurisdiction.
- B. Finish Material Ratings: Current Minnesota State Building Code for flame spread, fuel contribution, and smoke and gas generation, with Table 803.5 of the MSBC requires Class C minimum in exit enclosures, exit passageways, and corridors serving Group R-2 occupancies due to sprinkler protection, Table 803.5 of the MSBC requires Class C minimum in other spaces.
- C. Assembly/Product Qualification: Do not substitute for specified products of manufacturers which have been tested and listed in UL assemblies, unless otherwise approved by the code official having jurisdiction.



1.4 SPECIAL FEES, PERMITS, AND TAXES

- A. Arrange and pay for all required fees, permits, and taxes, unless noted otherwise.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

**SECTION 01 42 00 - REFERENCES**

## PART I - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## I.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

## I.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
  - I. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

## I.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

AA	Aluminum Association, Inc. (The) www.aluminum.org	(703) 358-2960
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists www.aatcc.org	(919) 549-8141
ABAA	Air Barrier Association of America www.airbarrier.org	(866) 956-5888
ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155
ACI	American Concrete Institute www.concrete.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AHA	American Hardboard Association (Now part of CPA)	
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955

AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Landcare Network)	
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts, Inc. www.aosaseed.com	(405) 780-7372
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA EWS	APA - The Engineered Wood Association; Engineered Wood Systems (See APA - The Engineered Wood Association)	
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)	
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning	(800) 527-4723

	Engineers www.ashrae.org	(404) 636-8400
ASME	ASME International (American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9500
AWCI	Association of the Wall and Ceiling Industry www.awci.org	(703) 534-8300
AWCMA	American Window Covering Manufacturers Association (Now WCMA)	
AWI	Architectural Woodwork Institute www.awinet.org	(571) 323-3636
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association) www.awpa.com	(205) 733-4077
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BICSI	BICSI, Inc. www.bicsi.org	(800) 242-7405 (813) 979-1991
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) www.bifma.com	(616) 285-3963
BISSC	Baking Industry Sanitation Standards Committee www.bissc.org	(866) 342-4772
BWF	Badminton World Federation (Formerly: IBF - International Badminton Federation) www.internationalbadminton.org	6-03-9283 7155
CCC	Carpet Cushion Council	(610) 527-3880



	<a href="http://www.carpetcushion.org">www.carpetcushion.org</a>	
CDA	Copper Development Association <a href="http://www.copper.org">www.copper.org</a>	(800) 232-3282 (212) 251-7200
CEA	Canadian Electricity Association <a href="http://www.canelect.ca">www.canelect.ca</a>	(613) 230-9263
CEA	Consumer Electronics Association <a href="http://www.ce.org">www.ce.org</a>	(866) 858-1555 (703) 907-7600
CFFA	Chemical Fabrics & Film Association, Inc. <a href="http://www.chemicalfabricsandfilm.com">www.chemicalfabricsandfilm.com</a>	(216) 241-7333
CGA	Compressed Gas Association <a href="http://www.cganet.com">www.cganet.com</a>	(703) 788-2700
CIMA	Cellulose Insulation Manufacturers Association <a href="http://www.cellulose.org">www.cellulose.org</a>	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association <a href="http://www.cisca.org">www.cisca.org</a>	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute <a href="http://www.cispi.org">www.cispi.org</a>	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute <a href="http://www.chainlinkinfo.org">www.chainlinkinfo.org</a>	(301) 596-2583
CRRC	Cool Roof Rating Council <a href="http://www.coolroofs.org">www.coolroofs.org</a>	(866) 465-2523 (510) 485-7175
CPA	Composite Panel Association <a href="http://www.pbmdf.com">www.pbmdf.com</a>	(301) 670-0604
CPPA	Corrugated Polyethylene Pipe Association <a href="http://www.cppa-info.org">www.cppa-info.org</a>	(800) 510-2772 (202) 462-9607
CRI	Carpet and Rug Institute (The) <a href="http://www.carpet-rug.com">www.carpet-rug.com</a>	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute <a href="http://www.crsi.org">www.crsi.org</a>	(847) 517-1200
CSA	Canadian Standards Association	(800) 463-6727 (416) 747-4000
CSA	CSA International (Formerly: IAS - International Approval Services) <a href="http://www.csa-international.org">www.csa-international.org</a>	(866) 797-4272 (416) 747-4000
CSI	Cast Stone Institute <a href="http://www.caststone.org">www.caststone.org</a>	(717) 272-3744
CSI	Construction Specifications Institute (The)	(800) 689-2900

	www.csinet.org	(703) 684-0300
CSSB	Cedar Shake & Shingle Bureau www.cedarbureau.org	(604) 820-7700
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945
EJCDC	Engineers Joint Contract Documents Committee www.ejdc.org	(703) 295-5000
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
ESD	ESD Association (Electrostatic Discharge Association) www.esda.org	(315) 339-6937
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA) www.intertek.com	(800) 967-5352
FIBA	Federation Internationale de Basketball (The International Basketball Federation) www.fiba.com	41 22 545 00 00
FIVB	Federation Internationale de Volleyball (The International Volleyball Federation) www.fivb.ch	41 21 345 35 35
FM Approvals	FM Approvals LLC www.fmglobal.com	(781) 762-4300
FM Global	FM Global (Formerly: FMG - FM Global) www.fmglobal.com	(401) 275-3000
FMRC	Factory Mutual Research (Now FM Global)	
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc. www.floridarroof.com	(407) 671-3772
FSA	Fluid Sealing Association	(610) 971-4850

	<a href="http://www.fluidsealing.com">www.fluidsealing.com</a>	
FSC	Forest Stewardship Council <a href="http://www.fsc.org">www.fsc.org</a>	49 228 367 66 0
GA	Gypsum Association <a href="http://www.gypsum.org">www.gypsum.org</a>	(202) 289-5440
GANA	Glass Association of North America <a href="http://www.glasswebsite.com">www.glasswebsite.com</a>	(785) 271-0208
GRI	(Part of GSI)	
GS	Green Seal <a href="http://www.greenseal.org">www.greenseal.org</a>	(202) 872-6400
GSI	Geosynthetic Institute <a href="http://www.geosynthetic-institute.org">www.geosynthetic-institute.org</a>	(610) 522-8440
HI	Hydraulic Institute <a href="http://www.pumps.org">www.pumps.org</a>	(973) 267-9700
HI	Hydronics Institute <a href="http://www.gamanet.org">www.gamanet.org</a>	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association <a href="http://www.hpva.org">www.hpva.org</a>	(703) 435-2900
HPW	H. P. White Laboratory, Inc. <a href="http://www.hpwhite.com">www.hpwhite.com</a>	(410) 838-6550
IAS	International Approval Services (Now CSA International)	
IBF	International Badminton Federation (Now BWF)	
ICEA	Insulated Cable Engineers Association, Inc. <a href="http://www.icea.net">www.icea.net</a>	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. <a href="http://www.icri.org">www.icri.org</a>	(847) 827-0830
IEC	International Electrotechnical Commission <a href="http://www.iec.ch">www.iec.ch</a>	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) <a href="http://www.ieee.org">www.ieee.org</a>	(212) 419-7900
IESNA	Illuminating Engineering Society of North America <a href="http://www.iesna.org">www.iesna.org</a>	(212) 248-5000

IEST	Institute of Environmental Sciences and Technology <a href="http://www.iest.org">www.iest.org</a>	(847) 255-1561
IGCC	Insulating Glass Certification Council <a href="http://www.igcc.org">www.igcc.org</a>	(315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance <a href="http://www.igmaonline.org">www.igmaonline.org</a>	(613) 233-1510
ILI	Indiana Limestone Institute of America, Inc. <a href="http://www.iliai.com">www.iliai.com</a>	(812) 275-4426
ISO	International Organization for Standardization <a href="http://www.iso.ch">www.iso.ch</a>	41 22 749 01 11
	Available from ANSI <a href="http://www.ansi.org">www.ansi.org</a>	(202) 293-8020
ISSFA	International Solid Surface Fabricators Association <a href="http://www.issfa.net">www.issfa.net</a>	(877) 464-7732 (702) 567-8150
ITS	Intertek Testing Service NA (Now ETL SEMCO)	
ITU	International Telecommunication Union <a href="http://www.itu.int/home">www.itu.int/home</a>	41 22 730 51 11
KCMA	Kitchen Cabinet Manufacturers Association <a href="http://www.kcma.org">www.kcma.org</a>	(703) 264-1690
LMA	Laminating Materials Association (Now part of CPA)	
LPI	Lightning Protection Institute <a href="http://www.lightning.org">www.lightning.org</a>	(800) 488-6864
MBMA	Metal Building Manufacturers Association <a href="http://www.mbma.com">www.mbma.com</a>	(216) 241-7333
MFMA	Maple Flooring Manufacturers Association, Inc. <a href="http://www.maplefloor.org">www.maplefloor.org</a>	(888) 480-9138
MFMA	Metal Framing Manufacturers Association, Inc. <a href="http://www.metalframingmfg.org">www.metalframingmfg.org</a>	(312) 644-6610
MH	Material Handling (Now MHIA)	
MHIA	Material Handling Industry of America <a href="http://www.mhia.org">www.mhia.org</a>	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America <a href="http://www.marble-institute.com">www.marble-institute.com</a>	(440) 250-9222
MPI	Master Painters Institute	(888) 674-8937

	www.paintinfo.com	(604) 298-7578
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(630) 942-6591
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(800) 797-6623 (281) 228-6200
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NAGWS	National Association for Girls and Women in Sport  www.aahperd.org/nagws/	(800) 213-7193, ext. 453
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCAA	National Collegiate Athletic Association (The) www.ncaa.org	(317) 917-6222
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 775-2300
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(888) 300-6382 (269) 488-6382
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900



NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association www.glass.org	(866) 342-5642 (703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association) www.nofma.com	(901) 526-5016
NOMMA	National Ornamental & Miscellaneous Metals Association www.nomma.org	(888) 516-8585
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. (The) www.ntma.com	(800) 323-9736 (540) 751-0930
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)	
NWWDA	National Wood Window and Door Association (Now WDMA)	
OPL	Omega Point Laboratories, Inc. (Now ITS)	
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting & Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322

PDI	Plumbing & Drainage Institute <a href="http://www.pdionline.org">www.pdionline.org</a>	(800) 589-8956 (978) 557-0720
PGI	PVC Geomembrane Institute <a href="http://pgi-tp.ce.uiuc.edu">http://pgi-tp.ce.uiuc.edu</a>	(217) 333-3929
PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America) <a href="http://www.landcarenetwork.org">www.landcarenetwork.org</a>	(800) 395-2522 (703) 736-9666
PTI	Post-Tensioning Institute <a href="http://www.post-tensioning.org">www.post-tensioning.org</a>	(602) 870-7540
RCSC	Research Council on Structural Connections <a href="http://www.boltcouncil.org">www.boltcouncil.org</a>	
RFCI	Resilient Floor Covering Institute <a href="http://www.rfci.com">www.rfci.com</a>	(301) 340-8580
RIS	Redwood Inspection Service <a href="http://www.redwoodinspection.com">www.redwoodinspection.com</a>	(888) 225-7339 (415) 382-0662
SAE	SAE International <a href="http://www.sae.org">www.sae.org</a>	(877) 606-7323 (724) 776-4841
SDI	Steel Deck Institute <a href="http://www.sdi.org">www.sdi.org</a>	(847) 458-4647
SDI	Steel Door Institute <a href="http://www.steeldoor.org">www.steeldoor.org</a>	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association <a href="http://www.sefalabs.com">www.sefalabs.com</a>	(877) 294-5424 (516) 294-5424
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)	
SGCC	Safety Glazing Certification Council <a href="http://www.sgcc.org">www.sgcc.org</a>	(315) 646-2234
SIA	Security Industry Association <a href="http://www.siaonline.org">www.siaonline.org</a>	(866) 817-8888 (703) 683-2075
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)	
SJI	Steel Joist Institute <a href="http://www.steeljoist.org">www.steeljoist.org</a>	(843) 626-1995
SMA	Screen Manufacturers Association <a href="http://www.smacentral.org">www.smacentral.org</a>	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association <a href="http://www.smacna.org">www.smacna.org</a>	(703) 803-2980

SMPTE	Society of Motion Picture and Television Engineers www.smpete.org	(914) 761-1100
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org	(800) 523-6154
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SPRI	Single Ply Roofing Industry www.spri.org	(781) 647-7026
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
STI	Steel Tank Institute www.steeltank.com	(847) 438-8265
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
SWRI	Sealant, Waterproofing & Restoration Institute www.swrionline.org	(816) 472-7974
TCA	Tile Council of America, Inc. (Now TCNA)	
TCNA	Tile Council of North America, Inc. www.tileusa.com	(864) 646-8453
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
TPI	Truss Plate Institute, Inc. www.tpinst.org	(703) 683-1010
TPI	Turfgrass Producers International www.turfgrassod.org	(800) 405-8873 (847) 649-5555
TRI	Tile Roofing Institute www.tilerroofing.org	(312) 670-4177
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association	(972) 243-3902

	<a href="http://www.uni-bell.org">www.uni-bell.org</a>	
USAV	USA Volleyball <a href="http://www.usavolleyball.org">www.usavolleyball.org</a>	(888) 786-5539 (719) 228-6800
USGBC	U.S. Green Building Council <a href="http://www.usgbc.org">www.usgbc.org</a>	(800) 795-1747
USITT	United States Institute for Theatre Technology, Inc. <a href="http://www.usitt.org">www.usitt.org</a>	(800) 938-7488 (315) 463-6463
WASTEC	Waste Equipment Technology Association <a href="http://www.wastec.org">www.wastec.org</a>	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau <a href="http://www.wclib.org">www.wclib.org</a>	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association <a href="http://www.wcmanet.org">www.wcmanet.org</a>	(212) 297-2122
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association) <a href="http://www.windowcoverings.org">www.windowcoverings.org</a>	(800) 506-4636 (212) 297-2109
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) <a href="http://www.wdma.com">www.wdma.com</a>	(800) 223-2301 (847) 299-5200
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California) <a href="http://www.wicnet.org">www.wicnet.org</a>	(916) 372-9943
WIC	Woodwork Institute of California (Now WI)	
WMMPA	Wood Moulding & Millwork Producers Association <a href="http://www.wmmpa.com">www.wmmpa.com</a>	(800) 550-7889 (530) 661-9591
WSRCA	Western States Roofing Contractors Association <a href="http://www.wsrca.com">www.wsrca.com</a>	(800) 725-0333 (650) 570-5441
WWPA	Western Wood Products Association <a href="http://www.wwpa.org">www.wwpa.org</a>	(503) 224-3930

- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

IAPMO	International Association of Plumbing and Mechanical Officials <a href="http://www.iapmo.org">www.iapmo.org</a>	(909) 472-4100
ICC	International Code Council <a href="http://www.iccsafe.org">www.iccsafe.org</a>	(888) 422-7233

ICC-ES	ICC Evaluation Service, Inc. <a href="http://www.icc-es.org">www.icc-es.org</a>	(800) 423-6587 (562) 699-0543
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UBC	Uniform Building Code (See ICC)	
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C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers <a href="http://www.usace.army.mil">www.usace.army.mil</a>	(202) 761-0011
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CPSC	Consumer Product Safety Commission <a href="http://www.cpsc.gov">www.cpsc.gov</a>	(800) 638-2772 (301) 504-7923
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DOC	Department of Commerce <a href="http://www.commerce.gov">www.commerce.gov</a>	(202) 482-2000
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DOD	Department of Defense <a href="http://dodssp.daps.dla.mil">http://dodssp.daps.dla.mil</a>	(215) 697-6257
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DOE	Department of Energy <a href="http://www.energy.gov">www.energy.gov</a>	(202) 586-9220
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EPA	Environmental Protection Agency <a href="http://www.epa.gov">www.epa.gov</a>	(202) 272-0167
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FAA	Federal Aviation Administration <a href="http://www.faa.gov">www.faa.gov</a>	(866) 835-5322
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FCC	Federal Communications Commission <a href="http://www.fcc.gov">www.fcc.gov</a>	(888) 225-5322
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FDA	Food and Drug Administration <a href="http://www.fda.gov">www.fda.gov</a>	(888) 463-6332
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GSA	General Services Administration <a href="http://www.gsa.gov">www.gsa.gov</a>	(800) 488-3111
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HUD	Department of Housing and Urban Development <a href="http://www.hud.gov">www.hud.gov</a>	(202) 708-1112
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LBL	Lawrence Berkeley National Laboratory <a href="http://www.lbl.gov">www.lbl.gov</a>	(510) 486-4000
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NCHRP	National Cooperative Highway Research Program (See TRB)	
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NIST	National Institute of Standards and Technology <a href="http://www.nist.gov">www.nist.gov</a>	(301) 975-6478
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OSHA	Occupational Safety & Health Administration <a href="http://www.osha.gov">www.osha.gov</a>	(800) 321-6742 (202) 693-1999
PBS	Public Buildings Service (See GSA)	
PHS	Office of Public Health and Science <a href="http://www.osophs.dhhs.gov/ophs">www.osophs.dhhs.gov/ophs</a>	(202) 690-7694
RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department <a href="http://www.state.gov">www.state.gov</a>	(202) 647-4000
TRB	Transportation Research Board <a href="http://gulliver.trb.org">http://gulliver.trb.org</a>	(202) 334-2934
USDA	Department of Agriculture <a href="http://www.usda.gov">www.usda.gov</a>	(202) 720-2791
USPS	Postal Service <a href="http://www.usps.com">www.usps.com</a>	(202) 268-2000

- D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board <a href="http://www.access-board.gov">www.access-board.gov</a>	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office <a href="http://www.gpoaccess.gov/cfr/index.html">www.gpoaccess.gov/cfr/index.html</a>	(866) 512-1800 (202) 512-1800
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point <a href="http://dodssp.daps.dla.mil">http://dodssp.daps.dla.mil</a>	(215) 697-2664
DSCC	Defense Supply Center Columbus (See FS)	
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point <a href="http://dodssp.daps.dla.mil">http://dodssp.daps.dla.mil</a>  Available from Defense Standardization Program	(215) 697-2664

	<a href="http://www.dps.dla.mil">www.dps.dla.mil</a>	
	Available from General Services Administration <a href="http://www.gsa.gov">www.gsa.gov</a>	(202) 619-8925
	Available from National Institute of Building Sciences <a href="http://www.wbdg.org/cdb">www.wbdg.org/cdb</a>	(202) 289-7800
FTMS	Federal Test Method Standard (See FS)	
MIL	(See MILSPEC)	
MIL-STD	(See MILSPEC)	
MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point <a href="http://dodssp.daps.dla.mil">http://dodssp.daps.dla.mil</a>	(215) 697-2664
UFAS	Uniform Federal Accessibility Standards Available from Access Board <a href="http://www.access-board.gov">www.access-board.gov</a>	(800) 872-2253 (202) 272-0080

- E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CBHF	State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation <a href="http://www.dca.ca.gov/bhfti">www.dca.ca.gov/bhfti</a>	(800) 952-5210 (916) 574-2041
CCR	California Code of Regulations <a href="http://www.calregs.com">www.calregs.com</a>	(916) 323-6815
CPUC	California Public Utilities Commission <a href="http://www.cpuc.ca.gov">www.cpuc.ca.gov</a>	(415) 703-2782
TFS	Texas Forest Service Forest Resource Development <a href="http://txforestservation.tamu.edu">http://txforestservation.tamu.edu</a>	(979) 458-6650

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

**SECTION 01 45 33 STRUCTURAL TESTS AND SPECIAL INSPECTIONS****PART I - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 INTENT AND CONDITIONS**

- A. Intent:
1. For compliance with the Minnesota State Building Code, the Owner shall employ and pay for a special inspector (or inspectors) as required by Chapter 17 of the International Building Code.
  2. Duties and responsibilities of the special inspector(s) shall be as outlined in Chapter 17 of the International Building Code and as herein specified.
  3. Define and coordinate structural tests and special inspection services.
  4. Define and coordinate conventional testing and inspection services.
  5. Testing and Inspection services are intended to assist in determining probable compliance of the work with requirements specified. These services do not relieve the Contractor of responsibility for compliance with the requirements of the Contract Documents.
- B. Conditions:
1. If inspection of fabricator's work is required, the Owner's representative may require testing and inspection of the work at the plant, before shipment. Owner, Architect and Structural Engineer of Record (SER) reserve the right to reject material not complying with Contract Documents.
  2. Perform testing and inspection in accordance with industry standard used as reference for specific material or procedure unless other criteria are specified. In the absence of a referenced standard, accomplish tests in accordance with generally accepted industry standards.
  3. Failure to detect defective work or materials shall in no way prevent later rejection if defective work or materials are discovered.

**1.3 RELATED REQUIREMENTS**

- A. Refer to individual technical specification sections for additional qualifications, inspections, tests, frequency and standards required.

**1.4 DEFINITIONS**

- A. Testing: Evaluation of systems, primarily requiring physical manipulation and analysis of materials, in accordance with approved standards.
- B. Inspection: Evaluation of systems, primarily requiring observation and judgment.
- C. Structural Tests and Special Inspections: Structural Tests and Special Inspection Services herein include items required by Chapter 17 of the International Building Code as adopted by the Minnesota State Building Code, and other items which in the professional judgement of the Structural Engineer of Record, are critical to the integrity of the building structure.
- D. Conventional Testing and Inspections: Conventional Testing and Inspection Services herein describe those items not specially required by Code but may be considered essential to the proper performance of the building systems.
- E. Architect of Record: The prime consultant in charge of overall design and coordination of the Project.

- F. Structural Engineer of Record (SER): The Licensed Engineer in responsible charge of the structural design for the Project.
- G. Licensed Structural Engineer: A professional engineer with education and experience in the design of structures similar to this Project and licensed in Minnesota.
- H. Testing Agency (TA):
- a. Testing Agency: Approved independent testing agency acceptable to the Owner, Architect, SER and as noted below:
  - b. Authorized to operate in Minnesota and experienced with the requirements and testing methods specified in the Contract Documents.
  - c. Meeting applicable requirements of references stated in paragraph I.4.
  - d. Calibrate testing equipment at reasonable intervals by devices of accuracy traceable to either the National Bureau of Standards, or to accepted values of natural physical constants.
- I. Special Inspector (SI): A properly qualified individual or firm performing special inspections.
- J. The categories of special inspector are:
- I. Special Inspector - Technical I, II and III: Usually an employee of a testing agency:
    - a. Technical I (Sections 31 20 00) - Technician shall be under the direct supervision of a licensed civil/geotechnical engineer regularly engaged in this type of work. Work shall be performed in a qualified geotechnical/testing laboratory.
    - b. Technical I (Sections 03 10 00, 03 20 00, 03 30 00)
      - 1) ACI Certified Concrete Field Testing Technician – Grade I.
      - 2) ACI Certified Concrete Strength Testing Technician.
      - 3) ACI Certified Concrete Laboratory Testing Technician – Grade I.
      - 4) ACI Certified Concrete Construction Inspector-In-Training.
      - 5) Inspector shall be employed by a testing laboratory, experienced in the type of work being performed, and under the direct supervision of a licensed civil/structural engineer.
    - c. Technical I (Section 04 20 00) - Technician shall be under the direct supervision of a licensed civil/structural engineer regularly engaged in testing and inspection of this type of work. The licensed engineer shall review and approve all inspection reports.
    - d. Technical I (Section 05 12 00) - Non-destructive Testing Technician SNT-TC-IA Level I, and/or AWS Certified Associate Weld Inspector (CAWI).
    - e. Technical II (Sections 31 20 00) - Technician with a minimum of 2 years' experience, or a graduate engineer, and is an employee of a qualified and approved geotechnical/technical laboratory, under the direct supervision of a licensed civil/geotechnical engineer regularly engaged in this type of work.
    - f. Technical II (Sections 03 10 00, 03 20 00, 03 30 00)
      - 1) ACI Certified Concrete Laboratory Testing Technician - Grade II.
      - 2) ACI Certified Laboratory Aggregate Testing Technician.
      - 3) ACI Certified Concrete Construction Inspector.
      - 4) Inspector shall be employed by a testing laboratory, experienced in the type of work being performed, and under the direct supervision of a licensed civil/structural engineer.
    - g. Technical II (Section 04 20 00) - Graduate civil/structural engineer, with experience in this type of work. Supervised by a licensed civil/structural engineer. The licensed engineer shall review and approve all inspection reports.
    - h. Technical II (Section 05 12 00) - Non-destructive Testing Technician ASNT TC-IA Level II, (NDE Technician II), AWS/CAWI, with minimum 3 years' experience, or an AWS/CWI.
    - i. Technical III (Sections 31 20 00) - A civil/geotechnical engineer regularly engaged in this type of work with a minimum of 4 years' experience, licensed in Minnesota, and is an employee of a qualified and approved geotechnical/testing laboratory. This licensed engineer shall review and approve all final field reports.

- j. Technical III (Section 03 30 00) - A civil/structural engineer regularly engaged in this type of work, with a minimum of 4 years' experience and licensed in Minnesota and is an employee of a qualified and approved testing laboratory. The licensed engineer shall review and approve all reports.
- k. Technical III (Section 05 12 00) - ASNT Level III with a minimum of 10 years' experience or an AWS/CWI with a minimum of 10 years' experience.
- 2. Special Inspector - Structural I and II: Usually an employee of the Structural Engineer of Record.
  - a. Structural I (Sections 03 10 00, 03 20 00, 03 30 00, 04 20 00, 05 12 00) - Graduate civil/structural engineer, or other personnel acceptable to the SER, with experience in the design of structural systems of this type. Inspections shall be performed under the direct supervision of a licensed civil/structural engineer.
  - b. Structural II (Sections 03 10 00, 03 20 00, 03 30 00, 04 20 00, 05 12 00) - Civil/structural engineer regularly engaged in the design of structural systems of this type, licensed in Minnesota. The licensed engineer shall review and approve all inspection reports.
- K. Building Official: The Officer or duly authorized representative charged with the administration and enforcement of the State Building Code.

## 1.5 REFERENCES

- A. See technical specification sections for specific references.
  - 1. ANSI/ASTM E329 – Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
  - 2. ASTM E543 – Standard Practice for Agencies Performing Non-destructive Testing.
  - 3. ASTM E548 – Standard Guide for General Criteria Used for Evaluating Laboratory Competence.
  - 4. ASTM C1077 – Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
  - 5. ASTM C1093 – Standard Practice for the Accreditation of Testing Agencies for Unit Masonry.
  - 6. ANSI/ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- B. Minnesota State Building Code.
- C. International Building Code.

## 1.6 RESPONSIBILITIES/AUTHORITY

- A. Structural Tests and Special Inspections:
  - 1. Special Inspector:
    - a. Attend all pre-installation meetings to review scope of structural tests and special inspections.
    - b. Test and/or inspect the work assigned for conformance with the building department approved plans, specifications, and applicable material and workmanship provisions of the code. Perform testing and inspection in a timely manner to avoid delay of work.
    - c. Bring nonconforming items to the immediate attention of the Contractor for correction, then, if uncorrected after a reasonable period of time, to the attention of the Structural Engineer of Record, the Building Official, and to the Architect.
    - d. Submit test and/or inspection reports to the Building Official, Contractor, the Structural Engineer of Record, and other designated persons in accordance with the Structural Testing and Special Inspection Schedule.
    - e. Submit a final signed report stating whether the work requiring special inspection was, to the best of the inspector's knowledge, in conformance with the approved plans, specifications and the applicable workmanship provisions of the code.
    - f. Sign the Structural Testing and Special Inspection Schedule in conjunction with other responsible parties prior to commencing construction.
  - 2. Architect:



- a. Coordinate the flow of reports and related information to expedite resolution of construction issues.
  - b. Attend pertinent pre-installation meetings to review scope of structural testing and special inspection.
  - c. Complete and sign the Structural Testing and Special Inspection Schedule in conjunction with other responsible parties prior to commencing construction. Provide a completed copy of the schedule to all signed parties including Building Official.
3. Structural Engineer of Record:
- a. Identify items requiring structural testing and special inspection including special cases.
  - b. Define "type" of special inspector required for "description" of work indicated on the Structural Testing and Special Inspection Schedule.
  - c. Attend pertinent pre-installation meetings to review scope of structural testing and special inspection.
  - d. Complete and sign the Structural Testing and Special Inspection Schedule in conjunction with other responsible parties prior to commencing construction.
  - e. Review reports issued by all special inspectors.
  - f. If engaged as a special inspector, provide structural testing and special inspection services as noted in Article 1.6.A.1.
4. Testing Agency:
- a. When engaged as a special inspector, provide structural testing and special inspection services as noted in Item 1.6.A.1.
  - b. Sign the Structural Testing and Special Inspection Schedule in conjunction with other responsible parties prior to commencing construction.
  - c. Attend pertinent pre-installation meetings to review scope of structural testing and special inspection.
5. Contractor:
- a. Arrange and attend all pre-installation meetings to review scope of structural testing and special inspection. Include the Building Official, Owner, Architect, SER, Testing Agency and other parties concerned.
  - b. Post or make available the Structural Testing and Special Inspection Schedule within project site office. Provide timely notification to those parties designated on the schedule so they may properly prepare for and schedule their work.
  - c. Provide special inspector access to the approved plans and specifications at the project site.
  - d. Review all reports issued by special inspectors.
  - e. Retain at the project site all reports submitted by the special inspectors for review by the building official upon request.
  - f. Correct in a timely manner, deficiencies identified in inspection and/or testing reports.
  - g. Provide safe access to the work requiring inspection and/or testing.
  - h. Provide labor and facilities to provide access to the work and to obtain, handle and deliver samples, to facilitate testing and inspection and for storage and curing of test samples.
  - i. Sign the Structural Testing and Special Inspection Schedule in conjunction with other responsible parties prior to commencing construction.
  - j. Verification of conformance of work within specified tolerances is solely the responsibility of the Contractor.
6. Fabricator:
- a. Submit a Certificate of Compliance to the Building Official, Special Inspector, and Structural Engineer of Record stating the work was performed in accordance with the Contract Documents.
  - b. Sign the Structural Testing and Special Inspection Schedule in conjunction with other responsible parties prior to commencing construction.
7. Building Official:
- a. Review all special inspector qualifications.
  - b. Review all fabricators who perform work in their shop, which requires special inspection.
  - c. Accept and sign completed Structural Testing and Special Inspection Schedule.
  - d. Review reports and recommendations submitted by special inspector.

- e. Review the "final signed reports" submitted by special inspector. These documents must be accepted and approved by the building department prior to issuance of a Certificate of Occupancy.
  - f. Determine work, which, in the Building Officials opinion, involves unusual hazards or conditions.
8. Owner:
- a. Provide and pay cost of structural testing and special inspection services.
  - b. Provide special inspector with Contract Documents and accepted shop drawings.
  - c. Provide special inspectors and testing agencies with full access to the site at all times.
  - d. Sign the Structural Testing and Special Inspection Schedule in conjunction with other responsible parties prior to commencing construction.
- B. Inspections by Building Official: provide timely notice for inspections performed by the building official, as required by IBC Chapter 17, the State Building Code, and local ordinance.

## 1.7 INSPECTION NOTICES

- A. Contractor: Provide minimum of 24 hours notice for all items requiring testing or inspection. Do not place items requiring testing and inspection services prior to or during placement until testing and inspection services are available. Do not enclose or obscure items requiring testing and inspection services after placement until testing and inspection services are performed.

## 1.8 REPORTS

- A. Testing agency and/or special inspectors shall submit a report in accordance with the Structural Testing and Special Inspection Schedule and shall conduct and interpret tests and inspections and state in each report whether; (1) test specimens and observations comply with Contract Documents, and specifically state any deviations, (2) record types and locations of defects found in work, (3) record work required and performed, to correct deficiencies.
- B. Submit reports for structural testing and special inspection, in timely manner to the Contractor, Building Official, SER, and Architect.
- 1. Submit reports for ongoing work, to provide the information noted below:
    - a. Date issued.
    - b. Project title and number.
    - c. Firm name and address.
    - d. Name and signature of tester or inspector.
    - e. Date and time of sampling.
    - f. Date of test or inspection.
    - g. Identification of product and specification section.
    - h. Location in project, including elevations, grid location and detail.
    - i. Type of test or inspections.
    - j. Results of tests or inspections and interpretation of same.
    - k. Observations regarding compliance with Contract Documents or deviations there from.
  - 2. Submit final signed report stating that, to the best of the special inspector's knowledge, the work requiring testing and/or inspection conformed to the Contract Documents.

## 1.9 FREQUENCY OF TESTING AND INSPECTION

- A. For detailed requirements see individual technical specification sections, attached schedule, and Part 3 of this section.

## 1.10 PROTECTION AND REPAIR

- A. Upon completion of testing sample-taking or inspection, repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed surfaces, as judged solely by the Architect/Engineer of Record. Protect work exposed by or for testing and/or inspection and protect repaired work. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for testing and/or inspection.

#### 1.11 TESTS TO DEMONSTRATE QUALIFICATION

- A. If the Contractor proposes a product material, method, or other system that has not been pre-qualified, the Architect or SER may require applicable tests, to establish a basis for acceptance or rejection. These tests will be paid for by the Contractor.
- B. The Architect or SER reserves the right to require certification or other proof that the system proposed, is in compliance with any tests, criteria or standards called for. The certificate shall be signed by a representative of an independent testing agency.

### PART 2 - PRODUCTS (NOT USED)

### PART 3 - EXECUTION

#### 3.1 SCOPE OF STRUCTURAL TESTS AND SPECIAL INSPECTIONS

- A. Refer to individual specification section articles for Quality Control testing and inspection items.
- B. Refer to attached Structural Testing and Special Inspection Program Summary Schedule, attached to this Section.

#### 3.2 STRUCTURAL TESTS AND SPECIAL INSPECTIONS PROGRAM SUMMARY

- A. The parties involved shall complete and sign the Structural Testing and Special Inspection Schedule. The completed schedule is an element of the Contract Documents and after permit issuance, becomes part of the building department approved plans and specifications. The completed schedule shall include the following:
  - 1. Specific listing of items requiring inspection and testing
  - 2. Associated specification section which defines applicable standards by which to judge conformance with approved plans and specifications in accordance with IBC Chapter 17 as adopted by the State Building Code. The specification section should also include the degree or basis of inspection and testing; i.e., intermittent/will-call or full-time/continuous.
  - 3. Frequency of reporting, i.e., intermittent, weekly, monthly, per floor, etc.
  - 4. Parties responsible for performing inspection and testing work.
  - 5. Required acknowledgments by each designated party.
- B. See attached "Structural Testing and Special Inspection Schedule".

END OF SECTION 01 45 33

**Structural Testing and Special Inspection  
Program Summary Schedule**

Project Name Minnehaha Townhomes Project No. 17060 (MMY)

2016015 (MSR)

Location 5364 Riverview Road and 5368 Riverview Road

and 5118 54th Street East, Minneapolis, Minnesota Permit No. \_\_\_\_\_ (1)

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the 2012 International Building Code as adopted by the current Minnesota State Building Code. It includes a schedule of Special Inspection services applicable to this project and the identity of agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompasses the following disciplines:

Structural       Architectural       Other: \_\_\_\_\_

The Special Inspector shall keep records of all inspections and shall furnish inspection reports to the Building Official, the Architect and Structural Engineer of Record. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official, the Architect and SER. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official, the Architect and SER.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

**ACKNOWLEDGEMENTS**

Each appropriate representative shall sign below:

Owner: _____	Firm: Minnesota Public Housing Authority	Date: _____
Contractor: _____	Firm: TBD	Date: _____
Architect: _____	Firm: Meyer, Scherer, Rockcastle, Ltd.	Date: _____
SER: _____	Firm: Mattson Macdonald Young, Inc	Date: _____
SI-S: _____	Firm: _____	Date: _____
SI-T: _____	Firm: _____	Date: _____
TA: _____	Firm: _____	Date: _____
F: _____	Firm: _____	Date: _____

If requested by engineer/architect of record or building official, the individual names of all prospective special inspectors and the work they intend to observe shall be identified.

Legend:      SER = Structural Engineer of Record      SI-T = Special Inspector - Technical      TA = Testing Agency  
                 SI-S = Special Inspector - Structural      F = Fabricator

Accepted for the Building Department By: \_\_\_\_\_ Date \_\_\_\_\_

Project Name Minnehaha Townhomes Project No. 17060 (MMY)

2016015 (MSR)

Location 5364 Riverview Road and 5368 Riverview Road  
and 5118 54th Street East, Minneapolis, Minnesota

Permit No. \_\_\_\_\_ (1)

Technical (2)		Description (3)	Type of Inspector (4)	Report Frequency (5)	Assigned Firm (6)
Section	Item No.				
1704.4	4a	Concrete Mix Designs	NA	Prior to Work	Contractor
1704.4	4b, 4c	Concrete Testing	SI-T	Per Visit	TA
1704.4	4d	Reinforcing Inspection	SI-S	Per Visit	SI-S
1705.4	5a, 5c	Masonry	SI-T	Per Visit	TA
1705.4	5b	Masonry	NA	Prior to work	Contractor
1704.7	7a, 7b, 7c	Soil Testing	SI-T	Per Visit	TA
1704.6	6a	Wood Assemblies	NA	Prior to work	Contractor
1704.6	6b	Wood Assemblies	SI-T	Per Visit	TA
1704.13	13a	Post-installed Anchors	SI-T	Per Visit	TA

Notes: This schedule shall be filled out and included in the Structural Testing and Special Inspection Program.

- (1) Permit No. to be provided by the Building Official.
- (2) Referenced to the specific technical scope section in the program and the Special Inspections Schedule on the drawings (see sheet **S001**).
- (3) Use descriptions per IBC Section 1704, as adopted by Minnesota State Building Code.
- (4) Special Inspector - Technical, Special Inspector – Structural, Testing Agency.
- (5) Weekly, monthly, per test/inspection, per floor, etc.
- (6) Firm contracted to perform services.



**SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS****PART I - GENERAL****I.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

**I.2 SUMMARY**

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections:
  - 1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.

**I.3 USE CHARGES**

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Water Service: Pay water service use charges for water used by all entities for construction operations.
- C. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.

**I.4 INFORMATIONAL SUBMITTALS**

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit and authorities having jurisdiction, whichever is more stringent. Comply with requirements of Green Communities standards.
- C. Dust-Control and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust-control and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
  - 1. Locations of dust-control partitions at each phase of the work.
  - 2. HVAC system isolation schematic drawing.
  - 3. Location of proposed air filtration system discharge.
  - 4. Other dust-control measures.
  - 5. Waste management plan.
- D. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage, including delivery, handling, and storage provisions for materials subject to water absorption or water damage, discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged Work.
  - 1. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, gypsum wallboard mudding, tiling, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

## 1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

## 1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts.

### 2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading. Space within existing facility that complies with this section's requirements is also acceptable.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
  - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
  - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and tack and marker boards.
  - 3. Drinking water and private toilet.
  - 4. Coffee machine and supplies.
  - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
  - 6. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations. Space within existing facility that complies with this section's requirements is also acceptable.
  - 1. Store combustible materials apart from building

### 2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
  - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section "Closeout Procedures".
- C. Air Filtration Units: HEPA primary and secondary filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
  - 1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

#### 3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
  - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction..
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
  - 1. Toilets: Use of Owner's existing toilet facilities will not be permitted.
- E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas of the site and adjacent buildings.
  - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed in accordance with approved coordination drawings.
    - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
    - b. Maintain negative air pressure within work area using HEPA-equipped air filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust containment devices.
  3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- H. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
1. Install electric power service overhead, unless otherwise indicated.
  2. Connect temporary service to Owner's existing power source, as directed by Owner.
- I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
  2. Install lighting for Project identification sign.
- J. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
1. At each telephone, post a list of important telephone numbers.
    - a. Police and fire departments.
    - b. Ambulance service.
    - c. Contractor's home office.
    - d. Architect's office.
    - e. Engineers' offices.
    - f. Owners Representative's office.
    - g. Principal subcontractors' field and home offices.
  2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

### 3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
  2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas

adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
  2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."
  3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting and testing.
  4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving"
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
  2. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Parking: Provide temporary parking areas for construction personnel. Coordinate with authorities having jurisdiction for any on-street parking required.
- F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
  2. Remove snow and ice as required to minimize accumulations.
- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Permanent Construction Identification Signs: Provide one 4 foot x 8 foot project identification sign to comply with MN Housing and Finance Agency regulations. Owner to approve final sign prior to installation.
    - a. Locate sign at intersection of Riverview Road and 54th Street.
    - b. Sign to be illuminated from 6:00am through 10:00pm.
    - c. Information to be included:
      - 1) Development name: Minnehaha Townhomes
      - 2) List names of major project funders - include logos. Owner to confirm list.
      - 3) List Equal Housing Opportunity logo.
      - 4) List firm names of all Owners - include logos. Owner to confirm list and provide logos.
      - 5) List firm name of Architect, MEP Engineer, Civil Engineer, and Structural Engineer - include logos. Architect to provide logos.
      - 6) Include leasing agent contact name and phone number.
  2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
    - a. Provide temporary, directional signs for construction personnel and visitors.
  3. Maintain and touchup signs so they are legible at all times.
- H. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."
- I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- J. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- K. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.



### 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
  - 1. Comply with work restrictions specified in Division 01 Section "Summary."
- B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings, requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
  - 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
  - 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
  - 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from the project site during the course of the project.
  - 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.
- E. Site Enclosure Fence: Prior to commencing earthwork, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
  - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
  - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner and one set of keys to Architect.
- F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- G. Temporary Egress: Maintain egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- H. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
  - 1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
- I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
  - 1. Prohibit smoking in construction areas.
  - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
  - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

### 3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
  1. Protect porous materials from water damage.
  2. Protect stored and installed material from flowing or standing water.
  3. Keep porous and organic materials from coming into prolonged contact with concrete.
  4. Remove standing water from decks.
  5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
  1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
  2. Keep interior spaces reasonably clean and protected from water damage.
  3. Periodically collect and remove waste containing cellulose or other organic matter.
  4. Discard or replace water-damaged material.
  5. Do not install material that is wet.
  6. Discard, replace or clean stored or installed material that begins to grow mold.
  7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
  1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
  2. Use permanent HVAC system to control humidity.
  3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
    - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
    - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record daily readings over a forty-eight hour period. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
    - c. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

### 3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
  1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

- C. Operate Project-identification-sign lighting daily from dusk until 10:00PM.
- D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
  - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
  - 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
  - 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

**END OF SECTION 01 50 00**

**SECTION 01 60 00 - PRODUCT REQUIREMENTS****PART I - GENERAL****I.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

**I.2 SUMMARY**

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. There are special product requirements for materials complying with Living Building Challenge requirements. These are noted in the specification sections for these materials. These must be strictly adhered to: no deviations permitted.
- C. Related Sections:
  - 1. Division 01 Section "Substitution Procedures" for requests for substitutions.
  - 2. Division 01 Section "References" for applicable industry standards for products specified.

**I.3 DEFINITIONS**

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
  - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

**I.4 ACTION SUBMITTALS**

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
  - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 14 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
    - a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."

- b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

#### I.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

#### I.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

- B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

- C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

#### I.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.



3. Refer to Divisions 02 through 49. Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
  4. Where products are accompanied by the term "as selected," Architect will make selection.
  5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
  6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," "as approved by Architect...", or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  3. Products:
    - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered, unless otherwise indicated.
  4. Manufacturers:
    - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered, unless otherwise indicated.
  5. Basis-of-Design Product: Where Specifications name a product as the Basis of Design, or refer to a product indicated on Drawings as the Basis of Design, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.

- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
  - 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
  - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
  - 3. Evidence that proposed product provides specified warranty.
  - 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
  - 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

**END OF SECTION 01 60 00**

**SECTION 01 73 00 - EXECUTION****PART I - GENERAL****I.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

**I.2 SUMMARY**

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Progress cleaning.
  - 5. Starting and adjusting.
  - 6. Protection of installed construction.
  - 7. Correction of the Work.
- B. There are special process and project execution requirements related to materials complying with the Living Building Challenge. These are noted in the specification sections for these materials. These must be strictly adhered to without deviation.
- C. Related Sections:
  - 1. Division 01 Section "Submittal Procedures" for submitting surveys.
  - 2. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

**I.3 INFORMATIONAL SUBMITTALS**

- A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- B. Certified Surveys: Submit two copies signed by land surveyor.

**I.4 QUALITY ASSURANCE**

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

**I.5 WARRANTY**

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
  - 1. For projects requiring compliance with sustainable design and construction practices and procedures, utilize products for patching that comply with requirements of Division 01 Section "Sustainable Design Requirements."
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
  - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
  - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  - 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor,

submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 3. Inform installers of lines and levels to which they must comply.
  - 4. Check the location, level and plumb, of every major element as the Work progresses.
  - 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
  - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

### 3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
  - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
  - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.



### 3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
  - 4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Comply with requirements for the disposal of materials.
  - 3. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
  - 4. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
    - a. Utilize containers intended for holding waste materials of type to be stored.
- B. Site: Maintain Project site free of waste materials and debris.

- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging or otherwise deleterious exposure during the construction period.

### 3.7 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

### 3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
  - I. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

**END OF SECTION 01 73 00**

**SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

## PART I - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## I.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
1. Salvaging nonhazardous demolition and construction waste.
  2. Recycling nonhazardous demolition and construction waste.
  3. Disposing of nonhazardous demolition and construction waste.
- B. Objectives:
1. The Owner has established that this project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, inaccurate planning, breakage, mishandling, contamination, or other factors shall be employed.
    - a. Of the inevitable waste that is generated, as many of the waste materials as economically feasible, and as stated here, shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized.
  2. The Owner encourages Contractor to seek information from experts in salvage or recycling in order to minimize disposal costs. There are numerous opportunities to sell salvage, or to donate salvage and accrue tax benefits; also there are outlets that will pick up, and in some cases buy recyclable materials
- C. Related Sections include the following:
1. Division 01 Section "Temporary Facilities and Controls" for environmental-protection measures during construction, and location of waste containers at Project site.
  2. Division 02 Section "Selective Structure Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements, and for disposition of hazardous waste.
  3. Division 04 Section "Unit Masonry" for disposal requirements for masonry waste.
  4. Division 31 Section "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

## I.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

#### I.4 PERFORMANCE REQUIREMENTS

- A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 55 percent minimum by weight of total waste generated by the Work.

#### I.5 SUBMITTALS

- A. Waste Management Plan: Submit 3 copies of plan within 30 days of date established for commencement of the Work.
- B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three copies of report. Include separate reports for demolition and construction waste, Include the following information:
  - 1. Material category.
  - 2. Generation point of waste.
  - 3. Total quantity of waste in tons.
  - 4. Quantity of waste salvaged, both estimated and actual in tons.
  - 5. Quantity of waste recycled, both estimated and actual in tons.
  - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
  - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- C. Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- H. Qualification Data: For Waste Management Coordinator and refrigerant recovery technician.
- I. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

#### I.6 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." 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 Coordinator.
  - 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.

#### 1.7 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
  1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
  2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
  3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
  4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
  5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
  6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
  1. Total quantity of waste.
  2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
  3. Total cost of disposal (with no waste management).
  4. Revenue from salvaged materials.
  5. Revenue from recycled materials.
  6. Savings in hauling and tipping fees by donating materials.
  7. Savings in hauling and tipping fees that are avoided.
  8. Handling and transportation costs. Include cost of collection containers for each type of waste.
  9. Net additional cost or net savings from waste management plan.

#### PART 2 - PRODUCTS (Not Used)

#### PART 3 - EXECUTION

##### 3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by Architect and Owner. Provide handling containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
  1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.

- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site for duration of Project.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
  - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
  - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
  - 2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

### 3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers.
  - 3. Store items in a secure area until installation.
  - 4. Protect items from damage during transport and storage.
  - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not permitted on Project site.
- C. Salvaged Items for Owner's Use:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers.
  - 3. Store items in a secure area until delivery to Owner.
  - 4. Transport items to Owner's storage area designated by Owner.
  - 5. Protect items from damage during transport and storage.

### 3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
  - 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.
  - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
  - 4. Store components off the ground and protect from the weather.
  - 5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

## 3.4 RECYCLING DEMOLITION WASTE

- A. Asphaltic Concrete Paving: Crush asphaltic concrete paving and screen to comply with requirements in Division 31 and Division 32 for use as general fill.
- B. Asphaltic Concrete Paving: Break up and transport paving that is non-recyclable or exceeds quantity required for reuse per Divisions 31 and 32 to asphalt-recycling facility.
- C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
  - 1. Pulverize concrete to maximum size to permit reuse as needed and directed by Work in Division 31 and Division 32.
  - 2. Crush concrete and screen to comply with requirements in Division 31 and Division 32 for use as satisfactory soil for fill or subbase or for general fill.
- D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
  - 1. Pulverize masonry to maximum 4-inch size.
    - a. Crush masonry and screen to comply with requirements in Division 31 for use as general fill.
  - 2. Clean and stack undamaged, whole masonry units on wood pallets that are not necessary to be recycled as general fill.
- E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- F. Metals: Separate metals by type.
  - 1. Structural Steel: Stack members according to size, type of member, and length.
  - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- H. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
  - 1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.
- J. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
  - 1. Store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- K. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- L. Plumbing Fixtures: Separate by type and size.
- M. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- N. Lighting Fixtures: Separate lamps by type and protect from breakage.
- O. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.
- P. Conduit: Reduce conduit to straight lengths and store by type and size.

### 3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
  - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
  - 2. Polystyrene Packaging: Separate and bag materials.
  - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
  - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
  
- B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.
  - 1. Comply with requirements in Division 32 Section "Plants" for use of chipped organic waste as organic mulch.
  
- C. Wood Materials:
  - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
  - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
  
- D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.
  - 1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

### 3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
  - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  
- B. Burning: Do not burn waste materials.
  
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

**END OF SECTION 01 74 19**

**SECTION 01 77 00 - CLOSEOUT PROCEDURES****PART I - GENERAL****I.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

**I.2 SUMMARY**

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final completion procedures.
  - 3. Warranties.
  - 4. Final cleaning.
- B. Related Sections:
  - 1. Division 01 Section "Execution" for progress cleaning of Project site.
  - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 4. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
  - 5. Divisions 02 through 34 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

**I.3 SUBSTANTIAL COMPLETION**

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.
  - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  - 2. Advise Owner of pending insurance changeover requirements.
  - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
  - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  - 8. Complete startup testing of systems.
  - 9. Submit test/adjust/balance records.
  - 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  - 11. Advise Owner of changeover in heat and other utilities.
  - 12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
  - 13. Complete final cleaning requirements, including touchup painting.
  - 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.



- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
  - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  - 2. Results of completed inspection will form the basis of requirements for final completion.

#### I.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
  - 1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
  - 2. Submit signed copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The signed copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  - 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  - 4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
  - 5. Resolve all outstanding commissioning items.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
  - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### I.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including if necessary, areas disturbed by Contractor that are outside the limits of construction.
  - 1. Organize list of spaces in sequential order.
  - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
  - 3. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.
    - c. Name of Contractor.
    - d. Page number.
  - 4. Submit list of incomplete items to Architect in the following format:
    - a. PDF electronic file.

#### I.6 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
  - 1. Provide two sets of warranties and bonds bound in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
  - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
  - 4. Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
  - 1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products complying with California Code of Regulations maximum allowable VOC levels.

## PART 3 - EXECUTION

### 3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Remove snow and ice to provide safe access to building
    - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - h. Sweep concrete floors broom clean in unoccupied spaces.
    - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or

- broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
- k. Remove labels that are not permanent.
  - l. Remove labels on items that are exposed to view and visible during normal use of the normally occupied spaces, including ducts, piping and equipment. Do not remove labels that are required to remain in place due to code requirements or maintenance needs.
  - m. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    - l) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.
  - n. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - o. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
  - p. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - q. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - r. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.
    - l) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report upon completion of cleaning.
  - s. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
  - t. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Construction Waste Disposal: Comply with requirements of Section 01 74 19 Construction Waste Management for removal, salvaging, recycling and disposal of debris and waste.

END OF SECTION 01 77 00

**SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Emergency manuals.
  - 3. Operation manuals for systems, subsystems, and equipment.
  - 4. Maintenance manuals for the care and maintenance of products, materials, and finishes, [systems and equipment.
- B. Related Sections include the following:
  - 1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
  - 2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
  - 3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
  - 4. Divisions 02 through 34 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

**1.3 DEFINITIONS**

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

**1.4 SUBMITTALS**

- A. Initial Submittal: Submit 2 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.
- B. Final Submittal: Submit two copies of each manual in final form at least 15 days before final inspection.

**1.5 COORDINATION**

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

**PART 2 - PRODUCTS****2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY**

- A. Organization: Include a section in the directory for each of the following:
  - 1. List of documents.

2. List of systems.
  3. List of equipment.
  4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

## 2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
  2. Table of contents.
  3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
1. Subject matter included in manual.
  2. Name and address of Project.
  3. Name and address of Owner.
  4. Date of submittal.
  5. Name, address, and telephone number of Contractor.
  6. Name and address of Architect.
  7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Provide two sets of heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.



2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider; cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
  - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
  - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## 2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
  1. Type of emergency.
  2. Emergency instructions.
  3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
  1. Fire.
  2. Flood.
  3. Gas leak.
  4. Water leak.
  5. Power failure.
  6. Water outage.
  7. System, subsystem, or equipment failure.
  8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
  1. Instructions on stopping.
  2. Shutdown instructions for each type of emergency.
  3. Operating instructions for conditions outside normal operating limits.
  4. Required sequences for electric or electronic systems.
  5. Special operating instructions and procedures.

## 2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
  1. System, subsystem, and equipment descriptions.
  2. Performance and design criteria if Contractor is delegated design responsibility.
  3. Operating standards.
  4. Operating procedures.
  5. Operating logs.
  6. Wiring diagrams.
  7. Control diagrams.
  8. Piped system diagrams.
  9. Precautions against improper use.

- 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
    - 1. Product name and model number.
    - 2. Manufacturer's name.
    - 3. Equipment identification with serial number of each component.
    - 4. Equipment function.
    - 5. Operating characteristics.
    - 6. Limiting conditions.
    - 7. Performance curves.
    - 8. Engineering data and tests.
    - 9. Complete nomenclature and number of replacement parts.
  - C. Operating Procedures: Include the following, as applicable:
    - 1. Startup procedures.
    - 2. Equipment or system break-in procedures.
    - 3. Routine and normal operating instructions.
    - 4. Regulation and control procedures.
    - 5. Instructions on stopping.
    - 6. Normal shutdown instructions.
    - 7. Seasonal and weekend operating instructions.
    - 8. Required sequences for electric or electronic systems.
    - 9. Special operating instructions and procedures.
  - D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
  - E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.
- 2.5 PRODUCT MAINTENANCE MANUAL
- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
  - B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
  - C. Product Information: Include the following, as applicable:
    - 1. Product name and model number.
    - 2. Manufacturer's name.
    - 3. Color, pattern, and texture.
    - 4. Material and chemical composition.
    - 5. Reordering information for specially manufactured products.
  - D. Maintenance Procedures: Include manufacturer's written recommendations and the following
    - 1. Inspection procedures.
    - 2. Types of cleaning agents to be used and methods of cleaning.
    - 3. List of cleaning agents and methods of cleaning detrimental to product.
    - 4. Schedule for routine cleaning and maintenance.
    - 5. Repair instructions.
  - E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - I. Include procedures to follow and required notifications for warranty claims.

## 2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard printed maintenance instructions and bulletins.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.
  - 2. Troubleshooting guide.
  - 3. Precautions against improper maintenance.
  - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - 5. Aligning, adjusting, and checking instructions.
  - 6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - I. Include procedures to follow and required notifications for warranty claims.

## PART 3 - EXECUTION

### 3.1 MANUAL PREPARATION

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
  - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
  - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
  - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
  - 2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."
- F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

**END OF SECTION 01 78 23**

**SECTION 01 78 39 - PROJECT RECORD DOCUMENTS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.
- B. Related Sections include the following:
  - 1. Division 01 Section "Closeout Procedures" for general closeout procedures.
  - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 3. Divisions 02 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

**1.3 SUBMITTALS**

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one set(s) of marked-up Record Prints and one set of pdf documents on appropriate electronic media.
- B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one copy of each Product Data submittal.
  - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

**PART 2 - PRODUCTS****2.1 RECORD DRAWINGS**

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
  - 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an understandable drawing technique.
    - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
  - 2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.



- d. Locations and depths of underground utilities.
  - e. Revisions to routing of piping and conduits.
  - f. Revisions to electrical circuitry.
  - g. Actual equipment locations.
  - h. Duct size and routing.
  - i. Locations of concealed internal utilities.
  - j. Changes made by Change Order or Construction Change Directive.
  - k. Changes made following Architect's written orders.
  - l. Details not on the original Contract Drawings.
  - m. Field records for variable and concealed conditions.
  - n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
  4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
  2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect.
    - e. Name of Contractor.

## 2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  4. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

## 2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  - 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

## 2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

## PART 3 - EXECUTION

### 3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

**END OF SECTION 01 78 39**

**SECTION 01 79 00 - DEMONSTRATION AND TRAINING****PART I - GENERAL****I.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

**I.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.
  - 3. Demonstration and training videotapes.
- B. Related Sections include the following:
  - 1. Division 01 Section "Project Management and Coordination" for requirements for pre-instruction conferences.
  - 2. Division 01 Section "General Commissioning Requirements" for commissioning related training requirements.
  - 3. Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

**I.3 SUBMITTALS**

- A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - 1. At completion of training, submit one complete training manual(s) for Owner's use.
- B. Qualification Data: For instructor.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

**I.4 QUALITY ASSURANCE**

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

**I.5 COORDINATION**

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

## PART 2 - PRODUCTS

### 2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
  1. Motorized doors, including but not limited to overhead coiling doors, overhead coiling grilles and automatic entrance doors.
  2. Equipment, including stage equipment and loading dock equipment
  3. Fire-protection systems, including fire alarm, fire pumps, and fire-extinguishing systems.
  4. Intrusion detection and security systems.
  5. Conveying systems, including elevators and wheelchair lifts.
  6. Heat generation, including boilers, pumps, and distribution piping
  7. Refrigeration systems, including chillers cooling towers condensers pumps and distribution piping.
  8. HVAC systems, including air-handling equipment air distribution systems and terminal equipment and devices.
  9. HVAC instrumentation and controls.
  10. Electrical service and distribution, including transformers, panelboards, uninterruptible power supplies and motor controls.
  11. Packaged engine generators, including transfer switches.
  12. Lighting equipment and controls.
  13. Communication systems, including intercommunication surveillance and voice and data equipment.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
  1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Operations manuals.
    - c. Maintenance manuals.
    - d. Project Record Documents.
    - e. Identification systems.
    - f. Warranties and bonds.
    - g. Maintenance service agreements and similar continuing commitments.
  3. Emergencies: Include the following, as applicable:
    - a. Instructions on meaning of warnings, trouble indications, and error messages.
    - b. Instructions on stopping.
    - c. Shutdown instructions for each type of emergency.
    - d. Operating instructions for conditions outside of normal operating limits.
    - e. Sequences for electric or electronic systems.
    - f. Special operating instructions and procedures.
  4. Operations: Include the following, as applicable:

- a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
  - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning.
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

#### 3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  - I. Schedule training with Owner with at least seven days' advance notice.



- C. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- D. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

**END OF SECTION 01 79 00**

## SECTION 01 81 11 – GREEN COMMUNITIES DESIGN REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes general requirements and procedures for the project to be in compliance with Enterprise Green Communities design and construction standards.
- B. Refer to Green Communities Intended Methods (attached) for selected strategies and implementation methodologies.
  - 1. Implementation of Green Communities items is included throughout the drawing set.
  - 2. Implementation of Green Communities items is mandatory and must be incorporated into the project construction. Any conflicts between documents and Green Communities requirements shall be brought to the attention of Architect immediately.

### PART 2 - PRODUCTS

#### 2.1 (not used)

### PART 3 - EXECUTION

#### 3.1 (not used)

END OF SECTION 01 81 11



# Multifamily - Intended Methods Worksheet

## 2016 MN Overlay to the 2015 Enterprise Green Communities Criteria

**Project Name:** Minnehaha Townhomes  
**Location (City):** Minneapolis  
**Developer/Owner/Borrower:** Minneapolis Public Housing Authority  
**Architect of Record:** MSR Design  
**General Contractor:** to be determined  
**HERS Rater/Energy Consult:** to be determined  
**This Form Prepared By:** MSR Design  
**Date Last Updated:** 21-Jun-17

Submittal Phase:	Construction Type:
<input type="checkbox"/> Application	<input type="checkbox"/> New Construction
<input type="checkbox"/> Loan Commitment/ Loan Closing	<input type="checkbox"/> Substantial/ Gut Rehab
<input type="checkbox"/> End of Construction/ Construction Close-out	<input type="checkbox"/> Moderate Rehab

- Multifamily New Construction projects must include all applicable "Mandatory" Criteria and at least (35) Optional Criteria Points.
- Multifamily Substantial, Gut, and Moderate Rehab projects must include all applicable "Mandatory" Criteria and at least (30) Optional Criteria Points.
- The information on this form must reference and reconcile with the 2015 Enterprise Green Communities Criteria as amended with the current/applicable version of the MN Overlay.
- For developments with scattered sites, different construction types, or a combination of low rise and mid/high rise buildings - a separate Intended Methods & Certification form must be provided.
- Items with text in red as such are proposed MN Overlay items.

C#	M/O	Criteria Title	Criteria Description	How Will Criteria Be Implemented? And, where in the plans, specifications, or other place will compliance be documented?	Intent to Comply				
					Yes	No	N/A	WR	OP

### 1. Integrative Design Category

1.1a	M	<b>Goal Setting</b> (Mandatory for all)	Develop an integrative design process that works best for your project team and intentions. At minimum, document: 1. A statement of the overall green development goals of the project and the expected intended outcomes from addressing those goals. 2. A summary of the integrative process that was used to select the green building strategies, systems and materials that will be incorporated into the project. 3. A description of how progress and success against these goals will be measured throughout the completion of design, construction and operation to		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.1b	M	<b>Criteria Documentation</b> (Mandatory for all)	Create design and construction documentation to include information on implementation of appropriate Enterprise Green Communities Criteria.		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.1c	9	<b>Designing for Project Performance</b>	Identify how the expected performance of your project compares to the actual performance of other projects in your portfolio and/or community.		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
1.2a	M or 2	<b>Resident Health and Wellbeing: Design for Health</b> (Mandatory for NC) (2 Optional Points for Sub and Mod Rehab)	Identify potential resident health factors and design your project to address resident health and well-being by using the matrix provided on pages 22 and 23 of the 2015 EGCC document.	Entire site will be a smoke free zone (7.16), site is located within 1/2-mile of MetroTrasit's Blue Line VA Station and the 22 bus line along 54th Street (2.8)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
1.2b	12	<b>Resident Health and Wellbeing: Health Action Plan</b>	At pre-design and continuing throughout the project life cycle, collaborate with public health professionals and community stakeholders to assess, identify, implement and monitor achievable actions to enhance health-promoting features of the project and minimize features that could present health risks. Specifically, create a Health Action Plan and integrate the selected interventions and a plan for monitoring and evaluating		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
1.3a	M	<b>Resilient Communities: Design for Resilience</b> (Mandatory for NC & Sub Rehab only)	Given your project building type, location and expected resident population, identify a project characteristic that would most likely impact your project's ability to withstand an unexpected weather event or loss of power. Select at least one criterion from the given list that would help mitigate that impact, and incorporate this within your project plans and design. Include a short narrative providing your rationale for selecting	Project will comply with Option 1 of 3.6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.3b	15	<b>Resilient Communities: Multi-Hazard Risk/Vulnerability Assessment</b>	Carry out a Vulnerabilities Assessment and implement building elements designed to enable the project to adapt to, and mitigate, climate impacts given the project location, building/construction type and resident population.		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0

Subtotal Category 1 Selected Optional Points **0**

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					Yes	No	N/A	WR	OP	
<b>2. Location + Neighborhood Fabric Category</b>										
<i>Criteria 2 Overlay . New Construction (NC) projects are not required to earn optional points under Criterion 2.8 Access to Public Transportation OR earn 8 optional points through selecting one or more of the following: Criterion 2.7, 2.9, 2.12, 2.13, or 2.14.</i>										
2.1	M	<b>Sensitive Site Selection</b> (Mandatory for NC only)	Do not locate new projects, including buildings, built structures, roads or parking areas, on portions of sites that meet any of the following provisions: 1. Land within 100 feet of wetlands, including isolated wetlands or streams. Maintain or establish riparian buffer using native vegetation where possible. Bike and foot paths are allowed if at least 25 feet from the wetlands boundary. 2. Land on slope greater than 15% 3. Land with prime soils, unique soils or soils of state significance per USDA designations 4. Public parkland 5. Land that is specifically identified as an existing habitat for any species on federal or state threatened or endangered lists 6. Land that is within the Special Flood Hazard Areas (SFHA) as identified by FEMA on the Flood Insurance Rate Map	site meets these criteria	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
2.2	M	<b>Connections to Existing Development and Infrastructure</b> (Mandatory for NC only) (See criteria for other exceptions)	Locate the project on a site with access to existing roads, water, sewers and other infrastructure within or contiguous to (having at least 25% of the perimeter bordering) existing development. Connect the project to the pedestrian grid.	Site is firmly within the Minneapolis city fabric and meets requirements.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
2.3	M	<b>Compact Development</b> (Mandatory for NC only)	At a minimum, build to the residential density (dwelling units/acre) of the census block group in which your project is located.	7.7 households/acre for census block. Site is 1.09 acres with 16 DU for the total site = 14.7 households/acre.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
2.4	5 or 7	<b>Compact Development</b>	Exceed the residential density (dwelling units/acre) of the census block group in which your project is located. Exceed by 2x for [5 points]; exceed by 3x for [7 points].		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		0
2.5	M	<b>Proximity to Services</b> (Mandatory for NC only)	Locate the project within a 0.5-mile walk distance of at least four, or a 1-mile walk distance of at least seven, of the listed services. For projects that qualify as Rural/Tribal/Small Town, locate the project within 5 miles of at least four of the listed services.	site located within 1 mile of VA Med Center, Minnehaha Park, Hiway Federal Credit Union, Pharmacy, World of Self Defense Gym, Plantiqueu Garden Center, and Cap's Grille	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
2.6	M	<b>Preservation of and Access to Open Space for Rural/Tribal/Small Towns</b> (Mandatory for applicable NC only)	Set aside a minimum of 10% (minimum of 0.25 acre) of the total project acreage as non-paved open space for use by all residents OR locate the project within a 0.25-mile walk distance of dedicated public non-paved open space that is a minimum of 0.75 acres.		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
2.7	6 max	<b>Preservation of and Access to Open Space</b>	Set aside a percentage of non-paved open space for use by all residents. 20% [2 points]; 30% [4 points]; 40% + written statement of preservation/conservation policy for set-aside land [6 points].		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		4
2.8	8 or 10	<b>Access to Public Transportation</b>	Locate projects within a 0.5-mile walk distance of transit services combined (bus, rail and/or ferry), constituting at least 60 or more transit rides per weekday, with some type of weekend ride option. [8 points]  For projects that qualify as Rural/Tribal/Small Town, locate the project within a 5-mile distance of at least one of the following transit options: 1) vehicle share program; 2) dial-a-ride program; 3) employer vanpool; 4) park-and-ride; or 5) public-private regional transportation. [8 points]  For an additional 2 points: Locate the project along dedicated bike trails or lanes that lead to transit services or stations (bus, rail and ferry) within 3 miles.	site is located within 1/2-mile of MetroTrasit's Blue Line VA Station and the 22 bus line along 54th Street	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		8
2.9	1 - 4	<b>Improving Connectivity to the Community</b>	Improve access to community amenities through at least one of the transit, auto or biking mobility measures listed.	bicycle racks are provided for residents and guests - 1 at each dwelling unit porch and 6 for general use by residents and guests	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		1
2.10	5 max	<b>Passive Solar Heating/Cooling</b>	Design and build with passive solar design, orientation and shading that meet specified guidelines.		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		0
2.11	4	<b>Brownfield Site or Adaptive Reuse Building</b>	Rehabilitate an existing structure that was not previously used as housing or locate the project on a brownfield site.		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		0

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2.12	6	<b>Access to Fresh, Local Foods</b>	Pursue one of three options to provide residents and staff with access to fresh, local foods, including neighborhood farms and gardens, community-supported agriculture, or proximity to farmers	compliant with Option 1: 160sf min garden space	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6
2.13	4	<b>LEED for Neighborhood Development Certification</b>	Locate building(s) in a Stage 2 Pre-Certified or Stage 3 Certified Neighborhood Development.		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
2.14	6 max	<b>Local Economic Development &amp; Community Wealth Creation</b>	Demonstrate that local preference for construction employment and subcontractor hiring was part of your bidding process [2 points] OR demonstrate that you achieved at least 20% local employment [3 points] OR provide physical space for small business, nonprofits, and/or skills and workforce education [3 points]		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0

Subtotal Category 2 Selected Optional Points **19**

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					Yes	No	N/A	WR	OP

### 3. Site Improvements Category

3.1	M	<b>Environmental Remediation</b>	See Minnesota Housing Environmental Standards	site was certified clean by city of minneapolis prior to MPHA acquiring site.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3.2	M	<b>Erosion and Sedimentation Control</b> (Mandatory for all, except for infill sites with buildable area smaller than one acre)	Implement EPA's Best Management Practices for Construction Site Stormwater Runoff Control, or local requirements, whichever is more stringent.	incorporated into Civil documents	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3.3	M	<b>Low Impact Development</b> (Mandatory only for projects located on greenfields)	Projects located on greenfields must meet the list of low-impact development criteria.	project site is not a greenfield. It was formerly site of several single family homes that were bought out and demo'd by city prior to MPHA acquiring the site	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3.4	M	<b>Landscaping</b> (Mandatory for all)	If providing plantings, all should be native or adapted to the region, appropriate to the site's soil and microclimate, and none of the new plants is an invasive species. <u>Reseed or xeriscape all disturbed areas.</u>	All plants, grass and trees are native speies or adapted to local conditions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3.5a	M	<b>Efficient Irrigation and Water Reuse</b> (Mandatory if irrigation is used)	If irrigation is used, install an efficient irrigation or water reuse system per the guidelines.	project will not have irrigation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.5b	4 or 8	<b>Efficient Irrigation and Water Reuse</b>	Install an efficient irrigation system equipped with a WaterSense-labeled weather-based irrigation controller (WBIC) OR at least 50% of the site's irrigation should be satisfied by reusing water.	project will not have irrigation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0
3.6	4 or 8	<b>Surface Stormwater Management</b>	Retain, infiltrate and/or harvest the first 1.0 inch of rain that falls [4 points] OR as calculated for a 24-hour period of a one-year (1) storm event, so that no stormwater is discharged to drains/inlets. [8 points] For both options, permanently label all storm drains and inlets		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4
3.7	1	<b>Reducing Heat Island Effect: Paving</b>	Use light-colored, high-albedo materials and/or an open-grid pavement, with a minimum solar reflectance of 0.3, over at least 50% of the site's hardscaped area.	light colored concrete will be used for all paving besides the parking stalls (which are asphalt)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1

Subtotal Category 3 Selected Optional Points **5**

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<b>4. Water Conservation Category</b>									
4.1	M or 6	<b>Water-Conserving Fixtures</b> (Mandatory for NC and Sub Rehab only) (Optional/5 points for Mod Rehab)	Install water-conserving fixtures in all units and any common facilities with the following specifications. Toilets: WaterSense-labeled and 1.28 gpf; Urinals: WaterSense-labeled and 0.5 gpf; Showerheads: WaterSense-labeled and 2.0 gpm; Kitchen faucets: 2.0 gpm; Lav faucets: WaterSense-labeled and 1.5 gpm. AND for all single-family homes and all dwelling units in buildings three stories or fewer, the static service pressure must not exceed 60 psi. Optional Mod Rehab points: All Toilets = 1 point, All Urinals = 1 point, All Showerheads = 1 point, All Kitchen Faucets = 1 point, and/or All Lavatory Faucets = 1 point.	fixtures will comply with this standard	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
4.2	6 max	<b>Advanced Water Conservation</b>	Reduce water consumption either by installing water-conserving fixtures in all units and all common space bathrooms with the following specifications: Toilets: WaterSense-labeled and 1.1 gpf [1 point]; Showerheads: WaterSense-labeled and 1.5 gpm [1 point]; Kitchen faucets: 1.5 gpm and lav faucets: WaterSense-labeled and 1.0 gpm [1 point]  OR Reduce total indoor water consumption by at least 30% compared to the baseline indoor water consumption chart, through a combination of your		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
4.3	4	<b>Leaks &amp; Water Metering</b>	Conduct pressure-loss tests and visual inspections to determine if there are any leaks; fix any leaks found; and meter or submeter each dwelling unit with a technology capable of tracking water use. Separately meter outdoor water consumption.	Each dwelling unit to have a water meter. Leaks to be tested (pressure and visible) prior to final completion.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4
4.4	4	<b>Efficient Plumbing Layout &amp; Design</b>	To minimize water loss from delivering hot water, the hot water delivery system shall store no more than 0.5 gallons of water in any piping/manifold between the hot water source and any hot water fixture.		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
4.5	6 max	<b>Water Reuse</b>	Harvest, treat, and reuse rainwater and/or greywater to meet a portion of the project's total water needs: 10% reuse [3 points]; 20% reuse [4 points]; 30% reuse [5 points]; 40% reuse [6 points].		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
4.6	Omit	<b>Access to Potable Water during Emergencies</b>	Not allowed if the project receives funding from Minnesota Housing.		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0

Subtotal Category 4 Selected Optional Points **4**

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					Yes	No	N/A	WR	OP
<b>5. Energy Efficiency Category</b>									
5.1a	M	<b>Building Performance Standard: NC Energy Star for Homes</b> (Mandatory for NC SF and Low Rise MF)	Certify each dwelling unit in the project through the ENERGY STAR New Homes program.	Project to comply with this standard	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5.1b	M	<b>Building Performance Standard: NC ASHRAE 90.1/Energy Star MFHR</b> (Mandatory for NC 4 & 5 + NC 6 Story or more)	Follow one of Three Compliance Pathways: 1) Buildings 4 Stories or more WITH Heated Garage. 2) Buildings 4 Stories or more WITHOUT Heated Garage. 3) Buildings with up to 5 Stories (dwelling units with own heating, cooling, and hot water heating) WITH or WITHOUT a Heated Garage.		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.1c	M	<b>Building Performance Standard</b> (Mandatory for Sub and Mod Rehab: single family and low-	For Sub Rehab, each dwelling unit, achieve a HERS Index score of 85 or less. For Mod Rehab, Performance Pathway HERS 85 or 100; Or, Overlay Prescriptive Pathway.		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.1d	M	<b>Building Performance Standard:</b> (Mandatory for Sub and Mod Rehab: mid-rise and high-rise multifamily)	For Sub Rehab, each dwelling unit, follow a Performance Pathway and demonstrate equivalent performance to ASHRAE 90.1-2010. For Mod Rehab, each dwelling unit, follow Performance Pathway: Or, Prescriptive Pathway.		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.2a	5 - 12	<b>Additional Reductions in Energy Use</b>	Design and construct a building that is projected to be at least 5% more efficient than what is required of the project by Criteria 5.1a-d. (Projects may receive points in Criteria 5.2a or 5.2b, but not both)		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
5.2b	12	<b>Advanced Certification: Nearing Net Zero</b>	Certify the project in a program that requires advanced levels of building envelope performance such as PHIUS, Living Building Challenge and/or DOE Zero Energy Ready Home. (Projects receiving points in Criterion 5.2b may not receive points per Criterion 5.2a)		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
5.3	M	<b>Sizing of Heating and Cooling Equipment</b> (Mandatory for NC and Rehab if scope of work includes HVAC work)	Size and select heating and cooling equipment in accordance with the Air Conditioning Contractors of America (ACCA) Manuals J and S or ASHRAE handbooks.	Project to comply with this standard	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5.4	M	<b>ENERGY STAR Appliances</b> (Mandatory for NC and for Rehab if new appliances are included in the scope of work)	If providing appliances, install ENERGY STAR clothes washers, dishwashers and refrigerators. If appliances will not be installed or replaced at this time, specify that, at the time of installation or replacement, ENERGY STAR models must be used.	Project to comply with this standard	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5.5	M	<b>Lighting</b> (Mandatory for NC and for "any new" fixtures at Rehab)	Follow the guidance for high-efficacy lighting controls and other characteristics for any new permanently installed lighting fixtures in project dwelling units, common spaces and exterior.	Project to comply with this standard	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5.6	M - 6	<b>Electricity Meter</b> (Mandatory for New Construction and Substantial Rehab) (Optional 6 points for Mod Rehab)	Install individual or submetered electric meters for all dwelling units.	Project to comply with this standard	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
5.7a	4	<b>Photovoltaic/Solar Hot Water Ready</b>	Orient, design, engineer, wire and/or plumb the development to accommodate installation of photovoltaic (PV) or solar hot water system in the future.		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
5.7b	10 max	<b>Renewable Energy</b>	Install photovoltaic (PV) panels or other electric-generating renewable energy source to provide a specified percentage of the project's estimated total energy demand or water heating energy demand. (Projects may earn points through Criterion 5.7b or 5.8b, but not both.)		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
5.8a	8	<b>Resilient Energy Systems: Floodproofing</b>	Conduct floodproofing, including perimeter floodproofing (barriers/shields), of lower floors. Design and install building systems as specified by the full criterion so that the operation of those systems will not be grossly affected in case of a flood.		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
5.8b	8	<b>Resilient Energy Systems: Islandable Power</b>	Provide emergency power through an islandable photovoltaic (PV) system or an efficient and permanent generator that will offer at least limited electricity for critical circuits during power outages per one of the three options listed. (Projects may earn points through Criterion 5.7b or 5.8b, but not both.)		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
Subtotal Category 5 Selected Optional Points									0

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6.1	M	<b>Low/No VOC Paints, Coatings and Primers</b> (Mandatory for NC and for Rehab if included in scope of work)	All interior paints and primers must have VOC levels, in grams per liter, less than or equal to the thresholds established by South Coast Air Quality Management District (SCAQMD) Rule 1113.	Project to comply with this standard	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6.2	M	<b>Low/No VOC Adhesives and Sealants</b> (Mandatory for NC and for Rehab if included in scope of work)	All adhesives and sealants (including caulks) must have VOC levels, in grams per liter, less than or equal to the thresholds established by the South Coast Air Quality Management District Rule 1168.	Project to comply with this standard	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6.3	3 max	<b>Recycled Content Material</b>	Incorporate building materials that are composed of at least 25% post-consumer recycled content or at least 50% post-industrial recycled content. [1 point]  Building materials that make up at least 75% of their project component each receive 1 point.		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
6.4	4 max	<b>Regional Material</b>	Use products that were extracted, processed and manufactured within 500 miles of the project for a minimum of 50%, based on cost, of the building materials' value.  Select any or all of these options (each material can qualify for 1 point): • Framing materials • Exterior materials (e.g., siding, masonry, roofing) • Flooring materials • Concrete/cement and aggregate material • Drywall/interior sheathing materials		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
6.5	1	<b>Certified, Salvaged and Engineered Wood Products</b>	For at least 25% of all structural wood products, by cost or value, commit to using either FSC-certified, salvaged products or engineered framing materials without urea formaldehyde.		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
6.6	M	<b>Composite Wood Products that Emit Low/No Formaldehyde</b> (Mandatory for NC and for Rehab if in scope of work)	All composite wood products must be certified as compliant with California 93120 Phase 2 OR, 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, per Criterion 6.2	Project to comply with this standard	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6.7a	M	<b>Environmentally Preferable Flooring</b> (Mandatory for NC and for Rehab if new flooring in the scope of work)	Do not install carpets in building entryways, laundry rooms, bathrooms, kitchens/kitchenettes, utility rooms or any rooms built on foundation slabs (aka Ground-connected Concrete Slabs). Exceptions: 1) Properly installed vapor barrier, 2) Functioning drain tile, 3) Capillary Break and vapor barrier, or 4) Poly-film test confirmation	Project to comply with this standard: there is no carpet used in this project	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6.7b	6	<b>Environmentally Preferable Flooring Throughout</b>	Use non-vinyl, non-carpet floor coverings throughout each building in the project.		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
6.8	M	<b>Mold Prevention: Surfaces</b> (Mandatory for all)	Use materials that have durable, cleanable surfaces throughout bathrooms, kitchens and laundry rooms. Materials installed in these rooms should not be prone to deterioration due to moisture intrusion or encourage the growth of mold.	Project to comply with this standard	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6.9	M	<b>Mold Prevention: Tub and Shower Enclosures</b> (Mandatory for NC and Rehab if applicable shower or bathroom work is in the scope of work)	Use moisture-resistant backing materials such as cement board, fiber cement board or equivalent per ASTM #D3273 behind tub/shower enclosures. Projects using a one-piece fiberglass tub/shower enclosure are exempt from this requirement	one-piece fiberglass shower and tub enclosures used for project	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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					Yes	No	N/A	WR	OP
6.10	12 max	<b>Asthmagen-free Materials</b>	Do not install products that contain ingredients that are known to cause or trigger asthma. Key products to avoid are: <ul style="list-style-type: none"> <li>• Insulation: Do not use spray polyurethane foam (SPF) or formaldehyde-containing fiberglass batts. [4 points]</li> <li>• Flooring: Do not use flexible vinyl (PVC) roll or sheet flooring or carpet-backed with vinyl with phthalates. Do not use fluid applied finish floors. [4 points]</li> <li>• Wall coverings: Do not use wallpaper made from vinyl (PVC) with phthalates or site-applied high-performance coatings that are epoxy or polyurethane based. [4 points]</li> <li>• Composite wood: Use only ULEF products for cabinetry, subflooring and other interior composite wood uses. [4 points]</li> </ul>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
6.11	5	<b>Reduced Heat-Island Effect: Roofing</b>	Use an ENERGY STAR–certified roofing product for 100% of the roof area OR install a “green” (vegetated) roof for at least 50% of the roof area and ENERGY STAR–certified roofing product for the remainder of the roof area.		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
6.12	M - 6	<b>Construction Waste Management</b> (Mandatory minimum requirements for all projects. Optional points are available for projects that go beyond mandatory.)	Commit to following a waste management plan that reduces non-hazardous construction and demolition waste through recycling, salvaging or diversion strategies through one of the three options. Achieve optional points by going above and beyond the requirement [6 points max].	Project complies with Option 1-a: diverting 50% minimum from landfill	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
6.13	3	<b>Recycling Storage for Multifamily Project</b>	Provide separate bins for the collection of trash and recycling for each dwelling unit and all shared community rooms (if applicable).  Additionally, in multifamily buildings, provide at least one easily accessible, permanent and dedicated indoor area for the collection and storage of materials for recycling. In single-family homes, points will be accrued only if curb-side recycling pickup is available.  Collected materials should include, at a minimum,		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3

Subtotal Category 6 Selected Optional Points **3**

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C#	M/O	Criteria Title	Criteria Description	How Will Criteria Be Implemented? And, where in the plans, specifications, or other place will compliance be documented?	Intent to Comply				
					Yes	No	N/A	WR	OP
7.1	M	<b>Ventilation</b> (Mandatory for all including Moderate Rehab)	<p>For each dwelling unit, in full accordance with ASHRAE 62.2-2010, install a local mechanical exhaust system in each bathroom a local mechanical exhaust system in each kitchen and a whole-house mechanical ventilation system</p> <p>For each multifamily building of four stories and more, in full accordance with ASHRAE 62.1-2010, install a mechanical ventilation system for all hallways and common spaces</p> <p>For all project types, in addition to the above requirements:</p> <ul style="list-style-type: none"> <li>All systems and associated ductwork must be installed per manufacturer's recommendations.</li> <li>All individual bathroom fans must be ENERGY STAR labeled, wired to turn on with the light switch, and equipped with a humidistat sensor, timer or other control (e.g., occupancy sensor, delay off switch, ventilation controller).</li> <li>If using central ventilation systems with rooftop fans, each rooftop fan must be direct-drive and variable-speed with speed controller mounted near the fan. Fans with design CFM 300-2000 must also have an ECM motor.</li> </ul>		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7.2	M	<b>Clothes Dryer Exhaust</b> (Mandatory for all)	Clothes dryers must be exhausted directly to the outdoors using rigid-type ductwork (except for condensing dryers, which must be plumbed to a drain).		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7.3	M	<b>Combustion Safety</b> (Mandatory for all)	At NC, only provide in-unit space and water heating with power-vented or closed (sealed) combustion equipment. At Rehab, replace existing in-unit space and water heating natural draft combustion equipment with new power-vented or closed (sealed) combustion equipment. If existing natural draft combustion equipment is planned to remain, a combustion action plan with post-combustion testing must be provided.		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7.4	9 or 11	<b>Elimination of Combustion within the Conditioned Space</b> (Optional points for NC and Rehab)	No combustion equipment may be used for cooking (including, but not limited to, ranges, cooktops, stoves, ovens) as part of the building project for NC or existing combustion equipment replaced with electric equipment [9 points] OR no combustion equipment may be used as part of the building project [11 points]	gas kitchen ranges are spec'd	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
7.5	M	<b>Vapor Retarder Strategies</b> (Mandatory for NC and for Rehab projects with foundation work)	Install vapor barriers that meet specified criteria appropriate for the foundation type.		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7.6	M	<b>Water Drainage</b> (Mandatory for NC and Rehab projects replacing assemblies called out in Criterion only)	Provide drainage of water away from walls, windows and roofs by implementing the list of techniques.		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7.7	M	<b>Mold Prevention: Water Heaters</b> (Mandatory for all)	Provide adequate drainage for water heaters that includes drains or catch pans with drains piped to the exterior of the dwelling.		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7.8	M	<b>Radon Mitigation</b> (Mandatory for all)	See Minnesota Housing Environmental Standards for Radon requirements.		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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					Yes	No	N/A	WR	OP
7.9	M	<b>Garage Isolation</b> (Mandatory for all)	<ul style="list-style-type: none"> <li>• Provide a continuous air barrier between the conditioned space and any garage space to prevent the migration of any contaminants into the living space.</li> <li>• Visually inspect common walls and ceilings between attached garages and living spaces to ensure that they are air-sealed before insulation is installed.</li> <li>• Do not install ductwork or air handling equipment in a garage.</li> <li>• Fix all connecting doors between conditioned space and garage with gaskets or otherwise make substantially airtight with weather stripping.</li> <li>• Install one hard-wired carbon monoxide (CO) alarm with battery backup function for each sleeping zone of the project, placed per National Fire Protection Association (NFPA) 720.</li> </ul>	No garages with this project	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
7.10	M	<b>Integrated Pest Management</b> (Mandatory for all)	Seal all wall, floor, and joint penetrations with low-VOC caulking or other appropriate nontoxic sealing <u>methods to prevent pest entry.</u>		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7.11a	9	<b>Beyond ADA: Universal Design</b> (NC)	Design a minimum of 15% of the dwelling units (no fewer than one) in accordance with ICC/ANSI A117.1, Type A, Fully Accessible guidelines. Design the remainder of the ground-floor units and elevator-reachable units in accordance with ICC/ANSI A117.1, <u>Type B.</u>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
7.11b	7 or 9	<b>Beyond ADA: Universal Design</b> (Substantial and Moderate Rehab only)	Design a minimum of 10% of the dwelling units (one, at minimum) in accordance with ICC/ANSI A117.1, Type A, Fully Accessible guidelines. [7 points]  For an additional 2 points: Design the remainder of the ground-floor units and elevator-reachable units with accessible unit entrances designed to accommodate people who use a wheelchair.		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0
7.12	M	<b>Active Design: Promoting Physical Activity within the Building</b> (Mandatory for all)	Situate at least one building stairway per the criterion to encourage use OR emphasize at least one strategy inside the building designed to increase frequency and <u>duration of physical activity per the criterion.</u>		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
7.13	10	<b>Active Design: Staircases and Building Circulation</b>	A staircase must be accessible and visible from the main lobby as well as visible within a 25-foot walking distance from any edge of lobby. Ensure that no turns or obstacles prevent visibility of or accessibility to the qualifying staircase from the lobby, and that the staircase is encountered before or at the same time as the elevators.  From the corridor, accessible staircases should be made visible by: Providing transparent glazing of at least 10 square feet (1 square meter) at all stair doors or at a side light OR providing magnetic door holds on all doors leading to the stairs OR removing door enclosures/vestibules.		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0
7.14	9	<b>Interior and Outdoor Activity Spaces for Children and Adults</b> (Applicable to NC and to Rehab if existing, older, worn equipment replaced)	Provide an on-site dedicated recreation space with exercise or play opportunities for adults and/or children that is open and accessible to all residents; see criterion for specifics.	A compliant size children play area is provided to promote active play	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9
7.15	M	<b>Reduce Lead Hazards</b> (Mandatory for all Rehab)	See Minnesota Housing Environmental Standards for <b>Lead-Bases Paint Hazard requirements</b>		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
7.16	10	<b>Smoke-Free Building</b>	Implement and enforce a no-smoking policy in all common and individual living areas and within a 25-foot perimeter around the exterior of all residential projects.	entire site is smoke free	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10

Subtotal Category 7 Selected Optional Points **19**

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**8. Operations, Maintenance and Resident Engagement Category**

8.1	M	<b>Building Maintenance Manual</b> (Mandatory for all multifamily projects)	Develop a manual with thorough building operations and maintenance guidance and a complementary plan. The manual and plan should be developed over the course of the project design, development and construction stages, and should include sections/chapters addressing the list of topics.		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8.2	M	<b>Emergency Management Manual</b> (Mandatory for all multifamily projects)	Provide a manual on emergency operations targeted toward operations and maintenance staff and other building-level personnel. The manual should address responses to various types of emergencies, leading with those that have the greatest probability of negatively affecting the project. The manual should provide guidance as to how to sustain the delivery of adequate housing throughout an emergency and cover a range of topics, including but not limited to: <ul style="list-style-type: none"> <li>• communication plans for staff and residents</li> <li>• useful contact information for public utility and other service providers</li> <li>• infrastructure and building “shutdown” procedures</li> </ul>		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8.3	M	<b>Resident Manual</b> (Mandatory for all)	Provide a guide for homeowners and renters that explains the intent, benefits, use and maintenance of their home’s green features and practices. The Resident Manual should encourage green and healthy activities per the list of topics		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8.4	M	<b>Resident and Property Staff Orientation</b> (Mandatory for all)	Provide a comprehensive walk-through and orientation for all residents, property manager(s) and buildings operations staff. Use the appropriate manuals (see Criteria 8.1, 8.2, 8.3) as the base of the curriculum, and review the project’s green features, operations and maintenance procedures, and emergency protocols		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8.5	O	<b>Project Data Collection and Monitoring System: 100% Owner Paid Utility Accounts, 15% Tenant Paid Utility Accounts</b> (Optional, no points)	For rental properties: Collect and monitor project energy and water performance data for 100% of owner-paid utilities and 15% of tenant-paid utilities for at least 5 years. This data must be maintained in a manner that allows staff to easily access and monitor it, enabling them to make informed operations and capital planning decisions. Also allow Enterprise access to this data.  For owner-occupied units: Collect and monitor energy and water performance data in a manner that allows for easy access and review and provides the ability to influence home operations. Also allow Enterprise access to this data.		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
8.6	7 or 11	<b>Project Data Collection and Monitoring System: &gt;15% Tenant Paid Utility Accounts</b> (Must include Criteria 8.5 requirements as well to claim 8.6 Criteria points)	Collect and monitor project energy and water performance data for at least 5 years. This data must be maintained in a manner that allows staff to easily access and monitor it, enabling them to make informed operations and capital planning decisions. Also allow Enterprise access to this data. 16–60% of units [7 points]; 60–100% of units [11 points]		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0

Subtotal Category 8 Selected Optional Points **0**

**Total Selected Optional Points** **50**

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					Yes	No	N/A	WR	OP

**Intent to Comply Certification - Initial Application Phase**

I/we hereby certify to Minnesota Housing that all applicable Mandatory and selected Optional Point Criteria of the 2015 Enterprise Green Communities Criteria as amended by the current/applicable version of the MN Overlay to the 2015 EGCC (unless exempt by Minnesota Housing approved waiver) are incorporated into the approved contract documents for the above mentioned development.

**Borrower/Developer/Owner**

Firm/Organization/Company	Signature	Typed/Printed Name of Person Signing	Date
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**Architect of Record/Borrower's Architect**

Firm/Organization/Company	Signature	Typed/Printed Name of Person Signing	Date
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**Contract Document Compliance Certification - Loan Commitment/Closing (MF Only) Phase**

I/we hereby certify to Minnesota Housing that all applicable Mandatory and selected Optional Point Criteria of the 2015 Enterprise Green Communities Criteria as amended by the current/applicable version of the MN Overlay to the 2015 EGCC (unless exempt by Minnesota Housing approved waiver) are incorporated into the approved contract documents and construction contract for the above mentioned development.

**Borrower/Developer/Owner**

Firm/Organization/Company	Signature	Typed/Printed Name of Person Signing	Date
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**Architect of Record/Borrower's Architect**

Firm/Organization/Company	Signature	Typed/Printed Name of Person Signing	Date
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**General Contractor**

Firm/Organization/Company	Signature	Typed/Printed Name of Person Signing	Date
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**SECTION 02 31 00 - SITE DEMOLITION**

**PART 1 - GENERAL**

**1.1 CONDITIONS OF THE CONTRACT**

- A. Conditions of the Contract, DIVISION 00 and General Requirements, DIVISION 01 govern work under this Section.
  - 1. Performance of the Work of this Section shall comply with DIVISION 00 for Prevailing Wage Rate Requirements that apply to this project.
  - 2. Performance of the Work of this Section shall comply with DIVISION 01 for Storm Water Plan "SWPPP" Requirements and SWPPP training requirements that apply to this project.

**1.2 SECTION INCLUDES**

- A. Selective demolition of built site elements for the pavement areas and picnic shelter concrete pads.
- B. Removal of existing utilities and utility structures.
- C. Existing utilities and utility structures that are temporarily placed out of service.

**1.3 RELATED SECTIONS**

- A. Section 024100 – Structure Demolition
- B. Section 311000 - Site Clearing
- C. Section 312200 - Grading
- D. Section 312323 - Fill

**1.4 REFERENCES**

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2004.
- C. Minnesota Department of Transportation Standard Specifications for Construction, 2016 Edition and Corresponding Supplements.
  - 1. Where reference is made to a number preceded by "MnDOT", the reference shall be understood to mean that numbered section of the Department of Transportation Standard Specifications, Latest edition.
  - 2. Provisions for measurement and payment shall not apply except as amended herein and all costs in connection therewith shall be included in the lump sum price bid for the work.

**1.5 SUBMITTALS**

- A. Documentation of all permits required for work.
- B. Construction Staging and Logistics Site Plan showing:
  - 1. Vegetation and existing site elements to be protected.

2. Areas for temporary erosion control.
  3. Areas for temporary construction and field offices, dumpsters, portable restrooms, etc.
  4. Areas for soil stockpiles, material storage and concrete washout area.
  5. Areas for temporary traffic control signage and personnel
  6. Sequence of demolition activities.
  7. Location of SWPPP and NPDES Permit Inspection Documents.
  8. Truck haul routes and the locations of gravel construction entrances.
  9. Temporary utilities to maintain service to infrastructure that needs to remain operational during Construction.
  10. Areas of soil support, sheet-piling, shoring, earth retention, etc.
  11. Plan of soil correction removals and sequence of earthwork.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction. Provide redline drawings to Owner and Engineer for documentation. Records shall include utilities or infrastructure element, size, elevation or depth and ownership. Pictures of existing underground infrastructure shall also be included with record drawings.

#### 1.6 QUALITY ASSURANCE

- A. Demolition Firm: Company specializing in the type of work required with a minimum of eight years of experience. Submit qualifications, years of business and list of similar demolition work for qualified demolition firm for approval.

#### 1.7 PROJECT CONDITIONS

- A. 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.
- B. When working about existing telephone or electrical poles, brace the pole for support. Take necessary measures to not damage the pole or associated utility lines.
- C. When working around existing utilities that become exposed, provide sufficient support to prevent excessive stress on the piping. The Contractor is fully responsible for any damages caused by failure to exactly locate and preserve all underground facilities.
- D. Secure a separate water use permit if withdrawing more than 10,000 gallons of water per day or 1 million gallons per year from surface water or ground water. GP1997-005 (temporary water appropriations) covers a variety of activities associated with road construction and should be applied if applicable. An individual appropriation permit may be required for projects lasting longer than one year or exceeding 50 million gallons. Information is located at [www.dnr.state.mn.us/waters/watermgmt\\_section/appropriations/permits.html](http://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/permits.html)

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Fill Material: As specified in Section 312323 – Fill.

## PART 3 - EXECUTION

## 3.1 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
  - 1. Obtain all required permits.
  - 2. Comply with applicable requirements of NFPA 241.
  - 3. Use of explosives is not permitted.
  - 4. The use of burning of refuse, brush and debris will not be permitted.
  - 5. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
  - 6. Provide, erect, and maintain temporary barriers and security devices.
  - 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
  - 8. Do not close or obstruct roadways or sidewalks without permit.
  - 9. 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.
  - 10. Neatly sawcut all bituminous and concrete to be removed. Do not sawcut or remove more pavement than is necessary to complete the new work.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Do not begin removal until built elements to be salvaged or relocated have been removed.
- D. Do not begin removal until vegetation to be relocated has been removed and 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 or other temporary support systems.
  - 2. Prevent movement or settlement of adjacent structures.
  - 3. Stop work immediately if adjacent structures appear to be in danger.
- F. If hazardous materials are discovered during removal operations, stop work and notify Engineer and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.
- G. Perform demolition in a manner that maximizes salvage and recycling of materials.
  - 1. Comply with requirements of 017419 Construction Waste Management and Disposal.
  - 2. Dismantle existing construction and separate materials.
  - 3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.



3.2 EXISTING UTILITIES

- A. Coordinate work with utility companies and Owner; notify before starting work and comply with their requirements; obtain required permits from all parties.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public or private 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 utilities and those utilities that will be temporarily taken out of service.
- H. Verify that utilities temporarily taken out of service serve only abandoned facilities before removal.
- I. Survey the utilities to be removed, disconnected or temporarily taken out of service and determine temporary utility needs to keep Owner systems that are to remain operational during construction.
- J. Coordinate temporary utility services with appropriate utility companies and MnDOT prior to installation.

3.3 SALVAGE AND REUSE

- A. Salvage the following items for reuse on the site.
  - 1. Pedestrian lights in plaza.
  - 2. Historic signs.
- B. See Architectural and Landscape Plans for reinstallation.

3.4 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site on a daily basis.
- B. No debris shall be disposed of in Owner facilities, containers or on Owner property unless directed to do so otherwise in writing.
- C. Remove from site all materials not to be reused on site; comply with requirements of 017419 Construction Waste Management and Disposal.
- D. Leave site in clean condition, ready for subsequent work.
- E. Clean up spillage and wind-blown debris from public and private lands.
- F. Remove all temporary work.

**END OF SECTION 02 31 00**

## SECTION 033000 - CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
  - 1. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. All bar supports must be dimensioned and located on the steel reinforcement shop drawings.
- D. Qualification data for testing agency.
- E. Aggregate tests.
- F. Certification of admixture conformance to chloride ion requirements
- G. Field quality-control test and inspection reports.
- H. Description of planned protective measures for hot or cold weather concreting. The plans shall incorporate means and methods to prevent detrimental frost penetration and freezing of concrete and supporting soils.

#### 1.3 QUALITY ASSURANCE

- A. Work shall conform to ACI 318 and ACI 301.
- B. Fiber reinforcing supplier shall have no less than five (5) years of satisfactory product performance experience with the approved product.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Provide equipment and personnel to handle the materials by methods that prevent damage.
- B. Store materials in accordance with the Manufacturer's instructions, with seals and label intact and legible. Maintain temperatures within the Manufacturers' recommended ranges.
- C. Furnish delivery tickets with each load of concrete delivered to the Project.

### PART 2 - PRODUCTS

#### 2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301.
  - 2. ACI 117.

#### 2.2 FORM-FACING MATERIALS

- A. Form Material: As given in Chapters 2 and 6 of ACI 301. Do not use aluminum materials in contact with the concrete
- B. Form Release Agent:
  - 1. Manufactured for the type of form material used
  - 2. Prevent adhesion of concrete to form material, staining of concrete or injury to exposed concrete surfaces
  - 3. Compatible with finish material applied to concrete
- C. Form Ties:
  - 1. Provide factory fabricated, adjustable length, removable or snap off form ties.
  - 2. Provide form ties such that upon removal of forms, metal shall be greater than 1/2" from surface where surface is not visible and 1-1/2" from surface where surface is to be visible in unfinished or finished space.

#### 2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Weldable Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.
- C. Plain-Steel Wire: ASTM A 82.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

## 2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.

## 2.5 MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I
    - a. Fly Ash: ASTM C 618, Class C or F.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, well graded. Provide aggregates from a single source. Fine aggregates to be free of materials with deleterious reactivity to alkali in cement.
- C. Light Weight Aggregates: ASTM C330.
- D. Water: Potable, clean and free from deleterious amounts of acids, alkalis or organic materials.

## 2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C 494, Type A.
  - 2. Retarding Admixture: ASTM C 494, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

## 2.7 FIBER REINFORCEMENT

- A. Synthetic Fiber: 100% virgin polypropylene, fibrillated, specific gravity 0.91, graded or minimum 3/4" uniform length, ICBO approved, to conform to ASTM C1116, Type III. Use in topping and slabs on grade at the rate of 3.0 pounds per cubic yard.

## 2.8 VAPOR RETARDERS

- A. ASTM E1745 Class C or A. Include manufacturer's recommended joint sealing tape.

## 2.9 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

## 2.10 CONCRETE MIXTURES, GENERAL

- A. Submit concrete mix design for each type of concrete at least 14 days prior to the proposed start of placement. Mix designs must be reviewed prior to pouring concrete. Review is for conformance with specification requirements only. Contractor is responsible for performance.
- B. Concrete shall conform to the requirements of ASTM C94 (Option A) unless other requirements of this project specification are more stringent. Establish mix proportions according to the procedure in ACI 301.
- C. Concrete Materials and Mixing for fiber-reinforced concrete: ASTM C1116 alternative number 2, performance level 1, and toughness index  $I_5$ .
- D. Provide concrete with workability such that it will fill the forms, without voids or honeycombs, when properly vibrated, without permitting materials to separate or excess water to collect on the surface
- E. Provide mixes meeting the following minimum requirements:

Use	28-Day Compressive Strength (Min.)	Maximum Aggregate Size	Air Content (ASTM C231)	Maximum Water Cement Ratio	Maximum Chloride Ion Content %
Footings, Caissons	3,000 psi	1-1/2" Class 1S	----	----	0.30
Walls (Interior)	4,000 psi	3/4" Class 1S	----	----	0.30

Use	28-Day Compressive Strength (Min.)	Maximum Aggregate Size	Air Content (ASTM C231)	Maximum Water Cement Ratio	Maximum Chloride Ion Content %
Columns, piers (Free-standing or Integral)	4,000 psi	3/4" Class 1S	----	----	1.00
Exterior Concrete, Garage Floors, Parking Ramps	4,000 psi	3/4" Class 4S	4½% - 7½%	0.45	0.15
Slabs on Grade	4,000 psi	3/4" Class 2S	----	----	1.00
Concrete Slab on Steel Deck	4,000 psi	3/4" Class 4S	----	----	1.00
Topping, Fill for Steel Pan Stairs	4,000 psi	3/8" Class 2S	----	----	1.00
Grade Beams, Supported Slabs and Beams	4,000 psi	3/4" Class 2S	----	----	1.00
Masonry Core Fill, Bond Beams, Lintels, Pilasters	3,000 psi	3/8" Class 1S	----	----	1.00
Lightweight Concrete	3,000 psi	3/8" Class 2S	----	----	1.00

- F. Structural lightweight concrete shall have an air-dry unit weight, per ASTM C567, of 115 pcf +/- 4 pcf.

## 2.11 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

## 2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and furnish batch ticket information.

## PART 3 - EXECUTION

### 3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.



- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  - 1. Install keyways, reglets, recesses, and the like, for easy removal.
  - 2. Do not use rust-stained steel form-facing material.
- D. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- E. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- F. Chamfer exterior corners and edges of permanently exposed concrete.
- G. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- H. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- I. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- J. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

### 3.3 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
  - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

### 3.4 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least two mesh spacings. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- E. All reinforcement including welded wire fabric and wall dowels are to be supported on chairs or bolsters. Lifting or laying reinforcement in wet concrete is not acceptable.

### 3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
  1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool 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 does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

### 3.6 CONCRETE PLACEMENT

- A. Place concrete in accordance with ACI 301, unless modified herein.
- B. Follow recommended practices of ACI 304, unless modified herein.
- C. Do not permit concrete to drop more than 5 feet from its point of release to mixers, hoppers, or conveyances. Use tremmies, chutes or pumps as necessary.

- D. Housekeeping pads not to exceed 4" thickness unless noted on the drawings.
- E. 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 average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- F. Hot-Weather Placement: Comply with ACI 301 and as follows:
  - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is Exposed formed surfaces: Smooth form finish per ACI 301. Provide a rubbed finish after removal of forms
  - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

### 3.7 FINISHING

- A. Formed Surfaces
  - 1. Concrete at tops of forms: Strike smooth and float to texture comparable to adjacent formed surfaces.
  - 2. Concealed formed surfaces: Rough form finish per ACI 301. Patch tie holes and defects, remove fins.
  - 3. Exposed formed surfaces: Smooth form finish per ACI 301. Provide a rubbed finish after removal of forms.
- B. Unformed Surfaces: Provide finishes per ACI 301 as scheduled and to the following tolerances. Conformance shall be determined by placing a freestanding straightedge on the surface. The gap beneath the straightedge shall not exceed that specified at more than 10% of the samples. Samples shall be evenly distributed over the surface and taken in an equal number of perpendicular directions with at least one sample per 100 square feet. No gap shall exceed that specified by more than 1/4".
  - 1. Troweled Finish: Conventional straightedged tolerance per ACI 117. Slope slab to floor drains.
  - 2. Scratched Finish: Bullfloated tolerance per ACI 117.
  - 3. Broom Finish: Conventional straightedged tolerance per ACI 117.
  - 4. Floated Finish: Conventional straightedged tolerance per ACI 117.
  - 5. Non-Slip Finish: Apply as a "dry shake" finish, wet abrasive prior to installation, and apply at a rate not less than 25 pounds per 100 square feet. Floated or broom finish.\
- C. Finish Schedule

1. As-cast rough form finish: Concealed walls, columns, beams, and slabs.
2. Rubbed smooth form finish: Exposed concrete walls, columns, beams, and wall caps.
3. Troweled finish: Exposed interior concrete floors and floors to receive carpeting, resilient flooring, or thin set tile finishes.
4. Floated finish: Floors to receive sand bed terrazzo.
5. Scratched finish: Floors to receive topping, or mortar setting beds for ceramic tile, quarry tile, pavers, etc.
6. Broom finish: Exterior platforms, aprons, ramps, loading docks, garage slabs.
7. Non-slip finish: Exposed concrete stair treads.

D. Clean exposed concrete to remove laitance, efflorescence and stains.

### 3.8 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  1. Moisture 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. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
    - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..

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.
  - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

### 3.9 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

### 3.10 FIELD QUALITY CONTROL

- A. Special Structural Testing and Inspection shall be performed by qualified parties as specified herein, and in accordance with the provisions of Section 014000.
- B. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- C. Inspections:
  1. Steel reinforcement placement.
  2. Steel reinforcement welding.
  3. Headed bolts and studs.
  4. Verification of use of required design mixture.
  5. Concrete placement, including conveying and depositing.
  6. Curing procedures and maintenance of curing temperature.
  7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: 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 one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture 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 mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Test Specimens: ASTM C 31.
  - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
  - a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. Strength of each concrete mixture will be satisfactory if every average of any three 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.
8. Test results shall be reported in writing to Architect, 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.
9. 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 Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.
10. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
11. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

END OF SECTION 033000



## SECTION 042200 - CONCRETE UNIT MASONRY

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Steel reinforcing bars.

#### 1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
- C. Samples: For each type and color of the following:
1. CMUs.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of product. For masonry units, include material test reports substantiating compliance with requirements.
- B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109 for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
  2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

## 1.5 QUALITY ASSURANCE

- A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
  - 1. Build sample panels for typical exterior wall in sizes approximately 48 inches long by 48 inches high by full thickness.

## 1.6 FIELD CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

## PART 2 - PRODUCTS

### 2.1 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
  - 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

### 2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
  - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- B. CMUs: ASTM C 90.
  - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi Retain one of first three options in "Density Classification"

Subparagraph below, or delete subparagraph for Contractor's option. Retain last option below for default requirement if using more than one weight. See the Evaluations.

2. Density Classification: Normal weight.

## 2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Aggregate for Mortar: ASTM C 144.
  1. White-Mortar Aggregates: Natural white sand or crushed white stone.
  2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- E. Aggregate for Grout: ASTM C 404.
- F. Water: Potable.

## 2.4 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A 615 or ASTM A 996, Grade 60.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement, General: ASTM A 951.
  1. Exterior Walls: Hot-dip galvanized carbon steel.
  2. Wire Size for Side Rods: 0.187-inch diameter.
  3. Wire Size for Cross Rods: 0.187-inch diameter.
  4. Spacing of Cross Rods: Not more than 16 inches o.c.
  5. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

## 2.5 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
  1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82, with ASTM A 153, Class B-2 coating.
  2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008, Commercial Steel, with ASTM A 153, Class B coating.

3. Steel Plates, Shapes, and Bars: ASTM A 36.

## 2.6 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene
- B. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

## 2.7 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
  1. Do not use calcium chloride in mortar or grout.
  2. Use portland cement-lime mortar unless otherwise indicated.
  3. For exterior masonry, use portland cement-lime mortar.
  4. For reinforced masonry, use portland cement-lime mortar.
  5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated.
  1. For masonry below grade or in contact with earth, use Type S.
  2. For interior non load-bearing partitions, Type O may be used instead of Type N.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
  1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
  2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi
  3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp,

unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

### 3.2 TOLERANCES

#### A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

#### B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet 1/4 inch in 20 feet or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet 3/8 inch in 20 feet or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet 1/4 inch in 20 feet or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet 3/8 inch in 20 feet, or 1/2-inch maximum.

#### C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

### 3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- E. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- F. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

### 3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
  - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
  - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
  - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
  - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

### 3.5 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
  - 1. Space reinforcement not more than 16 inches o.c.
  - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
  - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.



### 3.6 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
  - 1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
  - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
  - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

### 3.7 FLASHING

- A. General: Install embedded flashing at ledges and other obstructions to downward flow of water in wall where indicated.
- B. Install flashing as follows unless otherwise indicated:
  - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
  - 2. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
  - 3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
  - 4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

### 3.8 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
  - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
  2. Limit height of vertical grout pours to not more than 60 inches.

### 3.9 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
  2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
  3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- I. Prism Test: For each type of construction provided, according to ASTM C 1314 at seven days and at 28 days.

### 3.10 PARGING

- A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat, and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

### 3.11 REPAIRING, POINTING, AND CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
  - 2. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

### 3.12 MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
  - 1. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

**SECTION 04 43 00 - INSULATED MASONRY VENEER SYSTEM**

## PART I - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## I.2 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
  - 1. Ground Face Masonry Units attached to pre-molded polystyrene backup panels.
  - 2. Weep materials.
  - 3. Elastomeric flashing
- A. Related Sections include the following:
  - 1. Division 07 Section "Joint Sealants" for sealing control and expansion joints in unit masonry.

## I.3 SUBMITTALS

- A. Product Data: For each type of product indicated, include:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Color charts.
  - 4. Installation methods.
  - 5. Manufacturer is responsible for all engineering of this system.
- B. Shop Drawings: For the following:
  - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
  - 2. Flashing: Submit detail drawings showing proper installation and flashing techniques.
  - 3. Letter on manufacturer's letterhead from structural engineer registered in state of Minnesota that the insulated masonry veneer system, its assembly, and anchorages for this specific project meet all applicable code requirements, can accommodate all live and dead loads required, and their attachment locations and fasteners are non-corrosive, moisture protected and durable for 25 years.
- C. Samples for Verification: For each type and color of the following:
  - 1. Exposed concrete masonry units.
  - 2. Accessories embedded in masonry.
- D. Qualification Data: For testing agency.
- E. Quality Assurance / Product Control Submittals:
  - 1. Proof of manufacturer qualifications as described in Article - Qualifications.
  - 2. Proof of installer qualifications as described in Article - Qualifications.
  - 3. Test Reports for physical properties upon request.
- F. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

#### I.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall be a manufacturer authorized installer and shall have completed the manufacturer's authorized installer program.
- B. Pre-installation Conference: Conduct conference at Project site. Product manufacturer's representative, Contractor, Architect and Mason Contractor to attend.
- C. Mockup Panel: Construct a sample panel, no less than 4' x 4', of units of each color and size to be used in the project. Approved panels may become part of the permanent work.
- D. Concrete blocks for grinding shall conform to ASTM C90. After the initial grinding process to expose the variegated colors of the natural aggregates, the pores and interstices of Trendstone Plus filled and polished units are filled with a cementitious grout and polished smooth in a multi-stage polishing process. Both the ground face and filled and polished surfaces shall have a factory-applied heat-treated acrylic or water-based sealer finish.
- E. Units shall conform to ASTM C1262 with respect to freezing and thawing.

#### I.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until approved by manufacturer's representative.
- B. Store accessory materials on elevated platforms, under cover, and in a dry location.
  - 1. Do not use accessory materials that have become damp.
  - 2. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
- C. Protection of Work: Cover walls each day after installation to keep open walls protected and dry. After units are installed they should be protected from damage by other trades performing operations that can stain or otherwise damage the finished surfaces by covering walls with plastic. Corners should be protected from damage after installation by covering them with plywood.

#### I.6 REFERENCES

- A. The following reference standards are incorporated into this section by reference:
  - 1. ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
  - 2. ASTM C 920 Standard Specification for Elastomeric Joint Sealants.
  - 3. ASTM E330 Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
  - 4. ASTM E2265 Standard Terminology for Anchors and Fasteners in Concrete & Masonry
- B. Building Code Compliance:
  - 1. Building Code Requirements for Masonry Structures (ACI 530-08/ASCE 5-08/TMS 402-08).
  - 2. Specifications for Masonry Structures (ACI 530-08/ASCE 5-08/TMS 402-08).
  - 3. Commentary on Building Code Requirements for Masonry Structures (ACI 530-08/ASCE 5-08/TMS 402-08).
  - 4. Commentary on Specifications for Masonry Structures (ACI 530-08/ASCE 5-08/TMS 402-08).

## 1.7 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress to prevent moisture from entering the tops of walls.
  - 1. Extend cover a minimum of 24 inches (600 mm) down the face of the masonry and hold cover securely in place.
- B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining the face of masonry.
  - 1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on the ground and over the wall surface.
  - 2. Protect sills, ledges, and projections from mortar droppings.
  - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  - 4. Turn scaffold boards near the wall on edge at end of each day to prevent rain from splashing mortar and dirt on completed stone masonry.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace stone masonry damaged by frost or freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
  - 2. Comply with Brick Industry Association (BIA) Technical Notes # 1.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
  - 1. Comply with Brick Industry Association (BIA) Technical Notes # 1.
- E. In order to maintain flowability and tackiness of adhesive it shall only be applied at temperatures of between 40°F to 120°F. Adhesive may be warmed by using a commercial electric heater of type designed for heating sealant grade adhesives. For best adhesion masonry units receiving adhesive should also be above 40°F at time on installation.

## 1.8 COORDINATION

- A. Advise installers of other work about specific requirements for flashing, and similar items to be built into masonry.
- B. Installer should coordinate installation through the Project Manager/General Contractor in order to ensure safe working conditions. Masonry veneer units are held temporarily by the insulation board, therefore vibration caused by nearby building activity could cause units to be displaced or fall.

## 1.9 WARRANTY

- A. Warranty on system, installation and components for 25 years from date of Substantial Completion.



## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS (BRICK-1)

- A. Acceptable manufacturers;
  - I. Oldcastle Architectural Inc.

## 2.2 MASONRY MATERIALS

- A. Masonry Units as follows:
  - I. Ground Face Masonry Units specified and shown on drawings shall be manufactured by the Oldcastle Architectural Inc.
    - a. Product: Trendstone
    - b. Color: Midwest Slate
    - c. Size: 4 inch by 16 inch, nominal
- B. EnduraMax™ Clay Brick All EnduraMax™ Clay Brick
  - I. Thin Brick: ASTM C 1088, Grade Exterior
  - 2. Type: TBS
    - a. Size: Engineer Modular: 1 3/4" (44.5 mm) thick 2 3/4" (69.9 mm) high, 7 5/8" (193.7 mm) long
- C. Mortar as follows:
  - I. EnduraMax™ mortar as manufactured by Oldcastle® Architectural. Mortar shall conform to ASTM C 270 Standard Specification for Mortar for Unit Masonry Type N or S

## 2.3 POLYSTYRENE BACKUP PANELS

- A. Molded-Polystyrene Board: Meeting ASTM C 578, EPS Type I
  - I. Pre-molded insulation panels as manufactured by Polyform.
- B. Polystyrene insulation panels shall be molded to fit the shapes of the clay brick selected so that each clay brick can be snapped into the panel allowing the clay brick to be installed flush with the back of the panels.
- C. Molded-Polystyrene panels shall be 2' x 48" x 48" for clay brick units.
- D. Backs of polystyrene panels shall be fabricated with grooved drainage channels to allow water to travel to flashing system and exterior of building veneer.
- E. Ensure polystyrene insulation does not come in direct contact with petroleum based solvents.

## 2.4 ADHESIVE MATERIALS

- A. Loctite® PL 300® VOC Foamboard Adhesive
- B. Gorilla Glue Polyurethane Adhesive by The Gorilla Glue Company

## 2.5 ANCHORS AND SUPPORTS

- A. Anchors: Manufacturer's supplied anchors shall be fabricated of stainless steel sheet meeting ASTM A 240/A 240M, Type 304. Anchors shall be attached to structural masonry backup wall with approved masonry screws. Use one (1) anchor/screw per 2.1 sq. ft. section of wall being covered (16" OC on vertical studs by 19" high).
- B. Fasteners:
  - 1. Wood Stud Applications: #10x 3-1/2" (min), Course Thread, 302HQ stainless steel screw with a Type FT 17 cutting tip, and a flat (countersunk) or bugle head and a minimum nominal shank diameter of 0.190 in. Screws must be of sufficient length to penetrate a minimum 1-inch (25 mm) minimum into structural members.
  - 2. CMU/Concrete Backup: 3/16" x 3-3/4" (min) carbon steel philips flat (countersunk) head screw add the thickness of the material to be fastened and a minimum 1" embedment into the concrete/CMU. Corrosion protection equal to a minimum protection of 750 Hours with 10% or less red rust when tested according to ASTM B117, Tapcon or equal.

## 2.6 FLASHING AND WEEP MATERIALS

- A. Galvanized Metal Flashing as supplied by manufacturer: 2.75 mm (12-gauge), 2-1/2 in. x 3-3/4 in. (63.5 mm x 95.2 mm) by 10 ft. (3 m), with 1/2 inch drip edge.
- B. Rubberized-Asphalt Flexible Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch (0.8 mm). Provide W. R. Grace & Co. "Perm-A-Barrier Wall Flashing" or similar approved.
  - 1. Adhesives, Primers, and Seam Tapes for Flexible Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- C. Weep Hole/Vent Products: Free-draining nylon mesh weephole cubes are supplied with the manufacturer's system. Open head joints are also acceptable weep holes.

## 2.7 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from concrete stone or clay brick masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone or brick producer.
  - 1. Approved cleaners: Vanatrol by ProSoCo, Inc..

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces indicated to receive [concrete stone] [clay brick] masonry units, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. If installed on a footer or foundation wall, the top of the footer or foundation shall be free of bumps and depressions. If unevenness is present, high spots shall be removed and depressions shall be filled.
  - 1. The footer or foundation bearing support shall not be less than 3-1/4 in (82.55 mm).

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION OF FLASHING

- A. Install flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
- C. Carry flashing vertically as detailed, but not less than 6 inches (150 mm) above horizontal plane. When present, flashing must overlap weather resistant barrier (WRB) a minimum of 3", with the flashing lap behind the WRB.
- D. Lap flexible flashing a minimum of 6 inches (152 mm).
- E. Seal all flashing laps with compatible lap cement.
- F. Extend head and sill flashings not less than 6 inches (150 mm) beyond edges of openings and turn up to form a watertight pan; seal with mastic.
- G. All discontinuous flashing shall be turned up minimum 1-inch into the head joint at flashing ends to form an end dam.
- H. Project flashing from face of wall approximately 1/4-inch (6 mm) to form a drip. Flexible flashing shall be cut back to the face of the wall after inspection, if the drip is deemed objectionable by Architect or if the flashing is subject to UV degradation.

### 3.3 INSTALLATION OF POLYSTYRENE PANELS

- A. Follow manufacturer's written installation guidelines regarding specific procedures for installing the polystyrene panels and installation of the stone and brick.
- B. Attach the polystyrene panels to back-up wall with stainless steel anchors and screws.
  - I. Space not more than 16 inches (406 mm) o.c. vertically and 19 inches (482 mm) o.c. horizontally with not less than 1 anchor for each 2.1 sq. ft. (0.185 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of window openings at intervals not exceeding 8" inches apart, around window perimeter.
- C. Attach the anchors near the foam pocket edges so that prongs are visible with the masonry units in place. Prongs shall be embedded in the mortar joint.
- D. Place a horizontal caulk bead (using caulking compatible with the polystyrene) about 2 in. (5 cm) below the planned soffit level. Placing caulk here improves thermal performance.
- E. Leave a clearance of at least 3/8 in (10 mm) between the bottom of the polystyrene panel and the base of the wall, the top of the steel support angle or lintel to allow for the installation of the weep holes and drainage.

### 3.4 INSTALLING CLAY BRICK INTO POLYSTYRENE PANELS

- A. At some locations Masonry Units shall be cut to the required size before inserting them in polystyrene pockets. Stone cutters, concrete saws or ceramic tile saws are acceptable. Ensure cut surface is not exposed to finished face of wall.
- B. Place the clay brick into the appropriate polystyrene insulation pocket.
  - 1. Ensure the back face of the masonry unit sits flat against the face of the insulation panel. If initial installation of the unit does not sit flush, remove the unit and clear the area to allow proper placement of the unit and reinstall the masonry unit
- C. Lay units using the best concrete masonry practices.
- D. Install only quality units; reject all defective units as defined by ASTM C90. Lay blocks with the faces level, plumb and true to the line strung horizontally at the ground or filled and polished face. Units shall have uniform, 3/8"-wide joints both horizontally and vertically on the finished side of the wall. Install flashing and weep holes as needed at shelf angles, lintels, ledges and other obstructions to allow for the unimpeded downward flow of water.
- E. Place weep holes in mortar joints where moisture may accumulate, including at base of walls, and above all lintels. The weeps should be located under the first course/row of masonry at the level of the mortar joint, directly at the foundation or the support angle.
  - 1. Use free draining mesh, open head joint or other manufacturer approved material supplied as part of the manufacturer system.
  - 2. Space weep holes no more than 32 inches (800 mm) apart.

### 3.5 MOVEMENT JOINTS

- A. Build joints as work progresses.
  - 1. Spacing
    - a. Clay Brick Units: install Expansion Joints no more than 30 feet apart
  - 2. Other Locations
    - a. Install movement joints
      - 1) Within 4 feet of outside corners
      - 2) At interior corners
      - 3) At changes in wall height
  - 3. Follow all movement joint recommendations provided by NCMA and BIA for, respectively, concrete masonry units and clay brick units.
- B. Install Joints with Backer Rod and Joint Sealant when required; in accordance with manufacturer's instructions.

### 3.6 MORTAR MIXING AND INSTALLATION

- A. Preparing A Batch Of Mortar: Use approximately  $\frac{3}{4}$  gallons of water for each 50 lb. bag of mortar to achieve proper consistency for selected "injection" equipment (grout bag, Quik Point mechanized caulking gun or Imer Pump). This proportion can be adjusted if the mixture is too thick or too runny or to suit the climatic conditions during installation.
- B. Injecting the Mortar:
  - 1. Fill the joints completely by injecting the mortar into the joint cavities thoroughly, embedding the prongs of the anchors in the process.

- C. Tool joints, when mortar is thumbprint hard, with a jointing tool (metal, wood dowel, etc.) into a concave configuration.
  - 1. Lay units with full mortar coverage on head and bed joints taking care not to block cores to be grouted or filled with masonry insulation.
  - 2. Care should be taken to remove mortar from the face of masonry units before it sets.
  - 3. Tuckpoint the joints of scored units for proper appearance. All exterior scored units must be tuckpointed to prevent water penetration.
    - a. Do not rake joints.

### 3.7 INSULATION CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (10 mm in 6 m), or 1/2 inch in 40 feet (13 mm in 12 m) or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (13 mm in 12 m) or more.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (13 mm in 12 m) or more.
- C. The masonry unit faces shall conform to the requirements of ASTM C90 when viewed from a distance of twenty (20) feet at right angles to the wall with normal lighting.

### 3.8 ADJUSTING AND CLEANING

- A. Remove and replace masonry units that:
  - 1. are broken, chipped, stained, or otherwise damaged units. Units may be repaired if methods and results are approved by Architect.
  - 2. have defective joints.
  - 3. do not match approved samples and mockups.
- B. Replace in a manner that matches approved samples and mockups and complies with other requirements while no evidence of replacement.
- C. Keep walls clean daily during installation using brushes, rags and the burlap squares supplied on the pallets. Harsh cleaning methods after walls have been erected will mar the surface of the blocks.
- D. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints. Protect the base of the wall from mortar and/or mud splatter. Do not allow excess mortar lumps or smears to harden on the finished surfaces.
- E. Cleaning Mortar Residue: If any mortar residue remains on the stones once the mortar has dried, use a masonry cleaner according to the manufacturer's instructions. Do not pressure wash or acid wash the system to clean the surface.
- F. Efflorescence: In the weeks and months following installation, efflorescence may occur. This is normal, and disappears with time. However, it can be cleaned by brushing the stone with a soft-bristle brush dipped in a gentle masonry cleaner. Rinse by spraying gently with a watering hose. Do not use a pressure washing system.
- G. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before cleaning stone masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Clean the completed masonry walls with manufacturer's recommended cleaner applied according to manufacturer's written instructions.

### 3.9 MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
  1. Crush masonry waste to less than 4 inches in each dimension.
  2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31 Section "Earth Moving."
  3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 43 00



## SECTION 06 10 00 - ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Framing with dimension lumber.
  - 2. Framing with engineered wood products.
  - 3. Wood blocking, cants, and nailers.
  - 4. Wood furring and grounds.
  
- B. Related Sections include the following:
  - 1. Division 6 Section "Sheathing."
  - 2. Division 6 Section "Metal-Plate-Connected Wood Trusses."

#### 1.3 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Timber: Lumber of 5 inches nominal or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
  - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
  - 2. NLGA: National Lumber Grades Authority.
  - 3. RIS: Redwood Inspection Service.
  - 4. SPIB: The Southern Pine Inspection Bureau.
  - 5. WCLIB: West Coast Lumber Inspection Bureau.
  - 6. WWPA: Western Wood Products Association.

## 1.4 SUBMITTALS

- A. **Product Data:** For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
  2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
  3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
  4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
  5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. **Fastener Patterns:** Full-size templates for fasteners in exposed framing.
- C. **Material Certificates:** For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- D. **Research/Evaluation Reports:** For the following, showing compliance with building code in effect for Project:
1. Wood-preservative-treated wood.
  2. Fire-retardant-treated wood.
  3. Engineered wood products.
  4. Power-driven fasteners.
  5. Powder-actuated fasteners.
  6. Expansion anchors.
  7. Metal framing anchors.

## 1.5 QUALITY ASSURANCE

- A. **Source Limitations for Engineered Wood Products:** Obtain each type of engineered wood product through one source from a single manufacturer.
- B. **Forest Certification:** For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":
1. Dimension lumber framing.
  2. Laminated veneer lumber.
  3. Parallel-strand lumber.

4. Prefabricated wood I-joists.
5. Rim boards.
6. Miscellaneous lumber.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

## PART 2 - PRODUCTS

### 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  1. Factory mark each piece of lumber with grade stamp of grading agency.
  2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
  3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
  4. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
  1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

### 2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWWA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWWA C31 with inorganic boron (SBX).
  1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
  3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
  4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
  5. Wood floor plates that are installed over concrete slabs-on-grade.

### 2.3 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 19 percent for 2-inch nominal (38-mm actual) thickness or less, no limit for more than 2-inch nominal (38-mm actual) thickness.
- B. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade of any species.
- C. Exterior and Load-Bearing Walls and Framing Other Than Non-Load-Bearing Interior Partitions: See structural drawings.
- D. Ceiling Joists (Non-Load-Bearing): Construction or No. 2 grade of any species.
- E. Joists, Rafters, and Other Structural Framing Not Listed Above: See structural drawings.
- F. Exposed Exterior or Interior Framing Indicated to Receive a Stained or Natural Finish: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.
1. Species and Grade: As indicated above for load-bearing construction of same type.

## 2.4 ENGINEERED WOOD PRODUCTS

- A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559 and containing no urea formaldehyde.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Boise Cascade Corporation.
    - b. Finnforest USA.
    - c. Georgia-Pacific.
    - d. Louisiana-Pacific Corporation.
    - e. Pacific Woodtech Corporation.
    - f. Roseburg Forest Products Co.
    - g. Weldwood of Canada Limited; Subsidiary of International Paper Corporation.
    - h. Weyerhaeuser Company.
    - i. Weekes Forest Products, Inc.
  3. Extreme Fiber Stress in Bending: 2600 psi minimum.
  4. Modulus of Elasticity, Edgewise: 1,900,000 psi minimum.
- B. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559 and containing no urea formaldehyde.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Weyerhaeuser Company.
  2. Extreme Fiber Stress in Bending, Edgewise: 2900 psi (20 MPa) for 12-inch nominal depth members.
  3. Modulus of Elasticity, Edgewise: 2,200,000 psi.
- C. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Provide units complying with material requirements of and with structural capacities established and monitored according to ASTM D 5055.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Anthony-Domtar Inc.
  - b. Boise Cascade Corporation.
  - c. Georgia-Pacific.
  - d. Huber, J. M. Corporation.
  - e. International Beams Inc.
  - f. International Paper Corporation.
  - g. Jager Building Systems Inc.
  - h. Louisiana-Pacific Corporation.
  - i. Nascor Incorporated.
  - j. Pacific Woodtech Corporation.
  - k. Roseburg Forest Products Co.
  - l. Standard Structures Inc.
  - m. Stark Truss Company, Inc.
  - n. Superior Wood Systems.
  - o. Weyerhaeuser Company.
  - p. Weekes Forest Products, Inc
3. Provide I-joists manufactured without urea formaldehyde.
  4. Structural Properties: Provide units with depths and design values not less than those indicated.
  5. Provide units complying with APA PRI-400, factory marked with APA trademark indicating nominal joist depth, joist class, span ratings, mill identification, and compliance with APA standard.
- D. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research/evaluation report for I-joists.
1. Manufacturer: Provide products by same manufacturer as I-joists.
  2. Material: Product made from any combination solid lumber, wood strands, and veneers. Provide rim boards made without urea formaldehyde. Provide material data upon request.
  3. Thickness: See structural drawings.
  4. Provide performance-rated product complying with APA PRR-401, rim board, factory marked with APA trademark indicating thickness, grade, and compliance with APA standard.

## 2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
  2. Nailers.
  3. Rooftop equipment bases and support curbs.
  4. Cants.
  5. Furring.
  6. Grounds.
  7. Utility shelving.



- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.
- C. For exposed boards, provide lumber with 19 percent maximum moisture content and of the species indicated.
- D. For concealed boards, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.
- E. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- F. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- G. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

## 2.6 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

## 2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153 or of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 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 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

## 2.8 METAL FRAMING ANCHORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following: Submit signed letter from manufacturer stating that products meet or exceed products indicated on drawings upon request.
  1. Alpine Engineered Products, Inc.
  2. Cleveland Steel Specialty Co.
  3. Harlen Metal Products, Inc.
  4. KC Metals Products, Inc.
  5. Simpson Strong-Tie Co., Inc.
  6. Southeastern Metals Manufacturing Co., Inc.
  7. USP Structural Connectors.
- D. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated or 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. Submit signed letter from manufacturer stating that products meet or exceed products indicated on drawings upon request.
- E. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60 (Z180) coating designation.
  1. Use for interior locations where stainless steel is not indicated.
- F. Stainless-Steel Sheet: ASTM A 666, Type 304 or 316.
  1. Use for exterior locations, in locations in contact with treated lumber, and where indicated.
- G. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base and with 2-inch- minimum side cover, socket 0.062 inch thick, and standoff and adjustment plates 0.108 inch thick.
- H. Install metal framing anchor and fasteners in strict accordance to manufacturer's recommendations.

## 2.9 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.
- B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- C. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
  - 1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
- E. Do not splice structural members between supports, unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
  - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
  2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- thickness.
  3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
  4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- H. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- I. Comply with AWWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
1. Use inorganic boron for items that are continuously protected from liquid water.
  2. Use copper naphthenate for items not continuously protected from liquid water.
- J. 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.
  3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's Uniform Building Code.
- K. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.
- L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
1. Comply with indicated fastener patterns where applicable.
  2. Use finishing nails, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
- 3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION
- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

### 3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal size furring horizontally at 24 inches o.c.
- C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal size furring vertically at 16 inches o.c.

### 3.4 WALL AND PARTITION FRAMING INSTALLATION

- A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions and for load-bearing partitions where framing members bearing on partition are located directly over studs. Fasten plates to supporting construction, unless otherwise indicated.
  - 1. For exterior walls, provide framing as indicated.
  - 2. For interior partitions and walls, provide framing as indicated.
  - 3. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.
- B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.
  - 1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.
  - 2. For load-bearing walls, provide double-jamb studs for openings 60 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated.

### 3.5 FLOOR JOIST FRAMING INSTALLATION

- A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:

1. Where supported on wood members, by toe nailing or by using metal framing anchors.
  2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.
- B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches and do not embed more than 4 inches.
- C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.
- D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches from top or bottom.
- E. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.
- F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.
- G. Anchor members paralleling masonry with 1/4-by-1-1/4-inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to 3 joists. Embed anchors at least 4 inches into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.
- H. Provide solid blocking between joists under jamb studs for openings.
- I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.
- J. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.
1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal- size lumber, double-crossed and nailed at both ends to joists.
  2. Steel bridging installed to comply with bridging manufacturer's written instructions.

### 3.6 CEILING JOIST AND RAFTER FRAMING INSTALLATION

- A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal- size or 2-by-4-inch nominal- size stringers spaced 48 inches o.c. crosswise over main ceiling joists.



- B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
  - 1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
  - 2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.
- C. Provide collar beams (ties) as indicated or, if not indicated, provide 2-by-6-inch nominal- size boards between every rafter, but not more than 24 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.
- D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.

### 3.7 STAIR FRAMING INSTALLATION

- A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:
  - 1. Stringer Size: 2-by-12-inch nominal- size, minimum.
  - 2. Stringer Material: solid lumber.
  - 3. Notching: Notch stringers to receive treads, risers, and supports; leave at least 3-1/2 inches of effective depth.
  - 4. Stringer Spacing: At least 3 stringers for each 36-inch clear width of stair.
- B. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

### 3.8 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather.

END OF SECTION 06100

## SECTION 061600 - SHEATHING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.
3. Subflooring.
4. Sheathing joint and penetration treatment.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

##### B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

##### C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

##### D. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Wood-preservative-treated wood.
2. Engineered wood products.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Post Installed anchors.
6. Metal framing anchors.

#### 1.3 QUALITY ASSURANCE

##### A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

- B. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":
1. Dimension lumber framing.
  2. Laminated veneer lumber.
  3. Parallel-strand lumber.
  4. Prefabricated wood I-joists.
  5. Rim boards.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

### 2.2 WOOD PANEL PRODUCTS

- A. Emissions: Products shall meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

### 2.3 WALL SHEATHING

- A. Plywood Wall Sheathing: CDX, Exposure 1 sheathing.
1. Span Rating: Not less than 32/16 – See Structural
  2. Nominal Thickness: Not less than 1/2 inch – See Structural
- B. Oriented-Strand-Board Wall Sheathing: CDX, Exposure 1 sheathing.
1. Span Rating: Not less than 32/16 – See Structural
  2. Nominal Thickness: Not less than 1/2 inch – See Structural
- C. Size: 48 by 96 inches.

### 2.4 ROOF SHEATHING

- A. Plywood Roof Sheathing: CDX, Exposure 1 sheathing.
1. Span Rating: Not less than 32/16 – See Structural
  2. Nominal Thickness: Not less than 1/2 inch – See Structural

B. Oriented-Strand-Board Roof Sheathing: CDX, Exposure 1 sheathing.

1. Span Rating: Not less than 32/16 – See Structural
2. Nominal Thickness: Not less than 1/2 inch – See Structural

## 2.5 SUBFLOORING AND UNDERLAYMENT

A. Plywood Combination Subfloor-Underlayment: CDX, Exposure 1 sheathing.

1. Span Rating: Not less than 32” o.c.
2. Nominal Thickness: Not less than 3/4 inch – See Structural
3. Edge Detail: Tongue and Groove.
4. Surface Finish: Fully sanded face.

B. Oriented-Strand-Board Combination Subfloor-Underlayment: CDX, Exposure 1 single-floor panels.

1. Span Rating: Not less than 32 o.c. – See Structural
2. Nominal Thickness: Not less than 3/4 inch – See Structural
3. Edge Detail: Tongue and groove.
4. Surface Finish: Fully sanded face.

C. Plywood Subflooring: CDX, Exposure 1 single-floor panels or sheathing.

1. Span Rating: Not less than 32/16 – See Structural
2. Nominal Thickness: Not less than 3/4 inch – See Structural

D. Oriented-Strand-Board Subflooring: CDX, Exposure 1, single-floor panels or sheathing.

1. Span Rating: Not less than 32/16.
2. Nominal Thickness: Not less than 3/4 inch.

E. Underlayment, General: Provide underlayment in nominal thicknesses indicated or, if not indicated, not less than 1/4 inch (6.4 mm) over smooth subfloors and not less than 3/8 inch (9.5 mm) over board or uneven subfloors.

F. Plywood Underlayment for Resilient Flooring: DOC PS 1, Exposure 1 Underlayment with fully sanded face.

G. Plywood Underlayment for Ceramic Tile: DOC PS 1, Exterior, C-C Plugged, not less than 5/8-inch (15.9-mm) nominal thickness, for ceramic tile set in organic or epoxy adhesive.

H. Plywood Underlayment for Carpet: DOC PS 1, Exposure 1, Underlayment.

I. Particleboard Underlayment: ANSI A208.1, Grade PBU M-2, Exterior Glue, complying with dimensional tolerances and thickness swell requirements of Grade PBU.

J. Hardboard Underlayment: AHA A135.4, Class 4 (Service), Surface S1S; with back side sanded.

## 2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  - 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
  - 1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
- F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
  - 1. For steel framing less than 0.0329 inch (0.835 mm) thick, attach sheathing to comply with ASTM C 1002.
  - 2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, attach sheathing to comply with ASTM C 954.
- G. Screws for Fastening Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117. Provide washers or plates if recommended by sheathing manufacturer.

## 2.7 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 and ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
  - 1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.025.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
  - b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Plus Self-Adhered Flashing, Vycor V40 Weather Barrier Strips.
  - c. MFM Building Products Corp.; Window Wrap.
  - d. Polyguard Products, Inc.; Polyguard 300.
  - e. Protecto Wrap Company; BT-20 XL, PS-45.
- C. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code or as indicated in the structural documents.
  2. ICC-ES evaluation report for fastener.
- D. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

### 3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  1. Subflooring:
    - a. Nail or screw to wood framing.
    - b. Screw to cold-formed metal framing.
    - c. Space panels 1/8 inch apart at edges and ends.



2. Wall and Roof Sheathing:
  - a. Nail to wood framing.
  - b. Screw to cold-formed metal framing.
  - c. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 061600

## SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

### 1.1 SUMMARY

#### A. Section Includes:

1. Wood roof trusses.
2. Wood girder trusses.

### 1.2 ALLOWANCES

- #### A. Provide wood truss bracing under the Metal-Plate-Connected Truss Bracing Allowance as specified in Section 012100 "Allowances."

### 1.3 ACTION SUBMITTALS

- #### A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.

- #### B. Shop Drawings: Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
6. Show splice details and bearing details.

- #### C. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

### 1.4 INFORMATIONAL SUBMITTALS

- #### A. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss-fabricating firm.

- #### B. Evaluation Reports: For the following, from ICC-ES:

1. Metal-plate connectors.
2. Metal truss accessories.

## 1.5 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
  - 1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
  - 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program, complies with quality-control procedures in TPI 1, and involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store trusses to comply with recommendations in SBCA BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal-plate-connected wood trusses.
- B. Structural Performance: Metal-plate-connected wood trusses shall be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1.
- C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.
- D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

### 2.2 DIMENSION LUMBER

- A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (ALSC) Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Provide dry lumber with 15 percent maximum moisture content at time of dressing.
- B. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061000 "Rough Carpentry."

## 2.3 METAL CONNECTOR PLATES

- A. General: Fabricate connector plates to comply with TPI 1.
- B. Hot-Dip Galvanized-Steel Sheet: ASTM A 653; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.

## 2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
  - 2. Where trusses are exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153.
- B. Nails, Brads, and Staples: ASTM F 1667.

## 2.5 METAL FRAMING ANCHORS AND ACCESSORIES

- A. Allowable design loads, as published by manufacturer, shall comply with or exceed 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. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60 coating designation.

## 2.6 FABRICATION

- A. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
  - 1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- B. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.

- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.
- F. Securely connect each truss ply required for forming built-up girder trusses.
- G. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
  - 1. Install bracing to comply with Section 061000 "Rough Carpentry."
  - 2. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.
- H. Install wood trusses within installation tolerances in TPI 1.
- I. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.
- J. Replace wood trusses that are damaged or do not comply with requirements.

END OF SECTION 061753

**SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Pre-finished and field finished wood interior casing, standing and running trim.
  - 2. Plastic-laminate countertops.
  - 3. Cultured Marble countertops.
  - 4. Wood trim, stair and stair railings
- B. Related Sections include the following:
  - 1. Division 06 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
  - 2. Division 12 Residential Casework for prefabricated cabinets.

**1.3 DEFINITIONS**

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.
- B. Rough carriages for stairs are a part of interior architectural woodwork. Platform framing, headers, partition framing, and other rough framing associated with stairwork are specified in Division 06 Section "Rough Carpentry."

**1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated, including cabinet hardware and accessories, handrail brackets, and finishing materials and processes.
- B. Product Data: For high-pressure decorative laminate, adhesive for bonding plastic laminate, solid-surfacing material, cabinet hardware and accessories, handrail brackets, and finishing materials and processes.
- C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
  - 1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
  - 2. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers and other items installed in architectural woodwork.
- D. Samples for Initial Selection:
  - 1. Plastic laminates.
  - 2. Solid-surfacing materials.
- E. Samples for Verification:
  - 1. Lumber with or for transparent finish, not less than 50 sq. in. (300 sq. cm), for each species and cut, finished on 1 side and 1 edge.
  - 2. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.



3. Lumber and panel products with shop-applied opaque finish, 50 sq. in. (300 sq. cm) for lumber and 8 by 10 inches (200 by 250 mm) for panels, for each finish system and color, with exposed surface finished.
4. Plastic laminates, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with 1 sample applied to core material and specified edge material applied to 1 edge.
5. Thermoset decorative-panels, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish.
6. Solid-surfacing materials, 6 inches (150 mm) square.
7. Corner pieces as follows:
  - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.
  - b. Miter joints for standing trim.
8. Exposed cabinet hardware and accessories, one unit for each type and finish.

F. Product Certificates: For each type of product, signed by product manufacturer.

G. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

H. Qualification Data: For fabricator.

#### I.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

B. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers and wood doors with face veneers that are sequence matched with woodwork and transparent-finished wood doors that are required to be of same species as woodwork.

C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. Provide AWI Quality Certification Program certificates indicating that woodwork complies with requirements of grades specified.
2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with such selections and requirements in addition to the quality standard.

D. All composite wood materials must be Urea Formaldehyde-free and certified per ANSI A208.1 and A208.2.

#### I.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

#### I.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

## 1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species and Cut for Transparent Finish (WD-1):
  - 1. Species and cut: Quarter sawn White Oak
  - 2. AWI Grade: Grade II
  - 3. Thickness: As noted on drawings.
  - 4. Edges: Eased edge at all exposed outside edges.
- C. Wood Species for Opaque Finish (WD-2):
  - 1. Species: Paint grade birch
  - 2. AWI Grade: Grade II
  - 3. Thickness: As noted on drawings.
  - 4. Edges: Eased edge at all exposed outside edges.
- D. Wood Products: Comply with the following:
  - 1. Recycled Content of Medium-Density Fiberboard and Particleboard: Provide products with an average recycled content of not less than ten percent.
  - 2. Hardboard: AHA A135.4.
  - 3. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
  - 4. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
  - 5. Softwood Plywood: DOC PS 1, Medium Density Overlay.
- E. Post Formed High-Pressure Decorative Laminate (PLAM-1): NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
  - 1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
    - a. Arborite; Division of ITW Canada, Inc.
    - b. Formica Corporation.
    - c. Nevamar Company, LLC; Decorative Products Div.
    - d. Wilsonart International; Div. of Premark International, Inc.
    - e. Or approved equal
  - 2. Basis of Design:
    - a. Manufacturer: Formica
    - b. Color: Graphite
    - c. Finish: Matte
  - 3. Edge Detail @ Countertop: ¾" Double Waterfall Edge with ¼" Radius

4. Substrate Material: Use only sanded, marine grade plywood substrate under PLAM-I at countertops.
- F. Cultured Marble Countertops (SSF-I): Gel-coated solid fabrication of filled plastic resin complying with ANSI Z124.3, Type 4, with pre-coated finish
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Leslie Marble
    - b. Or approved equal
  2. Product: Cultured Marble Vanity Top
  3. Colors: Smoked Almond #C119
  4. Thickness: 3/4 inch *with dripless edge*
  5. Bowl Style: Newport
  6. Backsplash: Include
  7. Finish: Gloss
  8. Fabricate tops in one piece, unless otherwise indicated. Comply with material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing
    - a. Fabricate tops with loose backsplashes for field application.
    - b. Install integral sink bowls in countertops in shop.
    - c. Drill holes in countertops for plumbing fittings and soap dispensers in shop.

## 2.2 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)."
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 110 degrees of opening.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
- D. Wire Pulls: To be installed by Owner after cabinet installation
- E. Catches: Magnetic catches, BHMA A156.9, B03141
- F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112.
- G. Shelf Rests: BHMA A156.9, B04013; metal
- H. Drawer Slides: BHMA A156.9, B05091.
  1. Heavy Duty (Grade IHD-100 and Grade IHD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
  2. Box Drawer Slides: Grade IHD-100; for drawers not more than 6 inches (150 mm) high and 24 inches (600 mm) wide.
  3. File Drawer Slides: Grade IHD-200; for drawers more than 6 inches (150 mm) high or 24 inches (600 mm) wide.
  4. Pencil Drawer Slides: Grade I; for drawers not more than 3 inches (75 mm) high and 24 inches (600 mm) wide.
  5. Keyboard Slides: Grade IHD-100; for computer keyboard shelves.
  6. Trash Bin Slides: Grade IHD-200; for trash bins not more than 20 inches (500 mm) high and 16 inches (400 mm) wide.
- I. Door Locks: BHMA A156.11, E07121.
- J. Drawer Locks: BHMA A156.11, E07041.
- K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

I. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

## 2.3 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber; kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

I. At countertops use only waterproof adhesives.

D. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

I. Wood Glues: 30 g/L.

2. Contact Adhesive: 250 g/L.

## 2.4 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

I. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch (19 mm) Thick or Less: 1/16 inch (1.5 mm).

2. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch (3 mm).

3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch (1.5 mm).

E. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

I. Form countertops in fabrication shop to arrive on site in one piece. Piecing together countertops on site at corners is not permitted.

F. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

I. Seal edges of openings in countertops with a coat of varnish.

## 2.5 SHOP FINISHING

A. Grade: Provide finishes of same grades as items to be finished.

- B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- C. Shop Priming: Shop apply the prime coat including backpriming, if any, for items specified to be field finished. Refer to Division 09 painting Sections for material and application requirements.
- D. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
  - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.
- E. Transparent Finish:
  - 1. AWI Finish System: Catalyzed polyurethane.
  - 2. Staining: None required.
  - 3. Wash Coat for Stained Finish: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
  - 4. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
  - 5. Filled Finish for Open-Grain Woods: After staining (if any), apply paste wood filler to open-grain woods and wipe off excess. Tint filler to match stained wood.
  - 6. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

#### 3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
  2. Maintain veneer sequence matching of cabinets with transparent finish.
  3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with
- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
1. Align adjacent solid-surfacing-material and recycled content countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
  2. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
  3. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.
  4. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."
- H. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

### 3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 40 23



**SECTION 07 11 13 - BITUMINOUS WATERPROOFING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Cold-applied, emulsified-asphalt waterproofing
- B. Related Sections include the following:
  - 1. Division 07 Section "Hot Fluid-Applied Rubberized Asphalt Waterproofing" for waterproofing coordination and interaction.

**1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.
- B. Material Certificates: For each product, signed by manufacturers.

**1.4 QUALITY ASSURANCE**

- A. Source Limitations: Obtain primary waterproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.
- B. Perform Work in accordance with the printed requirements of the membrane manufacturer and this specification. Advise designer of any discrepancies prior to commencement of the Work.
- C. Maintain one copy of manufacturer's literature on site throughout the execution of the Work.
- D. At the beginning of the Work and at all times during the execution of the Work, allow access to site by the waterproofing membrane manufacturer's representative.
- E. Materials used in this Section, including primers, mastics and membranes, asphaltic protection boards, composite drainage boards and expansion joint membranes shall be fully compatible and shall be sourced and or produced by one manufacturer.
- F. Submit copies of the membrane manufacturer's current ISO certification including the manufacturing of the membrane, primer, mastics, adhesives and protection board.

**1.5 PROJECT CONDITIONS**

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit waterproofing to be performed according to manufacturers' written instructions.
  - 1. No installation work shall be performed during rainy or inclement weather and on frost or wet covered surfaces.
  - 2. No installation below manufacturer's recommended minimum installation temperature.

- B. Ventilation: Provide adequate ventilation during application of waterproofing in enclosed spaces. Maintain ventilation until waterproofing has cured.

## 1.6 WARRANTY

- A. For the Work of this Section, the 12 months warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to 60 months.
- B. Contractor hereby warrants the waterproofing membrane for leak coverage in accordance with GC24, but for two years.
- C. Waterproofing membrane manufacturer hereby warrants the waterproofing membrane for leak coverage as a result of faulty materials for a period of ten years. Scope of warranty shall include materials required to return the membrane to a watertight condition.

## PART 2 - PRODUCTS

### 2.1 COLD-APPLIED, EMULSIFIED-ASPHALT WATERPROOFING (WP-1)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Henry Corp HE784 – Aqua-Block WB or comparable product by one of the following:
    - a. Carlisle; Barricoat R
    - b. ChemMasters Corp.
    - c. Degussa Building Systems; Sonneborn Brand Products.
    - d. Gardner Gibson, Inc.
    - e. Karnak Corporation.
    - f. Koppers Inc.
    - g. Malarkey Roofing Products.
    - h. Meadows, W. R., Inc.
    - i. Tamms Industries, Inc.
- B. Product Characteristics:
  - 1. Elongation: 2000%,
  - 2. Maximum VOC: 10 g/l
  - 3. Water vapour permeance: 0.1 perm (10 ng/Pa.m<sup>2</sup>.s), ASTM E96,
  - 4. Chemical resistance: Alkalis, calcium chloride, mild acid and salt solutions,
  - 5. Application Temperature: Minimum 40 degrees F.
- C. Joint Treatment Mesh
  - 1. Joint Treatment and Reinforcement: Mesh, open weave glass fabric yarn saturated with synthetic resins complying with ASTM D1668, Type I, shall be Henry 183 or comparable product as part of approved manufacturer's system.
- D. Flashing and Transition Membrane
  - 1. Flashing and Transition Membrane shall be Henry Blueskin® WP200 or comparable product as part of approved manufacturer's system, and having the following physical properties:
    - a. Thickness: 1.5 mm (60 mils) min.,
    - b. Flexibility: Pass @ -40 degrees C to ASTM D1970,
    - c. Tensile strength (membrane): 2.24 MPa to ASTM D412,
    - d. Tensile strength (film): 34.5 MPa to ASTM D882,
    - e. Elongation: 300% to ASTM D412,
    - f. Puncture resistance: 222 N min. to ASTM E154.

2. Primer for self-adhering membranes at temperatures above 25 degrees F shall be Henry Aquatac™ Primer or comparable product as part of approved manufacturer's, having the following physical properties:
  - a. Color: Aqua;
  - b. Weight: 8.7 lbs/gal;
  - c. Solids by weight: 53%;
  - d. Water based, no solvent odours
  - e. Drying time (initial set): 30 minutes at 50% RH and 70 degrees F;
- E. Liquid Membrane & Termination Sealant
  1. Termination Sealant shall be Henry Polybitume® 570-05 Polymer Modified Sealing Compound or comparable product as part of approved manufacturer's system, having the following characteristics:
    - a. Compatible with sheet waterproofing membrane and substrate,
    - b. Solids by volume: 70%,
    - c. Complies with CGSB 37.29,
    - d. Remains flexible with ageing
    - e. Chemical resistance: Alkalies, calcium chloride, mild acid and salt solutions.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.
  1. Proceed with waterproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
  2. Test for surface moisture according to ASTM D 4263.

#### 3.2 FOOTING/FOUNDATION WALLS, JUNCTURES, CRACKS IN SLAB AND PROTRUSIONS

- A. Coat penetrations, such as brackets, clips, braces, etc. that are set into the concrete with a 90 mil coating of primary waterproofing membrane to the height of the wearing course and around projections to ensure a complete seal prior to coating the entire area.
- B. Penetrations subject to movement should be flashed with fabric reinforcement set into a minimum thickness of 90 mils of primary waterproofing membrane to required height on the wall and at least 4 inches on the slab, embed fabric reinforcement into wet coating followed by a second coat.
- C. To all cracks and cold joints less than 1/16 inch, apply a coat of primary waterproofing membrane at a minimum thickness of 30 mils extending 3 inches on either side of joint, embed a 6 inch wide strip of joint treatment mesh and apply additional 30 mil coating of primary waterproofing membrane.
- D. To all cracks greater than 1/8 inch, fill void with non-shrink cementitious patching material and allow to cure dry. Prime area and install self-adhered flashing membrane, extend 3 inches on either side of crack. Overlap end joint of sheet a minimum 3 inches.
- E. At monolithic wall/slab junctures, apply a coat of primary waterproofing membrane at a minimum thickness of 30 mils extending 3 inches on either side of joint, embed a 6 inch wide strip of joint treatment mesh and apply additional 30 mil coating of primary waterproofing membrane.
- F. At non-monolithic wall/slab junctures, prime area, trowel-in fillet bead to inside corners and install self-adhered flashing membrane sheet to the required height on the wall and at least 4 inches on the slab. Lap primary waterproofing membrane over a minimum of 2 inches.

- G. At footing to foundation wall junctions apply a coat of primary waterproofing membrane at a minimum thickness of 30 mils extending 3 inches on either side of joint, embed a 6 inch wide strip of joint treatment mesh and apply additional 30 mil coating of primary waterproofing membrane.

### 3.3 PRIMARY WATERPROOFING MEMBRANE APPLICATION

#### A. Application (Vertical Applications)

1. Apply a prime coat of primary waterproofing membrane diluted by 25% by volume with clean water at the rate of approximately 1.2 gal/100ft<sup>2</sup> and allow to dry.
2. Apply a full and continuous coat of primary waterproofing membrane at approximately 1.2 gal/100ft<sup>2</sup> and embed fabric reinforcement into coating ensuring no fishmouths or wrinkles are created and allow to set.
3. Extend and overlap fabric reinforcement 2 inches at all joints. Allow membrane to fully cure/dry prior to subsequent application coatings.
4. Apply second full and continuous coat of primary waterproofing membrane at 2.4 gal/100ft<sup>2</sup> and allow to cure.
5. At all corners, angles and junctions of foundation walls & footings, reinforce with 2 extra plies of fabric embedded in wet mastic.

### 3.4 CURING AND PROTECTION:

- A. Allow membrane to dry thoroughly. Protect from rain until fully cured. Allow membrane to fully cure prior to installing protection board, drainage composite or backfilling. Patch or repair damaged areas using same material as original coating.
- B. Protect cured membrane from damage caused by backfilling by using Drainage Composite prior to commencing backfill.

### 3.5 CLEANING

- A. Remove waterproofing materials from surfaces not intended to receive waterproofing.

**END OF SECTION 07 || 13**

**SECTION 07 21 00 - THERMAL INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Concealed building insulation.
  - 2. Cavity-wall insulation.
  - 3. Blown-in insulation.
  - 4. Vapor retarders.
  - 5. Sound attenuation insulation.
  - 6. Spray foam fire caulk insulation
- B. Related Sections include the following:
  - 1. Division 01 Section "Alternates" for exterior wall insulation.

**1.2 PERFORMANCE REQUIREMENTS**

- A. Plenum Rating: Provide glass-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.
  - 1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm air velocity.
  - 2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with *Chaetomium globosum* on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

**1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Product test reports.

**1.4 QUALITY ASSURANCE**

- A. Retain ASTM test method below based on product and kind of fire-resistance characteristic specified for each product in Part 2. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84 for surface-burning characteristics by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

**PART 2 - PRODUCTS****2.1 MANUFACTURERS**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

## 2.2 FIBER BLANKET INSULATION

- A. Unfaced, Glass-Fiber Blanket Acoustical Insulation (INSUL-1): ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, passing ASTM E 136 for combustion characteristics.
1. Available Manufacturers:
    - a. GreenFiber
    - b. Knauf
  2. The sound attenuation blanket shall be a mineral fiber blanket with a minimum density of 2.5 pounds per cubic foot.
    - a. The thickness of the sound attenuation blanket shall not be less than 3 inches.
- B. Unfaced, Glass-Fiber Blanket Insulation (INSUL-2): ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, passing ASTM E 136 for combustion characteristics.
1. The sound attenuation blanket shall be a mineral or glass fiber blanket with a minimum density of 2.5 pounds per cubic foot.
  2. The thickness of the sound attenuation blanket shall not be less than 3 inches.
  3. Where INSUL-1 is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
    - a. 3-1/2 inches thick with a thermal resistance of 13 deg F x h x sq. ft./Btu at 75 deg F.
    - b. 3-5/8 inches thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F.
    - c. 5-1/2 inches thick with a thermal resistance of 19 deg F x h x sq. ft./Btu at 75 deg F.
- C. Unfaced Mineral-Fiber Blanket (INSUL-5): Type I with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, passing ASTM E 136 for combustion characteristics.
1. Available Manufacturers:
    - a. Roxul, Inc
    - b. Owens Corning, Product: Therma Fiber
  2. Where mineral-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
    - a. 3-1/2 inches thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F minimum.
    - b. 3-5/8 inches thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F.
    - c. 5-1/2 inches thick with a thermal resistance of 19 deg F x h x sq. ft./Btu at 75 deg F.
    - d. 6-1/2 inches thick with a thermal resistance of 21 deg F x h x sq. ft./Btu at 75 deg F.
    - e. 9-1/2 inches thick with a thermal resistance of 30 deg F x h x sq. ft./Btu at 75 deg F.

## 2.3 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation (INSUL-3): ASTM C 578, Type IV, 1.60 lb/cu. ft. with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, and having a recycled content of 15% minimum:
1. Available Manufacturers:
    - a. DiversiFoam Products.
    - b. Dow Chemical Company.
    - c. Owens Corning.
    - d. Pactiv Building Products Division.
  2. Type IV, 1.60 lb/cu. ft., unless otherwise indicated.

## 2.4 LOOSE-FILL INSULATION

- A. Cellulosic-Fiber Loose-Fill Insulation (INSUL-6): ASTM C 739, chemically treated for flame-resistance, processing, and handling characteristics.



## 2.5 ONE COMPONENT WINDOW AND DOOR SPRAY FOAM INSULATION

- A. Spray foam (INSUL-4): Meets ASTM C 1620-05.
  - I. Available Manufacturers:
    - a. Hilti Corp: CF 812 Insulating Foam
    - b. Equivalent products acceptable if approved by Architect prior to installation.

## 2.6 VAPOR RETARDERS

- A. Polyamide Vapor Retarders (VR-1): complies with ASTM C 665 and ASTM E 96, 2 mils thick, unreinforced, with a variable permeance rating per ambient humidity conditions providing a continuous, permanent air barrier.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.
- D. Single-Component Nonsag Urethane Sealant: ASTM C 920, Type I, Grade NS, Class 25, Use NT related to exposure, and Use O related to vapor-barrier-related substrates.
- E. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and with demonstrated capability to bond vapor retarders securely to substrates indicated.

## 2.7 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- B. Insulation for Miscellaneous Voids:
  - 1. Foam Fire Barrier Insulation (INSUL-4): ASTM E 814, 1 part spray foam, with L-Rated smoke seal and F-Rated fire barrier, per ASTM E 84.
  - 2. Approved Products:
    - a. 3M; FIP 1-Step Firestop Foam

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

### 3.2 INSTALLATION OF CAVITY-WALL INSULATION

- A. On units of foam-plastic board insulation, install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates indicated.
  - I. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Division 04 Section "Unit Masonry."

### 3.3 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

- A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
  - I. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
- C. Protect top surface of horizontal insulation from damage during concrete work by applying protection course with joints butted.

### 3.4 INSTALLATION OF NON-FOAM SPRAYED MATERIALS

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions. Seal gaps or voids with netting or mesh fabric per manufacturer's written instructions.
- C. Install in accordance with manufacturer's instructions. Product must be installed according to local code, and must be applied by a qualified applicator.
- D. Apply insulation by spray method, to uniform density without voids.

### 3.5 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Install insulation at all furred out exterior walls.
- C. Seal joints between foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- D. Set vapor-retarder-faced units with vapor retarder to warm-in-winter side of construction, unless otherwise indicated.
  - I. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
- E. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:
  - I. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  3. Maintain 3-inch clearance of insulation around recessed lighting fixtures.
  4. For wood-framed construction, install mineral-fiber blankets according to ASTM C 1320 and as follows:
    - a. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.
    - b. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
- F. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
  2. Foam Fire Barrier Insulation: Apply according to manufacturer's written instructions.
- G. Place loose-fill insulation into spaces indicated, by machine blowing to comply with ASTM C 1015. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.
1. For cellulosic-fiber loose-fill insulation, comply with the Cellulose Insulation Manufacturers Association's Special Report #3, "Standard Practice for Installing Cellulose Insulation."

### 3.6 INSTALLATION OF INSULATION FOR SOUND ATTENUATION

- A. Use full fit layers of the sound attenuation insulation where indicated on the Contract Drawings.
- B. Sound attenuation insulations shall not be installed to fill voids where airspace is specifically called out in the contract documents.

### 3.7 INSTALLATION OF VAPOR RETARDERS

- A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated and according to manufacturer's standard instructions. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.
- C. Provide full, continuous coverage of building envelope by vapor retarder unless noted otherwise.
- D. Before installing vapor retarder, apply urethane sealant to flanges of framing including head and sill plates, studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
- E. Firmly attach vapor retarders to framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- F. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.

- G. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder adhered to the base layer.

**END OF SECTION 07 21 00**

**SECTION 07 25 00 - WEATHER BARRIERS****PART I - GENERAL****I.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**I.2 SUMMARY**

- A. This Section includes the following:
  - 1. Vapor permeable weather barrier and installation accessories.
- B. Related Sections include the following:
  - 1. Division 01 Section "Alternates".
  - 2. Division 06 Section "Sheathing" for wall sheathings, wall sheathing joint-and-penetration treatments.
  - 3. Division 07 Section "Fluid Applied Air Barriers" for alternate condition

**I.3 SUBMITTALS**

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.
- B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
  - 1. Include details of interfaces with other materials that form part of air barrier.
  - 2. Include details of mockups.
- C. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.
- D. Qualification Data: For Applicator.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers.

**I.4 QUALITY ASSURANCE**

- A. Applicator Qualifications: A firm experienced in weather barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: All barrier system components shall be produced by and obtained from a single manufacturer of the specified weather barrier assembly.
- C. Installing contractor:
  - 1. Minimum of 5 years' experience with installation of weather barrier assembly.
  - 2. Show evidence of trained installers to successfully complete the Work.
- D. Mockups: Before beginning installation of weather barrier, build mockups of exterior wall assembly shown on Drawings, incorporating backup wall construction, external cladding, window, door frame and sill,

insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of weather barrier membrane.

1. Demonstrate the proper installation sequence and workmanship required for the air barrier assembly installation at typical conditions, transitions, openings, and penetrations through the exterior building envelope.
2. Build a minimum of 8 feet tall by 8 feet wide exterior wall panel incorporating the back-up wall, window with sill, door frame, through-wall flashing, insulation, cladding, foundation, roof edge, and building corner. Show all weather barrier assembly materials and seals.
3. Approved mock-up represents the minimum quality for the Work for the weather barrier assembly installation. Materials and installation procedures utilized in the mock-up become the standard of quality and construction for all subsequent similar conditions on the building.
4. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
5. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply weather barrier until mockups are approved.
6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site.

1. Include installers of other construction connecting to weather barrier, including roofing, waterproofing, architectural precast concrete, masonry, sealants, windows, glazed curtain walls, and door frames.
2. Review weather barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

#### I.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by weather barrier manufacturer.
- B. Remove and replace materials that are damaged.
- C. Protect stored materials from direct sunlight.

#### I.6 PROJECT CONDITIONS

- A. Environmental Limitations: Apply weather barrier within the range of wind conditions recommended by weather barrier manufacturer. Protect substrates from environmental conditions that affect performance of weather barrier.
- B. Install on substrates clear of snow, ice, frost, and liquid moisture. Do not apply weather barrier to a damp or wet substrate or during snow, rain, fog, or mist.
- C. Do not install in snow, rain, fog or mist. Do not apply within 1 hour of a rain event.
- D. Maximum UV exposure time of the weather barrier assembly without cover or cladding; per manufacturer's written recommendations.
- E. Provide weather protection at the top of walls and unfinished roofs at the end of each day.

#### I.7 WARRANTY

- A. Product Warranty: Provide manufacturer's product warranty for a minimum of ten (10) years from date of Substantial Completion.



- B. Pre-installation meetings and jobsite observations by weather barrier manufacturer for warranty is required prior to assembly installation.

## PART 2 - PRODUCTS

### 2.1 WEATHER BARRIER (WRB-1)

- A. Basis of Design: Provide and install DuPont Tyvek CommercialWrap and related assembly components or equal products by one of the following
- B. Description: spunbonded polyolefin, non-woven, non-perforated, weather barrier with the following performance characteristics:
  - 1. Air Penetration: 0.001 cfm/ft<sup>2</sup> at 75 Pa, when tested in accordance with ASTM E2178. Type I per ASTM E1677. ≤0.04 cfm/ft<sup>2</sup> at 75 Pa, when tested in accordance with ASTM E2357.
  - 2. Water Vapor Transmission: 28 perms, when tested in accordance with ASTM E96, Method B.
  - 3. Water Penetration Resistance: Minimum 280 cm when tested in accordance with AATCC Test Method 127.
  - 4. Basis Weight: Minimum 2.7 oz/yd<sup>2</sup>, when tested in accordance with TAPPI Test Method T-410.
  - 5. Air Resistance: Air infiltration at >1500 seconds, when tested in accordance with TAPPI Test Method T-460.
  - 6. Tensile Strength: Minimum 38/35 lbs/in., when tested in accordance with ASTM D882, Method A.
  - 7. Tear Resistance: 12/10 lbs., when tested in accordance with ASTM D1117.
  - 8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84, Flame Spread: 10, Smoke Developed: 10.

### 2.2 AUXILIARY MATERIALS

- A. Seam Tape: As recommended by the weather barrier manufacturer.
- B. Sealants
  - 1. Provide sealants that comply with ASTM C920, elastomeric polymer sealant to maintain watertight conditions.
    - a. Products: Sealants recommended by the weather barrier manufacturer.
- C. Adhesives:
  - 1. Provide adhesive recommended by weather barrier manufacturer.
    - a. Products: Adhesives recommend by the weather barrier manufacturer.
- D. Primers:
  - 1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.
    - a. Products: Primers recommended by the flashing manufacturer.
- E. High Temperature Resistant Flashing
  - 1. High Temperature Resistant flexible membrane flashing materials for window openings and penetrations recommended by manufacturer.
  - 2. High Temperature Resistant straight flashing membrane materials for flashing windows and doors and sealing penetrations such as masonry ties, etc. recommended by manufacturer.
  - 3. High Temperature Resistant thru-Wall flashing membrane materials for flashing at changes in direction or elevation (shelf angles, foundations, etc.) and at transitions between different assembly materials.
  - 4. Preformed Inside and Outside Corners and End Dams: Preformed three-dimensional shapes to complete the flashing system used in conjunction with Thru-Wall Flashing.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Substrate surfaces shall be free of grease, dirt, debris, oil, unbonded paint, corrosion or other substances.
- B. Verify that substrate construction is complete, clean, dry or damp, and ready to receive barrier system with no damaged or unsupported areas; or sharp protrusions or voids.
- C. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories. Start of weather barrier material installation indicates Installing Contractor's acceptance of the substrate and installation conditions.

### 3.2 WEATHER BARRIER INSTALLATION

- A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.
- B. Install weather barrier prior to installation of windows and doors.
- C. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.
- D. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent layers installed in a shingling manner to overlap lower layers. Maintain weather barrier plumb and level.
- E. Sill Plate Interface: Extend lower edge of weather barrier over sill plate interface 3-6 inches. Secure to foundation with elastomeric sealant as recommended by weather barrier manufacturer.
- F. Window and Door Openings: Extend weather barrier completely into rough openings.
  - 1. Wrap the 4 sides of each rough opening so that the interior vapor seal can be made continuous to compatible sealant.
  - 2. Sandwich all windows/door flanges between bonded membranes.
- G. Overlap weather barrier
  - 1. Exterior corners: minimum 12 inches.
  - 2. Seams: minimum 6 inches.
- H. Weather Barrier Attachment:
  - I. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommend fasteners, space 12-18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.
  - J. Apply flashing to wall surfaces prior to spray-applying air/weather barrier membrane.

### 3.3 SEAMING

- A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.
- B. Seal any tears or cuts as recommended by weather barrier manufacturer.

### 3.4 OPENING PREPARATION AT FLANGED WINDOWS

- A. Cut weather barrier in an I-shaped cut pattern. A modified I-shaped cut is also acceptable.
  - 1. Cut weather barrier horizontally along the bottom and top of the window opening.
  - 2. From the top center of the window opening, cut weather barrier vertically down to the sill.
  - 3. Fold side and bottom weather barrier flaps into window opening and fasten.
- B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

### 3.5 FLASHING AT FLANGED WINDOWS

- A. Cut flexible flashing a minimum of 12 inches longer than width of sill rough opening and vertical jambs.
- B. Cover horizontal sill by aligning flexible flashing edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.
- C. Fan flexible flashing at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges if necessary.
- D. Apply membrane flashing wrap up each jamb, extending into the full depth of the rough opening and on the face of the sheathing a minimum of 4 inches.
- E. On exterior, apply continuous bead of sealant to wall or backside of window mounting flange across jambs and head. Do not apply sealant across sill.
  - 1. Install window according to manufacturer's instructions.
- F. Apply strips of flashing at jambs overlapping entire mounting flange. Extend jamb flashing 1-inch above top of rough opening and below bottom edge of sill flashing. Continuously bond the jamb flashing to the rough opening membrane sandwiching the flange.
- G. Apply strip of flashing as head flashing overlapping the mounting flange. Head flashing should extend beyond outside edges of both jamb flashings, and above any sheet metal head flashing.
- H. Position weather barrier head flap across head flashing. Adhere flashing over the sheet metal head flashing (install head flashing and rough opening jamb and sill flashing prior to spray-applying the air-weather barrier).
- I. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal with membrane wrap of rough opening, after spray foam insulating the gap at the window perimeter. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C 1193.

### 3.6 THRU-WALL FLASHING INSTALLATION

- A. Apply primer per manufacturer's written instructions.
- B. Install preformed corners and end dams bedded in sealant in appropriate locations along wall.
- C. Starting at a corner, remove release sheet and apply membrane to primed surfaces in lengths of 8 to 10 feet.
- D. Extend membrane through wall and leave ¼ inch minimum exposed to form drip edge.
- E. Roll flashing into place. Ensure continuous and direct contact with substrate.

- F. Lap ends and overlap preformed corners 4 inches minimum. Seal all laps with sealant.
  - G. Terminate membrane on vertical wall.
    - I. Apply sealant bead at each termination.
- 3.7 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT BASE OF WALL
- A. Seal vertical and horizontal seams with tape or sealing membrane.
- 3.8 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT SHELF ANGLE
- A. Seal weather barrier to bottom of shelf angle with sealing membrane.
  - B. Apply thru-wall flashing to top of shelf angle. Overlap thru-wall flashing with weather barrier by 6-inches.
  - C. Seal bottom of weather barrier to thru-wall flashing with tape or sealing membrane.
- 3.9 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT WINDOW HEAD
- A. Cut flap in weather barrier at window head.
  - B. Prime exposed sheathing
  - C. Install lintel as required. Verify end dams extend 4 inches minimum beyond opening.
  - D. Install end dams bedded in sealant.
  - E. Adhere 2 inches minimum thru-wall flashing to wall sheathing. Overlap lintel with thru-wall flashing and extend ¼ inch minimum beyond outside edge of lintel to form drip edge.
  - F. Apply sealant along thru-wall flashing edges.
  - G. Fold weather barrier flap back into place and tape bottom edge to thru-wall flashing.
  - H. Tape diagonal cuts of weather barrier.
    - I. Secure weather barrier flap with fasteners.
- 3.10 FIELD QUALITY CONTROL
- A. Notify manufacturer's designated representative to obtain required periodic observations of weather barrier assembly installation.
- 3.11 PROTECTION
- A. Protect installed weather barrier from damage

**END OF SECTION 07 25 00**

**SECTION 07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS**

## PART I - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## I.2 SUMMARY

- A. This Section includes the following:
  - 1. Fluid-applied membrane air barrier, vapor permeable.
- B. Related Sections include the following:
  - 1. Division 01 Section "Alternates" for Base condition.
  - 2. Division 01 Section "Air Barrier Systems" for testing protocols and compliance for installed air barrier systems
  - 3. Division 06 Section "Sheathing" for wall sheathings, wall sheathing joint-and-penetration treatments, building paper, and building wraps.

## I.3 DEFINITIONS

- A. ABAA: Air Barrier Association of America.
- B. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

## I.4 PERFORMANCE REQUIREMENTS

- A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Material Performance
  - 1. Air permeance of membrane: ASTM E2178, 0.004 cfm/ft<sup>2</sup> at 1.57 psf (0.02 L/s/m<sup>2</sup> at 75 Pa)
  - 2. Water vapor permeance of membrane: ASTM E96
    - a. Desiccant method, Procedure A; 18.3 US Perm (1040 ng/Pa s m<sup>2</sup>)
    - b. Water method, Procedure B; 31.5 US Perm (1800 ng/Pa s m<sup>2</sup>)
  - 3. Water resistance of membrane: AATCC Test Method 127, deviated, 2.16 inches (55 cm) of water for 5 hours; no leakage
  - 4. Flammability
    - a. Surface burning characteristics: ASTM E84
      - 1) Membrane: flame spread index of 15, smoke developed value of 0
      - 2) Termination membrane: flame spread index of 15, smoke developed value of 45
- C. Assembly Performance
  - 1. Air Leakage: ASTM E2357, 0.04 cfm/ft<sup>2</sup> at 1.57 psf (0.2 L/s/m<sup>2</sup> at 75 Pa)
  - 2. Loads from imposed pressures: Withstands design wind, fan, and stack pressures, both positive and negative, without damage or displacement of the air barrier assembly or adjacent materials. Allows transfer of these loads to the structure.

3. Movement: Allows for thermal, creep, and anticipated seismic and building movement within the air barrier assembly, each air barrier detail, and transitions to adjacent systems without breaching the air barrier system or negating specified air leakage performance.
4. Continuity: Joins air barrier materials and adjacent compatible materials and systems preventing air leakage and maintaining specified air leakage performance at the following locations and as shown on the Drawings:
  - a. Transitions from roof air barrier to wall
  - b. Transitions from window, curtain wall, storefront, louvers, and doors to wall
  - c. Transitions from foundation waterproofing to wall
  - d. Transitions from one type of exterior cladding to another
  - e. Across construction, control, expansion, and seismic joints
  - f. Penetrations of utilities, pipes, conduit, and ducts
  - g. Penetrations of ties, anchors, and channels for exterior finishes
  - h. Pathways for potential air leakage into the building envelope

#### 1.5 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.
- B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
  1. Include details of interfaces with other materials that form part of air barrier.
  2. Include details of mockups.
- C. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.
- D. Qualification Data: For Applicator.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers.

#### 1.6 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance and that is an ABAA-licensed contractor, employs certified and registered installers, and complies with ABAA's Quality Assurance Program.
- B. Source Limitations: Barrier system components shall be produced by and obtained from a single manufacturer of the specified fluid-applied membrane air barrier assembly.
- C. Installing contractor:
  1. Minimum of 5 years' experience with installation of fluid-applied membrane air barrier assembly.
  2. Show evidence of adequate equipment and trained installers to successfully complete the Work.
- D. Accredited laboratory testing for materials: Accredited by International Accreditation Service, Inc. (IAS) or American Association for Laboratory Accreditation (A2LA).
- E. Field Quality Assurance:
  1. Schedule field tests for air and water infiltration, and membrane adhesion of the mock-up and the Work as described in Field Quality Control of this Section. Coordinate observations of the tests by the third-party observer.



- F. Mockups: Before beginning installation of air barrier, build mockups of exterior wall assembly shown on Drawings, incorporating backup wall construction, external cladding window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.
1. Demonstrate the proper installation sequence and workmanship required for the air barrier assembly installation at typical conditions, transitions, openings, and penetrations through the exterior building envelope.
  2. Build a minimum of 8 feet tall by 8 feet wide exterior wall panel incorporating the back-up wall, window with sill, door frame, through-wall flashing, insulation, cladding foundation, roof edge, and building corner. Show all air barrier assembly materials and seals. Coordinate with the Third-party Testing Agency for the size of testing area required for field testing the mock-up and allow testing prior to fully installing the insulation and cladding. Refer to Field Quality Control of this Section for test methods and quantity of tests.
  3. Do not install any barrier materials on the building until the mock-up is reviewed and approved by the air barrier manufacturer's field representative, Owner, Architect, and Third-party Observer.
  4. Approved mock-up represents the minimum quality for the Work for the air barrier assembly installation. Materials and installation procedures utilized in the mock-up become the standard of quality and construction for all subsequent similar conditions on the building.
  5. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
  6. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
  7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- G. Preinstallation Conference: Conduct conference at Project site.
1. Include installers of other construction connecting to air barrier, including roofing, waterproofing, architectural precast concrete, masonry, sealants, windows, glazed curtain walls, and door frames.
  2. Review air barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

#### I.7 DELIVERY, STORAGE, AND HANDLING

- A. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.
- B. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- C. Protect stored materials from direct sunlight.

#### I.8 PROJECT CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.
- B. Maintain ambient temperatures during application between
  1. Fluid-applied membrane: 25° F to 100° F (-4° C to 38° C)
  2. Termination membrane: 0° F to 150° F (-18° C to 66° C)
  3. Sealant: 40° F to 95° F (5° C to 35° C)
- C. Install on substrates clear of snow, ice, frost, and liquid moisture. Substrates can be damp during installation.

- D. Do not install in snow, rain, fog or mist. Do not apply within 1 hour of a rain event.
- E. Maximum UV exposure time of the air barrier assembly without cover or cladding: Six months.
- F. Provide weather protection at the top of walls and unfinished roofs at the end of each day.
- G. Protect adjacent areas by covering or masking.

## 1.9 WARRANTY

- A. Product Warranty: Provide manufacturer's product warranty for a minimum of five (5) years from date of Substantial Completion with installation completed by a certified 3M applicator.
- B. Workmanship Warranty: Provide workmanship warranty for a minimum of one (1) year from date of Substantial Completion including all air barrier assembly materials and accessories, against failures including loss of air tight seal, loss of watertight seal, loss of attachment, loss of adhesion, and failure to cure properly.

## PART 2 - PRODUCTS

### 2.1 AIR BARRIER ASSEMBLY

- A. Material Performance
  - 1. Total thickness: ASTM D3652
    - a. Membrane:
      - 1) CMU/Plywood: 35 mils (0.89 mm), wet
    - b. Termination membrane: 10 mils (0.25 mm)
  - 2. Tack Free Time: 1 hour (ASTM C679) Full Cure: 8 hours
  - 3. Air permeance of membrane: ASTM E2178, <0.00006 cfm/ft<sup>2</sup> at 1.57 psf (<0.0003 L/s/m<sup>2</sup> at 75 Pa)
  - 4. Air leakage of assembly: ASTM E2357
    - a. Opaque wall: <0.0000 cfm/ft<sup>2</sup> at 1.57 psf (<0.0000 L/s/m<sup>2</sup> at 75 Pa)
    - b. Penetrated wall: <0.0000 cfm/ft<sup>2</sup> at 1.57 psf (<0.0000 L/s/m<sup>2</sup> at 75 Pa)
  - 5. Pull adhesion of membrane: ASTM D4541, exceeds minimum 110 kPa
    - a. Exterior Grade Gypsum Board: Method B, 49.2 psi (339.0 kPa)
  - 6. Elongation at break: ASTM D412
    - a. Membrane: 350%
    - b. Sealant: > 600%
    - c. Termination membrane (3015): 700%
  - 7. Tensile strength: ASTM D412
    - a. Membrane: 150 psi (1.03 MPa)
    - b. Sealant 525: 400 psi (2.76 MPa)
    - c. Termination membrane: 1740 psi (12.00 MPa)
  - 8. Compatibility of membrane: No adverse reaction with synthetic rubber, butyl, polyurethane, silicone, and silane terminated hybrid sealants.
  - 9. Lap adhesion of termination membrane (3015): ASTM D3330, 40 oz./inch (0.44 N/mm)
  - 10. Low temperature flexibility of termination membrane (3015): ASTM D1970, Section 7.6, at -22° F (-30° C); passes bend test and no leakage during water head test
  - 11. Nail sealability of air barrier membrane (2085VP) and termination membrane (3015):
    - a. ASTM D1970, Section 7.9, 5 inches (127 mm) of water head after 3 days; dry and passes
    - b. ASTM E331/547, as modified per AAMA-711-07, Annex 1; passes initial and after thermal cycling

### 2.2 FLUID-APPLIED MEMBRANE AIR BARRIER (AIRB-1)

- A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: synthetic polymer membrane.
  - 1. Products: Subject to compliance with requirements, provide one of the following

- a. Synthetic Polymer Membrane:
  - 1) 3M Liquid Air Barrier 2085VP
- b. Description:
  - 1) Total membrane thickness: ASTM D3652
    - a) CMU/Plywood: 35 mils (0.89 mm), wet
  - 2) Tack free: ASTM C679, 1 hour at 70° F at 50% relative humidity

### 2.3 AUXILIARY MATERIALS

- A. Sealant: 3M™ Polyurethane Sealant 540; a one component, moisture curing sealant
  - 1. ASTM C920, Type S, Grade NS, Class 25
  - 2. Tack free: 60-90 minutes at 73° F at 50% relative humidity
- B. Sealant: 3M™ Polyurethane Construction Sealant 525; a one component, moisture curing sealant
  - 1. ASTM C920, Type S, Grade NS, Class 25
  - 2. Tack free: 90-150 minutes at 73° F at 50% relative humidity
- C. Termination membrane: 3M™ Self-Adhered Air and Vapor Barrier Membrane 3015 in detail widths
  - 1. Description: Tan colored, semi-transparent proprietary film with acrylic adhesive and silicone coated release liner.
  - 2. Weight: 13.4 oz/yd<sup>2</sup> (464 g/m<sup>2</sup>)
  - 3. Total membrane thickness: ASTM D3652, 10 mils (0.25 mm)
- D. Primer for flashing application at difficult substrates: Test adhesion before application. See Preparation in this Section. Select from the following products:
  - 1. 3M™ Hi-Strength 90
  - 2. 3M™ Hi-Strength 94 ET Spray Adhesive
  - 3. 3M™ Scotch-Weld Holdfast 70
  - 4. 3M™ Fastbond™ Contact Adhesive 30NF

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Substrate surfaces shall be free of grease, dirt, debris, oil, unbonded paint, corrosion or other substances.
- B. Verify that substrate construction is complete, clean, dry or damp, and ready to receive barrier system with no damaged or unsupported areas; or sharp protrusions or voids. Substrate must meet the following requirements:
  - 1. Exterior gypsum sheathing: Moisture content below 19%; no open joints or cracks wider than 1/4 inch
  - 2. Plywood: Moisture content below 16%; no open joints or cracks wider than 1/4 inch
  - 3. Concrete surfaces: Cured minimum 3 days, fins and extrusions ground flush and void areas filled and cured
  - 4. Masonry: Mortar joints shall be tooled smooth, remove mortar extrusions including at the brick ties
  - 5. Metal: Wipe down to remove any release agents or coatings
- C. Start of air barrier material installation indicates Installing Contractor's acceptance of the substrate and installation conditions.

### 3.2 PREPARATION

- A. Connection to Difficult Substrates and Other Systems:

1. Test adhesion of membrane, termination membrane, and flashing by installing a 6 inch square test patch of the material over the difficult substrate or other system. Removal of the test patch should not be possible without permanent damage to either the test patch or substrate material.
  2. Consult the manufacturer for detailing connections that fail this test.
- B. Gaps or cracks in substrate exceeding 1/4 inch width: Fill gap or crack with sealant and tool surface flush and smooth.
- C. Gaps or cracks in substrate exceeding 1 inch width: Mechanically fasten metal sheet or approved transition material to span the gap or crack.
- D. Penetrations of air barrier assembly: Fill gaps or cracks exceeding 1/4 inch width between the substrate and the penetration with sealant.

### 3.3 AIR BARRIER ASSEMBLY INSTALLATION

- A. Install air barrier assembly in accordance with manufacturer's instructions in locations shown on the Drawings to provide a continuous air barrier assembly.
- B. Membrane
1. Application equipment
    - a. Pump: Graco Mark V, GH 733, GH 833, or equivalent
    - b. Tip sizes: 525, 527, and 625
    - c. Hose length and gauge: 200 linear feet of 1/2 inch hose
  2. Apply liquid membrane to a wet thickness of 26 mils for exterior gypsum sheathing and 35 mils for CMU.
  3. Through-wall flashings: Seal top edge of through-wall flashing with 3M™ approved sealant.
  4. Transitions to adjacent systems: See the Drawings for project specific detailing of transitions to the roof, foundation waterproofing, and door systems.
- C. Termination membrane and flashing
1. Cut membrane to length and wind up into a roll. Fold the starting edge back over itself to create the paper release liner. Peel back the liner to expose the 2-3 inch starting strip of the membrane. Do not contaminate the starting strip with dust or debris before applying it to the intended surface.
  2. Install membrane in "weatherboard" or "shingle fashion". Stagger all adjacent vertical joints.
  3. Align and set the membrane in place, rolling the product back against the exposed adhesive. Simultaneously unwind the roll pulling the release liner, maintaining pressure against the substrate to tack the membrane in place. Wipe the membrane down with a feathering motion from the middle outward to obtain a smooth surface.
  4. Lap a minimum of 2 inches. Roll the membrane with a rubber roller to ensure a tight seal against the wall and between overlapped edges.
  5. Install 6 inch wide membrane at inside and outside vertical corners and construction joints, lapping a minimum of 2 inches on either side.
  6. Carefully execute detail work to ensure a continuously sealed building envelope.
  7. Seal the leading edge of the unfinished membrane installation at the end of each work day with sealant. Smooth the sealant bead to the surface to avoid creating a projecting obstruction.
  8. Repair all wrinkles and fish mouths extending within 2 inches of the membrane edge with a repair membrane piece extending 6 inches beyond the defect.
- D. Window and Louver Openings:
1. Wrap rough openings as detailed in the Drawings with either termination membrane in detail widths or flashing material.
  2. Install sealant at each inside corner of the window sill, jamb, and head.
  3. Apply detail strips of termination membrane at each inside corner extending the full depth of the sill and a minimum 4 inches onto the face.

4. Install detail strips at the sill, jambs, and head in lengths beyond window opening extending the full depth of the sill.
5. Apply reinforcing piece cut into a football, bowtie, or butterfly shape at each corner.
6. Install membrane in "weatherboard" or "shingle fashion" with a minimum 2 inch overlap at all detail strips.

E. Penetrations:

1. Seal all penetrations with sealant. Install flashing or membrane material cut to length to allow installation around the full circumference of penetration.
2. Masonry Ties or Anchors:
  - a. Post-applied: Install backplate of tie or anchor over the air barrier with self-tapping screws. Apply sealant over the screw heads.
  - b. Knife plate: Cut a one piece termination membrane to overlap minimum 2 inches in each direction of the knife plate. Cut a slot for the knife plate and apply the membrane over. Apply sealant at the knife plate penetration perimeter.
3. Utilities, Pipes, Conduit, and Duct Penetrations:
  - a. Apply sealant between the penetration and the exterior wall.
  - b. Apply termination membrane to allow continuous 2 inch overlap onto vent/pipe penetration and cut "fingers" to transition to the exterior wall.
  - c. Install a narrow, termination membrane collar strip around the circumference of the penetration perimeter, lapping onto the penetration and substrate.
  - d. Install one piece termination membrane with penetration shape cut out on to the substrate. Apply over "fingers" on the substrate and extend a minimum of 2 inches beyond the penetration perimeter.
  - e. Apply sealant at the penetration perimeter and cut edge of the one piece membrane.
  - f. Substrate transitions and building joints: See Drawings for project specific detailing with backer rod, sealant, and termination membrane.
  - g. Repairs: Apply termination membrane 6 inch larger than test or damage area. Seal cut edges of membrane with sealant.

### 3.4 FIELD QUALITY CONTROL

- A. Third-party testing agency: Cooperate with the third-party testing agency. Provide access and utilities to testing areas of work. Do not cover air barrier assembly until testing is completed and accepted. Submit test results as specified under Submittals of this Section.
- B. Tests
  1. Qualitative air leakage: ASTM E1186. Conduct [quantity] at the mock-up and [quantity] at select locations of the Work.
  2. Quantitative air leakage: ASTM E783, at 1.57 psf (75 Pa). Conduct [quantity] at the mock-up and [quantity] at select locations of the Work.
  3. Water penetration: ASTM E1105. Conduct [quantity] at the mock-up and [quantity] at select locations of the Work.
  4. Membrane adhesion: ASTM D4541, modified. Use a Type II Pull Tester. Cut through the membrane at the perimeter of the disc.
    - a. Conduct [quantity] sets at the mock-up and [quantity] sets at select locations 24 hours after installation. Each set includes three adhesion tests.
    - b. Record the mode of failure and area where material failed.
    - c. Record the adhesion level from the gauge at the end of the test.
  5. Repair all test areas to conform to the project specifications.
  6. Repair or take corrective action all non-conforming work to meet the project specifications.

### 3.5 PROTECTION AND CLEANING

- A. Protect air barrier materials from damage during installation and the remainder of the construction period.

- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and acceptable to the air barrier assembly manufacturer.
- C. Spray applied membrane should not be applied in excessive winds. Care should be taken to minimize overspray during application. Protection of adjacent, finished, surfaces is recommended.

**END OF SECTION 07 27 26**

## SECTION 073113 - ASPHALT SHINGLES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Asphalt shingles.
  - 2. Underlayment.
  - 3. Ridge vents.
  - 4. Metal flashing and trim.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Evaluation reports.
- C. Sample warranty.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

#### 1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.
  - 1. Material Warranty Period: 30 years from date of Substantial Completion, prorated, with first three years nonprorated.
  - 2. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 60 mph (27 m/s) for five years from date of Substantial Completion.
  - 3. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for five years from date of Substantial Completion.
  - 4. Workmanship Warranty Period: Ten years from date of Substantial Completion.



## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E 108 or UL 790 by Underwriters Laboratories, Inc. or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

## 2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Laminated-Strip Asphalt Shingles: ASTM D 3462/D 3462M, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
  - 1. Approved Manufacturer:
    - a. GAF
    - b. Equal as approved by Architect
  - 2. Product: GAF Timberline HD
  - 3. Strip Size: Manufacturer's standard
  - 4. Algae Resistance: Granules resist algae discoloration.
  - 5. Impact Resistance: UL 2218, Class 4.
  - 6. Color and Blends: As selected by Architect from manufacturer's full range.
- B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles

## 2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226/D 226M, asphalt-saturated organic felts, nonperforated.
  - 1. Type: Type I.
- B. Self-Adhering Sheet Underlayment, Polyethylene Faced: ASTM D 1970/D 1970M, minimum of 40-mil- (1.0-mm-) thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release backing; cold applied.

## 2.4 RIDGE VENTS

- A. Rigid Ridge Vent: Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent for use under ridge shingles.
  - 1. Features:
    - a. Nonwoven geotextile filter strips.
    - b. External deflector baffles.

## 2.5 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.
- B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- (3-mm-) diameter, sharp-pointed, with a minimum 3/8-inch- (9.5-mm-) diameter flat

head and of sufficient length to penetrate 3/4 inch (19 mm) into solid wood decking or extend at least 1/8 inch (3 mm) through OSB or plywood sheathing.

1. Shank: Barbed.
  2. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- C. Felt-Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch (25-mm) minimum diameter.
- D. Synthetic-Underlayment Fasteners: As recommended in writing by synthetic-underlayment manufacturer for application indicated.

## 2.6 METAL FLASHING AND TRIM

- A. General: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
1. Sheet Metal: Aluminum, mill finished.
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.

## PART 3 - EXECUTION

### 3.1 UNDERLAYMENT INSTALLATION

- A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
- B. Single-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches (50 mm) over underlying course. Lap ends a minimum of 4 inches (100 mm). Stagger end laps between succeeding courses at least 72 inches (1830 mm). Fasten with felt-underlayment nails.
1. Install felt underlayment on roof sheathing not covered by self-adhering sheet underlayment. Lap edges over self-adhering sheet underlayment not less than 3 inches (75 mm) in direction that sheds water.
- C. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install lapped in direction that sheds water. Lap sides not less than 3-1/2 inches (89 mm). Lap ends not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Roll laps with roller. Cover underlayment within seven days.

### 3.2 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

### 3.3 ASPHALT-SHINGLE INSTALLATION

- A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
- B. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- C. Fasten asphalt-shingle strips with a minimum of four roofing nails located according to manufacturer's written instructions.
  - I. When ambient temperature during installation is below 50 deg F (10 deg C), seal asphalt shingles with asphalt roofing cement spots.
- D. Closed-Cut Valleys: Extend asphalt-shingle strips from one side of valley [12 inches (300 mm)] <Insert dimension> beyond center of valley. Use one-piece shingle strips without joints in valley. Fasten with extra nail in upper end of shingle. Install asphalt-shingle courses from other side of valley and cut back to a straight line 2 inches (50 mm) short of valley centerline. Trim upper concealed corners of cut-back shingle strips.
  - I. Do not nail asphalt shingles within 6 inches (150 mm) of valley center.
  - 2. Set trimmed, concealed-corner asphalt shingles in a 3-inch- (75-mm-) wide bed of asphalt roofing cement.
- E. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
- F. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
  - I. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

END OF SECTION 073113

**SECTION 07 46 00 - SIDING**

## PART 1 - GENERAL

## I.1 SUMMARY

- A. Section includes fiber-cement siding.

## I.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For siding including related accessories.
- C. Qualification Data: For qualified vinyl siding installer.
- D. Product certificates.
- E. Product test reports.
- F. Research/evaluation reports.
- G. Maintenance data.
- H. Warranty: Sample of special warranty.

## I.3 QUALITY ASSURANCE

- A. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.
- B. Source Limitations: Obtain each type, color, texture, and pattern of siding including related accessories, from single source from single manufacturer.

## I.4 WARRANTY

- A. Special Warranty: Standard form in which manufacturer agrees to repair or replace siding that fail(s) in materials or workmanship within specified warranty period.
  - I. Warranty Period: 30 years from date of Substantial Completion.

## I.5 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - I. Furnish full lengths of siding including related accessories, in a quantity equal to 2 percent of amount installed.

## PART 2 - PRODUCTS

## 2.1 FIBER-CEMENT SIDING

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
  - I. Basis-of-Design Product: Subject to compliance with requirements, provide James Hardie Commercial, Artisan Lap Siding or comparable product by one of the following
    - a. Cemplank.
    - b. CertainTeed Corp.
    - c. GAF Materials Corporation.
    - d. MaxiTile, Inc; a California corporation.

- e. Nichiha Fiber Cement
- 2. Horizontal Pattern: Boards 7-1/4 inches wide in plain style.
  - a. Complies with ASTM C 1186 Type A Grade II.
  - b. Complies with ASTM E 136 as a noncombustible material.
  - c. Complies with ASTM E 84 Flame Spread Index = 0, Smoke Developed Index = 5.
  - d. Texture: Smooth.
  - e. Thickness: 5/8 inch (NOTE: Conventional 5/16" nominal thickness siding is not acceptable)
  - f. Lengths: 12 foot.
- 3. Finish:
  - a. Factory Priming: Manufacturer's standard acrylic primer.
  - b. Top Coat: See Section 09 91 13.

## 2.2 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
  - 1. Provide accessories made from same material as adjacent siding unless otherwise indicated.
- B. Flashing: Provide aluminum flashing complying with Division 07 Section "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
  - 1. Finish for Aluminum Flashing: Factory-prime coating
- C. Fasteners:
  - 1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch into substrate.
  - 2. For fastening fiber cement, use hot-dip galvanized fasteners.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding and related accessories.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Comply with siding manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
  - 1. Do not install damaged components.
  - 2. Center nails in elongated nailing slots without binding siding to allow for thermal movement.
- B. Install fiber-cement siding and related accessories.
  - 1. Install fasteners no more than 24 inches o.c.
- C. Starting: Install a 1/2 inch thick lath starter strip at the bottom course of the wall. Apply planks horizontally with minimum 1-1/4 inches (32 mm) wide laps at the top. The bottom edge of the first plank overlaps the starter strip.
- D. Allow minimum vertical clearance between the edge of siding and any other material in accordance with the manufacturer's installation instructions.
- E. Maintain clearance between siding and adjacent finished grade.
- F. Locate splices at least one stud cavity away from window and door openings.
- G. Install joint sealants as specified in Division 07 Section "Joint Sealants" and to produce weathertight installation.
- H. Install materials in strict accordance with manufacturer's installation instructions. Install flashing around all wall openings.

- I. Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch (19 mm) or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.
- J. Place fasteners no closer than 3/4 inch (19 mm) and no further than 2 inches (51 mm) from side edge of trim board and no closer than 1 inch (25 mm) from end. Fasten maximum 16 inches (406 mm) on center.
- K. Maintain clearance between trim and adjacent finished grade.
- L. Trim inside corner with a single board trim both side of corner.
- M. Outside Corner Board: Attach trim on both sides of corner with 16 gage corrosion resistant finish nail 1/2 inch (13 mm) from edge spaced 16 inches (406 mm) apart, weather cut each end spaced minimum 12 inches (305 mm) apart.
- N. Allow 1/8 inch gap between trim and siding.
- O. Seal gap with high quality, paint-able caulk.
- P. Fasten through overlapping boards. Do not nail between lap joints.
- Q. Overlay siding with single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten trim boards to trim boards.

### 3.3 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

**END OF SECTION 07 46 00**

**SECTION 07 46 01 – FIBER CEMENT TRIM****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Fiber-cement soffit and fascia panels for use at exterior of buildings.
- B. Related Sections:
  - 1. Division 06 Section "Rough Carpentry" for wood furring, grounds, nailers, and blocking.
  - 2. Division 06 Section "Sheathing" for wall sheathing and weather-resistive barriers.

**1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Product Certificates: For each type of panel, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.
- D. Research/Evaluation Reports: For each type of panel required, from the ICC.
- E. Maintenance Data: For each type of panel and related accessories to include in maintenance manuals.
- F. Warranty: Sample of special warranty.

**1.4 QUALITY ASSURANCE**

- A. Labeling: Provide fiber-cement panel that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.
- B. Source Limitations: Obtain siding, including related accessories, from single source from single manufacturer.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Store materials in a dry, well-ventilated, weathertight place.
- B. Panels must be stored flat and kept dry before installation. A waterproof cover over panels and accessories should be used at all times prior to installation.
- C. If panels are exposed to water or water vapor prior to installation, allow to completely dry before installing. Failure to do so may result in shrinkage at ship lap joints, and such action may void warranty.
- D. Panels must be carried on edge. Do not carry or lift panels flat. Improper handling may cause cracking or panel damage.



- E. Direct contact between the panels and the ground should be avoided at all times. It is necessary to keep panels clean during installation process.

## 1.6 COORDINATION

- A. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

## 1.7 WARRANTY

- A. Special Warranty: Standard form in which manufacturer agrees to repair or replace siding that fail(s) in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 30 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 FIBER-CEMENT SOFFIT PANELS

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide James Hardie Fiber Cement Soffit and Fascia Panels or comparable product by one of the following:
    - a. Cemplank.
    - b. CertainTeed Corp.
    - c. GAF Materials Corporation.
    - d. MaxiTile, Inc; a California corporation.
    - e. Nichiha Fiber Cement.
  - 2. Soffit Panels:
    - a. Complies with ASTM E 136 as a noncombustible material.
    - b. Texture: Smooth, perforated.
    - c. Thickness: 1/4 inch.
    - d. Panel Sizes: fit full width of soffit with one piece.
  - 3. Fascia Panels:
    - a. Complies with ASTM E 136 as a noncombustible material.
    - b. Texture: Smooth.
    - c. Thickness: 1/4 inch.
    - d. Panel Sizes: 4 foot x 8 foot.
  - 4. Finish:
    - a. Factory primed.
    - b. See Division 09 Section "Exterior Paint" for field applied paint finish.

### 2.2 ACCESSORIES

- A. Fasteners:
  - 1. For fastening fiber cement, use corrosion resistant fasteners, such as hot-dipped galvanized screws.
  - 2. Do not use aluminum fasteners, staples, clipped head nails or fasteners that are not rated or designed for intended use.
  - 3. See manufacturer's detailed instructions for appropriate fasteners for construction method used.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding and related accessories. Examine site to ensure substrate conditions are within specification for proper installation.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Clean substrates of projections and substances detrimental to application.

### 3.2 INSTALLATION

- A. General: Comply with soffit panel manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
  - 1. Do not install damaged components.
  - 2. Center nails in elongated nailing slots without binding siding to allow for thermal movement.
- B. Allow minimum clearance between the edge of soffit panels and all other materials in accordance with the manufacturer's installation instructions.
- C. Install joint sealants as specified in Division 07 Section "Joint Sealants" and to produce weathertight installation.
- D. Install materials in strict accordance with manufacturer's installation instructions.
- E. Fasten into structural framing. Fasteners must penetrate minimum as required by manufacturer for substrate materials. Additional fasteners may be required to ensure adequate security.
- F. Seal gaps with high quality, paint-able caulk.

### 3.3 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

**END OF SECTION 07 46 01**

## SECTION 07 54 23 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

### PART I - GENERAL

#### I.1 SUMMARY

- A. Section Includes:
  - I. Fully adhered TPO membrane roofing system over unconditioned porches.

#### I.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Verification: For the following products:
  - I. Sheet roofing, of color specified.
- D. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
  - I. Submit evidence of compliance with performance requirements.
- E. Research/evaluation reports.
- F. Field quality-control reports.
- G. Maintenance data.

#### I.3 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product.
- B. Source Limitations: Obtain components including roof insulation for membrane roofing system from same manufacturer as membrane roofing.
- C. Exterior Fire-Test Exposure: ASTM E 108, Class B; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
- D. Preinstallation Roofing Conference: Conduct conference at Project site.

#### I.4 WARRANTY

- A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.
  - I. Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 TPO MEMBRANE ROOFING

- A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible TPO sheet.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Carlisle SynTec Incorporated.
    - b. Firestone Building Products Company.
    - c. GAF Materials Corporation.
    - d. GenFlex Roofing Systems.
    - e. Johns Manville.
    - f. Versico Incorporated.
  - 2. Thickness: 45 mils, nominal.
  - 3. Color: Gray

## 2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

- A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.
  - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
  - 2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    - a. Plastic Foam Adhesives: 50 g/L.
    - b. Gypsum Board and Panel Adhesives: 50 g/L.
    - c. Multipurpose Construction Adhesives: 70 g/L.
    - d. Fiberglass Adhesives: 80 g/L.
    - e. Contact Adhesive: 80 g/L.
    - f. Other Adhesives: 250 g/L.
    - g. Single-Ply Roof Membrane Sealants: 450 g/L.
    - h. Nonmembrane Roof Sealants: 300 g/L.
    - i. Sealant Primers for Nonporous Substrates: 250 g/L.
    - j. Sealant Primers for Porous Substrates: 775 g/L.
- B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils thick, minimum, of same color as sheet membrane.
- C. Bonding Adhesive: Manufacturer's standard, water based.
- D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- E. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

## 2.3 ROOF INSULATION

- A. Polyisocyanurate Board Insulation (INSUL-7): ASTM C 1289, Type II, Class I, Grade 2, felt or glass-fiber mat facer on both major surfaces.
- B. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated or required for sloping to drain. Fabricate to slopes indicated.

## 2.4 INSULATION ACCESSORIES

- A. Insulation Adhesive: Insulation manufacturer's recommended cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- B. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric, water permeable and resistant to UV degradation, type and weight as recommended by roofing system manufacturer for application.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
  - 1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
  - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

### 3.3 INSULATION INSTALLATION

- A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

### 3.4 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.
- B. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

- C. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.
- D. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.
- E. Apply membrane roofing with side laps shingled with slope of roof deck where possible.
- F. Seams: Clean seam areas, overlap membrane roofing and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
  - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
  - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
  - 3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

### 3.5 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings[ and mechanically anchor to substrate through termination bars].

### 3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

END OF SECTION 07 54 23

**SECTION 07 71 00 - ROOF SPECIALTIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Roof edge drainage systems.
  - 2. Counterflashings and reglets.
  - 3. Aluminum soffits and fascia. See Section 01 23 00 Alternates.

**1.2 PERFORMANCE REQUIREMENTS**

- A. FMG Listing: Manufacture and install copings roof edge flashings that are listed in FMG's "Approval Guide" and approved for Windstorm Classification, Class 1-90 Identify materials with FMG markings.
- B. Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressures:
  - 1. Design Pressure: See Structural Drawings

**1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show layouts of manufactured roof specialties, including plans and elevations. Identify factory- vs. field-assembled work.
- C. Samples: For each type of manufactured roof specialty indicated with factory-applied color finishes.
- D. Product Test Reports: Verifying compliance of copings and roof edge flashings with performance requirements.

**PART 2 - PRODUCTS****2.1 MANUFACTURERS**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

**2.2 EXPOSED METALS**

- A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for use and finish indicated, finished as follows:
  - 1. Surface: Smooth, flat finish.
  - 2. Color: Match PT-4. See Section 09 91 23 for color.
  - 3. High-Performance Organic Finish: Two-coat, thermocured system with color coats containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2604.
- B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:



1. High-Performance Organic Finish: Two-coat, thermocured system with color coats containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2604.
2. Color: Match PT-4. See Section 09 91 23 for color.

### 2.3 CONCEALED METALS

- A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for use and structural performance indicated, mill finished.
- B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

### 2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
- C. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

### 2.5 ROOF EDGE DRAINAGE SYSTEMS

- A. Available Manufacturers:
  1. Architectural Products Co.
  2. ATAS International, Inc.
  3. Berger Bros. Co.
  4. Castle Metal Products.
  5. Cheney Flashing Company.
  6. Hickman, W. P. Company.
  7. Merchant & Evans, Inc.
  8. Metal-Era, Inc.
  9. Metal-Fab Manufacturing LLC.
  10. MM Systems Corporation.
  11. Obdyke, Benjamin Incorporated.
  12. Perimeter Systems, a division of Southern Aluminum Finishing Co.
  13. Petersen Aluminum Corp.
- B. Gutters and Downspouts (MTL-1): Manufactured formed gutter in uniform section lengths not exceeding 12 feet, with mitered and welded or soldered corner units, end caps, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front gutter rim. Furnish with flat-stock gutter straps and gutter support brackets and expansion joints and expansion-joint covers fabricated from same metal as gutters.
  1. Fabricate gutter from the following exposed metal:
    - a. Aluminum: 0.032 inch thick.
  2. Gutter Style: K-style (Ogee) profile in accordance with SMACNA's "Architectural Sheet Metal Manual."
  3. Gutter size: 4" x 5" (nominal) or greater. Manufacturer to confirm necessary gutter size to drain roof as shown on the roof plan.
  4. Downspouts: Rectangular open-face with mitered elbows, manufactured from the following exposed metal. Furnish wall brackets, from same material and finish as downspouts, with anchors.
    - a. Extruded Aluminum: 0.125 inch thick.
  5. Downspout size: 4"x4" (nominal) or greater.

6. Color: Architect to select from manufacturer's standard colors palette.

## 2.6 COUNTERFLASHINGS AND REGLETS

- A. Available Manufacturers:
  1. Castle Metal Products.
  2. Cheney Flashing Company.
  3. Fry Reglet Corporation.
  4. Hickman, W. P. Company.
  5. Keystone Flashing Company.
  6. Merchant & Evans, Inc.
  7. Metal-Era, Inc.
  8. MM Systems Corporation.
- B. Counterflashings: Manufactured units in lengths not exceeding 12 feet designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal in thickness indicated:
  1. Aluminum: 0.024 inch thick.
- C. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashings indicated with factory-mitered and -welded corners and junctions, from the following exposed metal in thickness indicated:
  1. Aluminum: 0.050 inch thick.

## 2.7 SOFFITS AND FASCIAS

- A. Soffit and Fascia (TRIM-2): Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia and soffit cover sections in section lengths not exceeding 12 feet (3.6 m). Provide matching corner units.
  1. Formed Aluminum Sheet Fascia Covers: Aluminum sheet, thickness as required to meet performance requirements.
    - a. Surface: Smooth, flat finish.
    - b. Finish: Two-coat fluoropolymer
    - c. Color: As selected by Architect from manufacturer's full range
  2. Corners: Factory mitered and soldered.
  3. Splice Plates: Concealed of same material, finish, and shape as fascia cover.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Install manufactured roof specialties according to manufacturer's written instructions. Anchor manufactured roof specialties securely in place and capable of resisting forces specified in performance requirements. Use fasteners, separators, sealants, and other miscellaneous items as required to complete manufactured roof specialty systems.
  1. Install manufactured roof specialties with provisions for thermal and structural movement.
  2. Torch cutting of manufactured roof specialties is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
  1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.

- C. Install manufactured roof specialties level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil-canning buckling, or tool marks.
- D. Install manufactured roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
- E. Expansion Provisions: Provide for thermal expansion of exposed manufactured roof specialties. Space movement joints at a maximum of 12 feet with no unplanned joints within 18 inches of corners or intersections.
- F. Fasteners: Use fasteners of type and size recommended by manufacturer but of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- G. Seal joints with sealant as required by manufacturer of roofing specialties.

### 3.2 ROOF EDGE DRAINAGE SYSTEM INSTALLATION

- A. General: Install gutters and downspouts to produce a complete roof drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Gutters: Join and seal gutter lengths. Attach gutters to firmly anchored straps spaced not more than 36 inches apart. Slope gutters to downspouts.
  - I. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion joint caps.
- C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.

### 3.3 COUNTERFLASHING AND REGLET INSTALLATION

- A. Counterflashings: Coordinate installation of counterflashings with installation of base flashings. Insert counterflashings in reglets or receivers and fit tightly to base flashings. Extend counterflashings 4 inches over base flashings. Lap counterflashing joints a minimum of 4 inches and bed with sealant.

### 3.4 CLEANING AND PROTECTION

- A. Retain paragraphs below that apply to roof specialties specified for Project. First paragraph below is not applicable to stainless steel or to painted or coated steel and aluminum.
- B. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- C. Clean and neutralize flux materials. Clean off excess solder and sealants.
- D. Remove temporary protective coverings and strippable films as roof specialties are installed.

END OF SECTION 07 71 00

**SECTION 07 84 13 - PENETRATION FIRESTOPPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
  - 1. Penetrations in fire-resistance-rated walls.
  - 2. Penetrations in horizontal assemblies.

**1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
  - 1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- C. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.
- D. Product test reports.

**1.3 QUALITY ASSURANCE**

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
- B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
  - 1. Penetration firestopping tests are performed by qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems bearing marking of qualified testing and inspection agency.

**PART 2 - PRODUCTS****2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. A/D Fire Protection Systems Inc.
  - 2. Grace Construction Products.
  - 3. Hilti, Inc.
  - 4. Johns Manville.
  - 5. Nelson Firestop Products.
  - 6. NUCO Inc.
  - 7. Passive Fire Protection Partners.
  - 8. Pyroplex Ltd
  - 9. RectorSeal Corporation.
  - 10. Specified Technologies Inc.

11. 3M Fire Protection Products.
12. Tremco, Inc.; Tremco Fire Protection Systems Group.
13. USG Corporation.

## 2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
  1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
  1. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
  2. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
  1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- F. VOC Content: Provide penetration firestopping that complies with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  1. Architectural Sealants: 250 g/L.
  2. Sealant Primers for Nonporous Substrates: 250 g/L.
  3. Sealant Primers for Porous Substrates: 775 g/L.
- G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

## 2.3 EXPANDING FOAM FIRESTOPPING

- A. Expanding foam product that has been tested by independent authorities in accordance with ASTM E-814 (UL 1479) and approved for use at through penetrations in fire rated assemblies up to 2 hours rated.
  1. CFC free.
  2. Product: Pyroplex® Fire Rated Expanding Foam.
    - a. Or approved equal.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

- C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
  - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- D. Install fill materials for firestopping by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
  - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.2 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
  - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
  - 2. Contractor's name, address, and phone number.
  - 3. Designation of applicable testing and inspecting agency.
  - 4. Date of installation.
  - 5. Manufacturer's name.
  - 6. Installer's name.

### 3.3 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

### 3.4 PENETRATION FIRESTOPPING SYSTEMS

- A. Expanding foam fire stopping approved for all through penetrations where UL approved.
- B. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- C. Firestopping for Metallic Pipes, Conduit, or Tubing
  - 1. UL-Classified Systems: FC 1009, FC 1059, WLI054, WLI058 or WLI164.
- D. Firestopping for Nonmetallic Pipe, Conduit, or Tubing:
  - 1. UL-Classified Systems: FC2030, FC2127, or FC2160, WL2075 or WL2078.
- E. Firestopping for Electrical Cables:
  - 1. UL-Classified Systems: FC3012, WL3035, WL3111 or WL3112.
- F. Firestopping for Insulated Pipes:

- I. UL-Classified Systems: FC5004 or FC5037, WL5028, WL5029, or WL5047.
- G. Firestopping for Miscellaneous Mechanical Penetrants:
  - I. UL-Classified Systems: FC7013, WL7070 or WL7042

END OF SECTION 07 84 13



**SECTION 07 92 00 - JOINT SEALANTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:
  - 1. Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 2. Exterior joints in horizontal traffic surfaces.
  - 3. Interior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 4. Interior joints in horizontal traffic surfaces.
- B. See Division 32 Section "Concrete Paving Joint Sealants" for sealing joints in pavements, walkways, and curbing.
- C. See Division 08 Section "Glazing" for glazing sealants.

**1.2 PERFORMANCE REQUIREMENTS**

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

**1.3 SUBMITTALS**

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Compatibility and adhesion test reports.

**1.4 QUALITY ASSURANCE**

- A. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint-sealant manufacturers for testing according to ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
- B. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates according to the method in ASTM C 1193 that is appropriate for the types of Project joints.

**1.5 WARRANTY**

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - I. Warranty Period: Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.
- B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

### 2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
  - I. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with Rule 1168 of the South Coast Air Quality Management District and Regulation 8, Rule 51 of Bay Area Air Quality Management District.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

### 2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Immersion in Liquids: Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- E. Multicomponent Nonsag Polysulfide Sealant:
  - I. Available Products:
    - a. Pacific Polymers, Inc.; Elasto-Seal 227 Type II (Gun Grade).
    - b. Pecora Corporation; Synthacalk GC-2+.
    - c. Polymeric Systems Inc.; PSI-350.
    - d. PolySpec Corp.; T-2235-M.
    - e. PolySpec Corp.; T-2282.
    - f. PolySpec Corp.; Thiokol 2P.
    - g. Sonneborn, Division of ChemRex Inc.; Sonolastic Polysulfide Sealant.
    - h. Or approved equal.
  - 2. Type and Grade: M (multicomponent) and NS (nonsag).

3. Class: 25.
  4. Use[s] Related to Exposure: T (traffic) and NT (nontraffic).
  5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
- F. Multicomponent Pourable Polysulfide Sealant:
1. Available Products:
    - a. Meadows, W. R., Inc.; Deck-O-Seal.
    - b. Pacific Polymers, Inc.; Elastoseal 227 Type I (Pourable).
    - c. Or approved equal.
  2. Type and Grade: M (multicomponent) and P (pourable).
  3. Class: 25.
  4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
  5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
- G. Single-Component Neutral-Curing Silicone Sealant:
1. Available Products:
    - a. Dow Corning Corporation; 799.
    - b. GE Silicones; UltraGlaze SSG4000.
    - c. GE Silicones; UltraGlaze SSG4000AC.
    - d. Polymeric Systems Inc.; PSI-63 I.
    - e. Schnee-Morehead, Inc.; SM573 I Poly-Glaze Plus.
    - f. Tremco; Proglaze SG.
    - g. Tremco; Spectrem 2.
    - h. Tremco; Tremsil 600.
    - i. Or approved equal.
  2. Type and Grade: S (single component) and NS (nonsag).
  3. Class: 25.
  4. Use Related to Exposure: NT (nontraffic).
  5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
- H. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant:
1. Available Products:
    - a. Pecora Corporation; 898.
    - b. Tremco; Tremsil 600 White.
    - c. Or approved equal.
  2. Type and Grade: S (single component) and NS (nonsag).
  3. Class: 25.
  4. Use Related to Exposure: NT (nontraffic).
  5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
- I. Multicomponent Nonsag Urethane Sealant:
1. Available Products:
    - a. Schnee-Morehead, Inc.; Permathane SM 7200.
    - b. Sika Corporation, Inc.; Sikaflex - 2c NS TG.
    - c. Sonneborn, Division of ChemRex Inc.; NP 2.
    - d. Tremco; Vulkem 227.
    - e. Tremco; Vulkem 322 DS.
    - f. Or approved equal.
  2. Type and Grade: M (multicomponent) and NS (nonsag).
  3. Class: 25.
  4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
  5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

## 2.4 LATEX JOINT SEALANTS

- A. Latex Sealant: Comply with ASTM C 834, Type O P, Grade NF.
- B. Available Products:
  - 1. Bostik Findley, Chem-Calk 600.
  - 2. Pecora Corporation; AC-20+.
  - 3. Schnee-Morehead, Inc.; SM 8200.
  - 4. Sonneborn, Division of ChemRex Inc.; Sonolac.
  - 5. Tremco; Tremflex 834.
  - 6. Or approved equal.

## 2.5 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
  - I. Available Products:
    - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
    - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
    - c. Or approved equal.

## 2.6 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), O (open-cell material), B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

## 2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.
    - a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
  - 2. Remove laitance and form-release agents from concrete.
    - a. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

## 3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
  - 1. Install acoustical sealant at all wall-to-wall interfaces, wall-to-floor, and wall-to-ceiling interfaces at all acoustically rated wall, floor and ceiling assemblies.
  - 2. Install acoustical sealant at all pipe penetrations, conduit penetrations, duct penetrations, structural penetrations and other penetrations at all acoustically rated wall, floor and ceiling assemblies.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
- G. Installation of Preformed Silicone-Sealant System: Comply with manufacturer's written instructions.
- H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.
- I. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- J. Install caulk joints at entire building exterior envelope to prevent vermin and rodent infestation of interior, conditioned spaces.
  - 1. Install caulk joints at all wall-to-floor, wall-to-ceiling and wall-to-roof locations where there are intersecting planes, seal sheathing to either sheathing on intersecting plane or to structural substrate.
  - 2. Install caulk at all building exterior envelope HVAC, electrical, plumbing and communication penetrations.
  - 3. Install caulk joints at all structural penetrations of the building exterior envelope.
  - 4. Install caulk joints at all door and window penetrations of the building exterior envelope.

### 3.3 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application JS-1: Exterior vertical and horizontal nontraffic construction joints in cast-in-place concrete.
  - 1. Joint Sealant: Multicomponent nonsag polysulfide sealant
  - 2. Joint-Sealant Color: As selected by Architect.
- B. Joint-Sealant Application JS-2: Exterior horizontal isolation and contraction joints in cast-in-place concrete slabs.
  - 1. Joint Sealant: Multicomponent pourable polysulfide sealant
  - 2. Joint-Sealant Color: As selected by Architect.
- C. Joint-Sealant Application JS-3: Exterior vertical control and expansion joints in unit masonry and joints between unit masonry and adjacent materials.
  - 1. Joint Sealant: Multicomponent nonsag polysulfide sealant
  - 2. Joint-Sealant Color: As selected by Architect.
- D. Joint-Sealant Application JS-4: Exterior vertical joints between different materials listed above.
  - 1. Joint Sealant: Multicomponent nonsag polysulfide sealant.
  - 2. Joint-Sealant Color: As selected by Architect.
- E. Joint-Sealant Application JS-5: Exterior perimeter joints between masonry and frames of doors, windows and louvers.
  - 1. Joint Sealant: Multicomponent nonsag polysulfide sealant
  - 2. Joint-Sealant Color: As selected by Architect.

- F. Joint-Sealant Application JS-6: Interior perimeter joints of exterior openings.
  - 1. Joint Sealant: Single-component neutral- and basic-curing silicone sealant
  - 2. Joint-Sealant Color: As selected by Architect.
  
- G. Joint-Sealant Application JS-7: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
  - 1. Joint Sealant: Single-component mildew-resistant neutral-curing silicone sealant.
  - 2. Joint-Sealant Color: White.
  
- H. Joint-Sealant Application JS-8: Perimeter joints between interior wall surfaces and frames of interior doors and windows.
  - 1. Joint Sealant: Latex sealant.
  - 2. Joint-Sealant Color: As selected by Architect.

END OF SECTION 07 92 00



**SECTION 08 11 63 – ALUMINUM STORM DOORS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
  - I. Aluminum storm doors with hardware

**1.2 REFERENCES**

- A. ANSI/AAMA 1002.10-93 "Voluntary Specification for Insulating Storm Products for Windows and Sliding Glass Doors"
- B. ASTM E 283-91 "Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors"
- C. ASTM E 330-91 "Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference"
- D. ASTM E 331-86 "Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Air Pressure Difference"
- E. AAMA 502-90 "Voluntary Specification for Field Testing of Windows and Sliding Glass Doors"
- F. ASTM E 90-90 "Laboratory Measurement of Airborne Sound Transmission of Building Partitions"
- G. ASTM E 413-87 "Determination of Sound Transmission Class (STC)"

**1.3 SUBMITTALS**

- A. Product Data: For each type of door indicated. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
- C. Samples: For factory-finished doors.

**1.4 QUALITY ASSURANCE**

- A. Qualifications: Fabrication shall be by a Door Manufacturer who can furnish evidence to the Owner that it is, and has been for not less than five (5) consecutive years, regularly engaged in the manufacturing of aluminum Storm door units similar in design and performance to those specified for this Project.
- B. Pre-award Installation:
  - I. Provide a complete installation of one (1) storm door as specified and selected by the Owner. Storm door mock-up to be completed within seven (7) days of the bid opening date. This storm door and installation shall be for the review of the product and installation. The Owner at his discretion may have the storm door tested by an Independent Test laboratory to verify compliance of the product with these Specifications. The cost for pre-award testing, by the Independent Laboratory shall be paid by Owner. Any deficiencies discovered on the storm door by the testing and the Bidder at no cost to the Owner will correct deficiencies in any similar models used in the project.
- C. Post Installation Field Testing:
  - I. The Owner will randomly select one (1) storm doors after installation for field-testing

2. Storm door field-testing will be in accordance with AAMA 502-90 using Test Method B. After installation and before final payment, up to two percent (2%), but not less than two (2) storm door units may be randomly selected by the Owner and subjected to an air leakage and water resistance tests. Air leakage and water resistance test results shall meet the specified requirements. If any randomly tested storm door fails, the Successful Bidder shall make necessary corrections until satisfactory results are achieved and make corrections to all other storm door units installed as part of this Project.
3. All costs associated with the Post Installation Field Testing and required repairs or replacements shall be borne by the Successful Bidder. These tests may be performed by either the Storm Door Manufacturer's technical service personnel using accurately calibrated and approved air leakage testing equipment, or by an approved Independent Test Laboratory. All tests shall be conducted in the presence of the Owner, or the

#### 1.5 WARRANTY

- A. Product Warranty: The successful Bidder shall furnish a positively written, non-prorated and fully transferable warranty from the Door Manufacturer against defects in materials and workmanship of the storm door units, under normal use, for a period of ten (10) years from the date of acceptance of the installed storm door units by the Owner. The warranty shall state that the Door Manufacturer shall provide all materials required to repair or replace defective materials or workmanship. The warranty shall further state that parts used to manufacture the storm door units, or suitable replacements, shall be available throughout the warranty period.
- B. Installation Warranty: The Successful Bidder shall furnish a written warranty against defects in the installation workmanship and materials for a period of three (3) years from the date of acceptance by the Owner. Installation warranty work will be performed at no cost to the Owner.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURER

- A. Acceptable Manufacturers: Complying with the requirements of this section, acceptable manufacturers are as follows:
  - I. Mon-Ray, Inc.

##### 2.2 MATERIALS

- A. Aluminum: All frame, sash and screen members shall be accurately extruded aluminum prime alloy 6063-T6. The minimum nominal wall thickness of all frame, sash, screens and Z-bar members shall not be less than 0.050" (1.27 mm).
- B. Glazing: Glazing for self storing acoustical storm doors shall be 1/8" (1.27 mm) clear tempered. The glass shall be glazed into the sash with a one-piece wrap-around, flexible vinyl glazing channel. All corners shall be secured and neatly tucked. All glass shall be factory washed.
- C. Weather-strip: All weather-strip shall be silicone treated, UV stabilized polypropylene pile with an integral polypropylene fin running through the center. Weather-stripping shall be bonded to a non-shrinking backing, which shall slide into extruded ports in the Z-bar and aluminum storm frame.
- D. Kick Panel: The kick panels are securely installed below the window unit in self-storing doors.
- E. Screens: All self-storing doors shall have a half screen mounted in the sash track of the storm frame. The screen shall be pre-bowed, extruded 6063-T6 tubular aluminum with a nominal wall thickness of 0.055" (1.39 mm). Mitered corners shall be joined neatly by means of solid T6 tempered aluminum corner gussets.

securely peened within the screen frame extrusion. The screen cloth shall be fiberglass 18 x 14 mesh in a charcoal color and secured into screen frame with a vinyl spline.

- I. Fiberglass 18 x 16 mesh shall not be acceptable.

## 2.3 DOOR TYPE AND OPERATION

- A. Type: All doors shall be self-storing aluminum sash. Storm door frame depth shall be 7/8" (22.2 mm) for standard 800 Series Doors. All door sash and screen inserts shall be easily removable to the interior for cleaning. The entire storm door shall be designed and constructed in a manner that allows for easy replacement of all parts, hardware and weather-stripping.
- B. Self-Storing Doors: Operating sash and frame shall have a two-track, self storing sash and screen design. Operating surfaces to be completely separated from metal-to-metal contact. All vertical sliding sash shall operate in a vinyl track with predetermined processed ventilating positions. The vinyl tracks will be secured into the door frame through the use of extruded ports. The vinyl track and spring loaded pin-locks shall provide a "ratchet action" design with automatic ventilation settings every two (2) inches (5.08 cm). In the closed and fully open positions the operating sash shall lock in non-ratcheted, secure holes. The pin-locks shall engage automatically into predetermined ventilating positions processed into each of the side storm frames.

## 2.4 HARDWARE

- A. All assembly and installation fasteners and screws incorporated in the storm door shall be non-magnetic, stainless steel. All hardware parts shall be of aluminum, stainless steel, nylon, or other non-corrosive materials compatible with aluminum.
  - I. Wrought metal or plastic parts will not be acceptable.
- B. Latch: The latch shall consist of a heavy-duty cast aluminum thumb push button on the exterior handle and push latch on the interior incorporating a slide lock, steel pin and spring stop.
- C. Closer: The closer shall be adjustable, spring loaded, heavy pneumatic with "hold open" feature. Wright models 170 or 150 are acceptable.
- D. Stop: The stop shall have a check chain with spring safety cushion.
- E. Hinges: The door frame shall be securely mounted to the Z-Bar with three (3) stainless steel, double leaf hinges with self lubricating oil-lite bushings.

## 2.5 FABRICATION

- A. Frame and Sash Construction:
  1. Door Frame: The storm door frame shall be constructed of tubular aluminum extrusions having an overall minimum depth of .875" (22.2 mm) and a minimum wall thickness of .055" (1.39 mm). Mitered corners shall be neatly joined by means of 6063-T6 tempered solid aluminum corner gussets with an overall width of .625" (15.87 mm), and average wall thickness of .250" (6.35 mm). Each corner gusset shall be securely anchored to the door frame by four (4) non-magnetic, stainless steel screws. The door frame shall be pre hinged to the Z-Bar (right or left as viewed from the exterior) by the Door Manufacturer.
  2. Window Frame: All aluminum head, jamb and sill members for the master frame and all frame expanders shall have a minimum wall thickness of 0.050" (1.27 mm). All members to be extruded 6063-T6 aluminum assembled in a secure and workman like manner to assure lasting weather resistant construction. Frame joints shall be butt-type, neatly joined and secured by means of non-magnetic, stainless steel screws anchored into integral screw ports. Vinyl weather-stripping and tracks shall be shaded from direct sunlight by the frame and sash members.
  3. Sash: All sash members shall be extruded 6063-T6 aluminum with a minimum wall thickness of 0.055" (1.39 mm). Mitered corners shall be joined by non-magnetic stainless steel corner keys, securely

peened on the inside of the sash insert. All sharp corners of the sash shall be deburred and smoothed. Sash meeting rails shall interlock in the closed position. All removable panels and operating sash shall have a full length extruded lift handle as part of the sash rail. The lift handle shall project 7/16" (11.1 mm) to the interior to allow adequate area to maintain a sure finger grip.

- B. Z-Bar: Shall be accurately extruded aluminum prime alloy 6063-T6. Wall thickness shall be .062" (1.57 mm). Pre-drilled installation holes shall be uniform and accurately positioned for maximum support. Weather-strip shall have specially extruded ports and be secured to prevent shrinkage, movement or loss.

## 2.6 FINISHES

- A. Organic (Painted Finish)
  - 1. Finish all exposed areas of aluminum storm doors and components with a factory applied spray coating in accordance with Aluminum Association Designation: \*Description AA Designation AAMA Guide Specification Siliconized polyester baked enamel AA-M12-C41-RX1 AAMA 2603
  - 2. Colors: To be selected by Architect from one of the manufacturer's standard colors. The head of all assembly and installation screws shall be painted the same color as the master frame of the storm door.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Bidders are expected to visit the job-site and make a complete survey of the Project prior to bid. All storm door openings will be measured by the Bidder for proper sizing of the new storm doors. Failure to do so will not relieve the Successful Bidder from the need to furnish any and all materials, which may be required, in accordance with the Specifications, without any additional cost to the Owner.
- B. Inspect openings before installation to assure surfaces are clean and dry. Verify that storm door opening and masonry openings are correct and the threshold is level.

### 3.2 PREPARATION

- A. Remove new storm door units from crating and packaging material. Verify that all parts and accessories are included. All storm door units and accessories shall be securely stored, upright and protected from the weather.
- B. Install only aluminum tubing or preservative treated lumber, as required, for all blocking.

### 3.3 INSTALLATION

- A. Storm doors shall be installed in strict accordance with the Manufacturer's instructions and Shop Drawings.
- B. Anchors should be not less than #8 non-magnetic, stainless steel screws. The length of the installation screws shall allow a minimum of one half (1/2) inch (12.7 mm) to penetrate into the door frame or blocking. Anchors must be adequate to handle thermal and building movement and specified uniform load requirements.
- C. Provide single-component or multi-component, low-modulus, non-sag sealant; comply with ASTM C920, Type S or M, Grade NS, Class 25.

### 3.4 ADJUST AND CLEAN

- A. Operate installed storm doors to assure a proper installation has occurred. Make any appropriate adjustments.

B. Remove excess sealant, dirt, door labels and wipe dust off frame and glass

END OF SECTION 08 11 63

**SECTION 08 14 16 - FLUSH WOOD DOORS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
  - 1. Solid-core doors with wood-veneer faces at all dwelling unit doors.
  - 2. Shop priming and Factory finishing flush wood doors.
  - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Sections:
  - 1. Division 08 Section "Glazing" for glass view panels in flush wood doors.

**1.2 SUBMITTALS**

- A. Product Data: For each type of door indicated. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
  - 1. Indicate dimensions and locations of mortises and holes for hardware.
  - 2. Indicate dimensions and locations of cutouts.
  - 3. Indicate requirements for veneer matching.
  - 4. Indicate doors to be factory finished and finish requirements.
  - 5. Indicate fire-protection ratings for fire-rated doors.
- C. Samples: For factory-finished doors.

**1.3 QUALITY ASSURANCE**

- A. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
- B. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

**PART 2 - PRODUCTS****2.1 DOOR CONSTRUCTION, GENERAL**

- A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
- B. WDMA I.S.1-A Performance Grade:
  - 1. Heavy Duty unless otherwise indicated.
  - 2. Extra Heavy Duty: Doors at all common dwelling unit entry doors.
  - 3. Standard Duty: Doors within dwelling units.
- C. Particleboard-Core Doors:
  - 1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no urea-formaldehyde resin.
  - 2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
  - 3. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

- D. Structural-Composite-Lumber-Core Doors:
  - 1. Structural Composite Lumber: WDMA I,S,10,
    - a. Screw Withdrawal, Face: 700 lbf.
    - b. Screw Withdrawal, Edge: 400 lbf.
  
- E. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
  - 1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
  - 2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Comply with specified requirements for exposed edges.
  
- F. Mineral-Core Doors:
  - 1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
  - 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
  - 3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

## 2.2 DOORS FOR OPAQUE FINISH

- A. Manufacturers (DR-1 and DR-2): Subject to compliance with requirements, provide products by one of the following:
  - 1. Algoma Hardwoods, Inc.
  - 2. Ampco, Inc.
  - 3. Chappell Door Co.
  - 4. Eagle Plywood & Door Manufacturing, Inc.
  - 5. Eggers Industries.
  - 6. Haley Brothers, Inc.
  - 7. Ideal Architectural Doors & Plywood.
  - 8. Ipik Door Company.
  - 9. Lynden Door Inc.
  - 10. Marlite.
  - 11. Marshfield Door Systems, Inc.
  - 12. Oshkosh Architectural Door Company.
  
- B. Interior Solid-Core Doors (DR-1 and DR-2): For all dwelling unit entry doors and at all doors within dwelling units.
  - 1. Grade: Custom.
  - 1. Faces: Any closed-grain hardwood of mill option.
  - 2. Core: Either glued wood stave or structural composite lumber.

## 2.3 LOUVERS AND LIGHT FRAMES

- A. Metal Louvers:
  - 1. Metal and Finish: Hot-dip galvanized steel, 0,040 inch thick, factory primed for paint finish
  
- B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.



## 2.4 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
  - I. Comply with requirements in NFPA 80 for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied.
- C. Openings: Cut and trim openings through doors in factory.
  - I. Light Openings: Trim openings with moldings of material and profile indicated.
  - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."
  - 3. Louvers: Factory install louvers in prepared openings.
- D. Prehung Doors: Provide flush wood doors as prehung units including doors, frames, weather stripping, and hardware.
  - I. Provide wood door frames, other than fire-rated wood door frames, that comply with Division 06 Section.
  - 2. Provide hardware, including weather stripping and thresholds, that complies with Division 08 Section "Door Hardware."

## 2.5 SHOP PRIMING

- A. Doors for Opaque Finish: Shop prime doors with one coat of wood primer specified in Division 09 Section "Exterior Painting", "Interior Painting". Seal all four edges, edges of cutouts, and mortises with primer.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Hardware: For installation, see Division 08 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
  - I. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
  - I. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
    - a. Comply with NFPA 80 for fire-rated doors.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

**END OF SECTION 08 14 16**

**SECTION 08 31 13 - ACCESS DOORS AND FRAMES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Access doors and frames for gypsum board walls and ceilings.

**1.3 SUBMITTALS**

- A. Product Data: For each type of access door and frame indicated. Include construction details, materials, individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each door face material, at least 3 by 5 inches (75 by 125 mm) in size, in specified finish.
- D. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

**1.4 QUALITY ASSURANCE**

- A. Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.
- B. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

**PART 2 - PRODUCTS****2.1 STEEL MATERIALS**

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
  - 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
  - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
  - 1. ASTM A 123/A 123M, for galvanizing steel and iron products
  - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- C. Steel Sheet: Uncoated and electrolytic zinc-coated, ASTM A 591/A 591M with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- D. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning" to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
  2. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.
- E. Drywall Beads: Edge trim formed from 0.0299-inch (0.76-mm) zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

## 2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS (ACCESS-1 and ACCESS-2)

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Acudor Products, Inc.
  2. Babcock-Davis; A Cierra Products Co.
  3. Bar-Co, Inc. Div.; Alfab, Inc.
  4. Cendrex Inc.
  5. Dur-Red Products.
  6. Elmdor/Stoneman; Div. of Acorn Engineering Co.
  7. Jensen Industries.
  8. J. L. Industries, Inc.
  9. Karp Associates, Inc.
  10. Larsen's Manufacturing Company.
  11. MIFAB, Inc.
  12. Milcor Inc.
  13. Nystrom, Inc.
  14. Williams Bros. Corporation of America (The).
- B. Flush Access Doors and Trimless Frames (ACCESS-1): Fabricated from steel sheet.
1. Locations: Gyp Board or plaster wall surfaces.
  2. Basis of Design Product: J. L. Industries, Inc., model WB
  3. Door: Minimum 16 gauge thick sheet metal, set flush with surrounding finish surfaces.
  4. Frame: Minimum 16 gauge thick sheet metal with drywall bead flange.
  5. Hinges: Concealed, continuous piano.
  6. Latch: Cam latch operated by screwdriver with interior release.
- C. Flush Access Doors and Frames (ACCESS-2): Fabricated from steel sheet.
1. Locations: Gyp Board or plaster ceiling surfaces.
  2. Basis of Design Product: J. L. Industries, Inc., model CT
  3. Door: Minimum 18 gauge thick sheet metal, set flush with surrounding finish surfaces.
  4. Frame: Minimum 18 gauge thick sheet metal with drywall bead flange.
  5. Hinges: Continuous piano.
  6. Latch: Cam latch operated by screwdriver with interior release.

## 2.3 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
1. Exposed Flanges: As indicated

2. For trimless frames with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
  3. Provide mounting holes in frames for attachment of units to metal or wood framing.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
1. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material so that finished material is coplanar with adjacent finish material.

#### 3.2 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

#### 3.3 CONSTRUCTION WASTE MANAGEMENT

- A. Comply with requirements of Section 01 74 19 Construction Waste Management and Section 01 74 20 Waste Management Plan for removal, salvaging, recycling and disposal of debris and waste.

**END OF SECTION 08 31 13**

**SECTION 08 53 13 – VINYL WINDOWS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
  - 1. Vinyl framed awning, sliding and fixed windows.
  - 2. Windows complete with hardware, glazing, weather strip, insect screen, jamb extension, and standard or specified anchors, trim and attachments.
  - 3. See Section 01 23 00: Alternates

**1.2 PRODUCT REQUIREMENTS**

- A. Sealed Insulating Glass Manufactures Association / Insulating Glass Certification Council (SIGMA / IGCC).
- B. Window and Door Manufacturers Association (WDMA):
  - 1. Hallmark Certification Program.
  - 2. ANSI/AAMA/NWDA 101/I.S.2 -97 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.
  - 3. AAMA/WDMA/CSA 101/I.S.2/A440-05 – Standard/Specification for windows, doors, and unit skylights
  - 4. AAMA/WDMA/CSA 101/I.S.2/A440-08 – NAFS North American Fenestration Standard/Specification for windows, doors, and skylights
- C. American Architectural Manufacturers Association (AAMA): 613: Voluntary Performance Requirements and Test Procedures for Organic Coatings on Plastic Profiles.
- D. National Fenestration Rating Council (NFRC): 101: Procedure for Determining Fenestration Product Thermal Properties.

**1.3 SUBMITTALS**

- A. Product Data: For each type of window unit indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and connections to supporting structure and other adjoining work.
  - 1. Manufacturer shall provide all engineering required for window assembly and installation into buildings, including all anchorages, fasteners, spacing, substrate requirements, flashings, seals and weeping functions.
- C. Samples for Verification: For each type of exposed finish required, in a representative section of each unit in manufacturer's standard size.
- D. Product Schedule: Use same designations indicated on Drawings.
- E. Qualification data.
  - 1. Manufacturer to provide a letter from Engineer registered in Minnesota that window design and installation for this specific project meets all the necessary code requirements and performance requirements.
- F. Product test reports.
- G. Field quality-control reports.

H. Maintenance data.

I. Sample warranty.

#### I.4 QUALITY ASSURANCE

A. **Manufacturer Qualifications:** A manufacturer capable of fabricating fiberglass clad windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

B. **Installer Qualifications:** An installer acceptable to unit skylight manufacturer for installation of units required for this Project.

C. **Emergency Egress or Rescue:** Comply with requirements for sleeping units of IBC International Building Code.

D. **Preinstallation Conference:** Prior to installation of any adjacent building envelope material that may come in contact with windows or window flashings, conduct conference at Project site to review flashing details and window installation.

#### I.5 PERFORMANCE REQUIREMENTS

A. **Air, Water and Structural Performance**

1. Windows shall meet R-PG35 Rating specifications in accordance with ANSI/AAMA/NWDA 101/I.S.2-97, AAMA/WDMA/CSA 101/I.S.2/A440-05, and AAMA/WDMA/CSA 101/I.S.2/A440-08
2. Window Air Leakage, ASTM E 283: Window air leakage when tested at 1.57 psf (25 mph) shall be 0.13 cfm/ft<sup>2</sup> of frame or less.
3. Window Water Penetration, ASTM E 547: No water penetration through window when tested under static pressure of 5.4 psf after 4 cycles of 5 minutes each, with water being applied at a rate of 5 gallons per hour per square foot.
4. Forced entry resistance not to exceed limits defined by the standard AAMA/WDMA/CSA 101/I.S.2/A440-05.
5. Field testing to verify compliance shall be performed on units of comparable size to gateway test sizes for designated Performance Classes as listed in Table 1 of Section 4.3 of AAMA/WDMA/CSA 101/I.S.2/A440-05

B. **Thermal Performance**

1. Windows shall meet whole-unit U-Value and SHGC Performance determined in accordance with NFRC 100.

C. Windows shall meet Energy Star Performance criteria for the Northern Climate Zone.

#### I.6 WARRANTY

A. **Special Warranty:** Manufacturer's standard form in which manufacturer agrees to repair or replace components which fail in materials or workmanship within specified warranty period.

- I. **Warranty Period:** Ten years from date of Substantial Completion.

#### I.7 DELIVERY

A. Deliver in original packaging and protect from weather.

B. **Storage:**

- I. Store materials in accordance with manufacturer's instructions.

2. Store materials off ground and under cover.
3. Protect materials from weather, direct sunlight, and construction activities.

C. Handling: Protect materials and finish during handling and installation to prevent damage.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS (VWIN-1)

A. Basis-of-Design Product: Subject to compliance with requirements, provide Pella 250 Series Fiberglass Windows or one of the following products that comply with the specifications herein and is approved by Architect.

### 2.2 MATERIALS

A. Awning, Sliding and Fixed Windows:

1. Factory-assembled vinyl windows with outward-opening sash installed in frame and fixed unit.
2. Frame and Sash Material: Manufacturer's standard reinforced vinyl material.

B. Frame:

1. Type: Block frame.
2. Overall Frame Depth: 3-1/4 inches nominal.
3. Frame Corners:
  - a. Mitered.
4. Jamb: Contain factory-drilled installation screw holes.
5. Frame insulation: Foam Insulation
6. Color: To be selected from manufacturer's standard range of colors.

C. Sash:

1. Sash Corners:
  - a. Mitered.

D. Glazing:

1. Double pane.
2. Float Glass: ASTM C 1036, Quality I.
  - a. Tempered Glass: ASTM C 1048.
3. Type: Polyurethane reactive (PUR) hot-melt glazed, 1 1/16-inch thick, insulating glass, multi-layer, Pella's Advanced Low-E coated with argon, tempered per code
4. Glazing performance, calculated based on NFRC 100:
  - a. U-factor = 0.27
  - b. Solar Heat Gain Coefficient = 0.29
  - c. Visible Light Transmission = 55%
  - d. Condensation Resistance = 60
  - e. Meets Energy Star performance requirements for Zone N.

E. Insect Screens: Standard.

1. Compliance: ASTM D 3656 and SMA 1201.
2. Screen Cloth: manufacturer's standard fiberglass mesh.
3. Set in aluminum frame fitted to inside of window.
4. Complete with necessary hardware.
5. Screen Frame Finish: Baked enamel.
  - a. Color: Match window frame color.



## 2.3 HARDWARE

- A. Operator:
  - 1. Manufacturer's standard operator.
- B. Limited Opening Hardware at all sliders and awning windows:
  - 1. Nominal Opening: 3 inches.
  - 2. Stainless steel.
- C. Finish: Baked enamel, color to be selected from manufacturer's standard colors.
- D. Locking System: .
  - 1. Manufacturer's standard single-handle locking system.
  - 2. Operate positive-acting arms that reach out and pull sash into locked position.
  - 3. Casement Windows: One installed on sash 27.5 inches and smaller in frame height, 2 unison operating locks installed on sash over 27.5 inches in frame height.
  - 4. Awning Windows: One installed on sash 27.5 inches and smaller in frame width, 2 unison operating locks installed on sash over 27.5 inches in frame width.
  - 5. Lock Handle Finish: Baked enamel, color to be selected from manufacturer's standard colors.

## 2.4 TOLERANCES

- A. Windows shall accommodate the following opening tolerances:
  - 1. Vertical Dimensions Between High and Low Points: Plus 1/4-inch, minus 0 inch.
  - 2. Width Dimensions: Plus 1/4-inch, minus 0 inch.
  - 3. Building Columns or Masonry Openings: Plus or minus 1/4-inch from plumb.

## 2.5 FINISH

- A. Exterior and Interior Finish:
  - 1. Color: To be selected from manufacturer's standard colors.

## 2.6 INSTALLATION ACCESSORIES

- A. Flashing/Sealant Tape: Pella SmartFlash or equal
  - 1. Aluminum-foil-backed butyl window and door flashing tape.
  - 2. Maximum Total Thickness: 0.013 inch.
  - 3. UV resistant.
  - 4. Verify sealant compatibility with sealant manufacturer.
- B. Interior Insulating-Foam Sealant: Low-expansion, low-pressure polyurethane insulating window and door foam sealant.
- C. Exterior Perimeter Sealant: "Pella Window and Door Installation Sealant" or equivalent high quality, multi-purpose sealant as specified in the joints sealant section.
- D. Block Frame Installation Accessories: Vinyl installation fin.
- E. Jamb Extensions: None.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Verification of Conditions: Before Installation, verify openings are plumb, square, and of proper dimension as required in Section 01 71 00. Report frame defects or unsuitable conditions to the General Contractor before proceeding.
- B. Acceptance of Conditions: Beginning of installation confirms acceptance of existing conditions.

## 3.2 INSTALLATION

- A. Assemble and install window unit according to manufacturer's instructions and reviewed shop drawings.
- B. Install windows to be weather-tight.
- C. Maintain alignment with adjacent work.
- D. Secure assembly to framed openings, plumb and square, without distortion.
- E. Integrate window system installation with exterior water-resistant barrier using flashing/sealant tape. Apply subflashing so nailing flanges are completely and continuously embedded on both sides of the membrane. Provide sill weeps, dams, and seals according to manufacturer's recommendations. Apply and integrate flashing/sealant tape with water-resistant barrier using watershed principles in accordance with window manufacturer's instructions.
- F. Place interior seal around window perimeter to maintain continuity of building thermal and air barrier using insulating foam sealant. Provide an air-tight seal.
- G. Seal window to exterior wall cladding with sealant and related backing materials at perimeter of assembly.

## 3.3 FIELD QUALITY CONTROL

- A. Field Testing: Field-test windows in accordance with AAMA 502, Test Method A.
  - I. All failed windows and window installations must be replaced. There is zero tolerance for not meeting this requirement.

## 3.4 CLEANING

- A. Remove visible labels and adhesive residue according to manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that would damage finish or glass.
- C. Leave windows and glass in a clean condition. Final cleaning as required in Section 01.

## 3.5 PROTECTING INSTALLED CONSTRUCTION

- A. Protect windows from damage by chemicals, solvents, paint, or other construction operations that may cause damage.

**END OF SECTION 08 53 13**

## SECTION 08 54 14 – FIBERGLASS WINDOWS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
1. Fiberglass framed awning sliding and fixed windows.
  2. Windows complete with hardware, glazing, weather strip, insect screen, jamb extension, and standard or specified anchors, trim and attachments.
  3. See Section 01 23 00: Alternates

#### 1.2 PRODUCT REQUIREMENTS

- A. American Society for Testing and Materials (ASTM):
1. E 283: Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.
  2. E 330: Standard Test Method for Structural Performance of Exterior Windows, Curtains Walls, and Doors by Uniform Static Air Pressure Difference.
  3. E 547: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.
  4. E 774: Specification for Sealed Insulated Glass Units.
  5. E 1886: Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
  6. E 1996: Standard Specifications for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes
  7. C 1036: Standard Specification for Flat Glass.
- B. Window and Door Manufactures Association (WDMA): I.S.4: Industry Standard for Water Repellent Preservative Treatment for Millwork.
- C. Sealed Insulating Glass Manufactures Association / Insulating Glass Certification Council (SIGMA / IGCC).
- D. American Architectural Manufacturers Association (AAMA):
1. AAMA 502 - Voluntary Specification for Field Testing of Windows and Sliding Doors.
  2. AAMA 613 - Voluntary Performance Requirements and Test Procedures for Organic Coatings on Plastic Profiles.
  3. AAMA 623 07 – Voluntary Specification, Performance Requirements and Test Procedures for Organic Coatings on Fiber Reinforced Thermoset Profiles
  4. AAMA 624 07 – Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Fiber Reinforced Thermoset Profiles
  5. AAMA 625 07 – Voluntary Specification, Performance Requirements and Test Procedures for Superior Performance Organic Coatings on Fiber Reinforced Thermoset Profiles
- E. Window and Door Manufacturers Association (WDMA):
1. Hallmark Certification Program.
  2. ANSI/AAMA/NWWDA 101/I.S.2 -97 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.
  3. AAMA/WDMA/CSA 101/I.S.2/A440-05 – Standard/Specification for windows, doors, and unit skylights
  4. AAMA/WDMA/CSA 101/I.S.2/A440-08 – NAFS North American Fenestration Standard/Specification for windows, doors, and skylights
- F. American Architectural Manufacturers Association (AAMA): 613: Voluntary Performance Requirements and Test Procedures for Organic Coatings on Plastic Profiles.

- G. National Fenestration Rating Council (NFRC): 101: Procedure for Determining Fenestration Product Thermal Properties.

### 1.3 SUBMITTALS

- A. Product Data: For each type of window unit indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and connections to supporting structure and other adjoining work.
  - I. Manufacturer shall provide all engineering required for window assembly and installation into buildings, including all anchorages, fasteners, spacing, substrate requirements, flashings, seals and weeping functions.
- C. Samples for Verification: For each type of exposed finish required, in a representative section of each unit in manufacturer's standard size.
- D. Product Schedule: Use same designations indicated on Drawings.
- E. Qualification data.
  - I. Manufacturer to provide a letter from Engineer registered in Minnesota that window design and installation for this specific project meets all the necessary code requirements and performance requirements.
- F. Product test reports.
- G. Field quality-control reports.
- H. Maintenance data.
- I. Sample warranty.

### 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating fiberglass clad windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.
- B. Installer Qualifications: An installer acceptable to unit skylight manufacturer for installation of units required for this Project.
- C. Emergency Egress or Rescue: Comply with requirements for sleeping units of IBC International Building Code.
- D. Preinstallation Conference: Prior to installation of any adjacent building envelope material that may come in contact with windows or window flashings, conduct conference at Project site to review flashing details and window installation.

### 1.5 PERFORMANCE REQUIREMENTS

- A. Air, Water and Structural Performance
  - 1. Windows shall meet C-50 Rating specifications in accordance with ANSI/AAMA/NWDA 101/I,S,2-97, AAMA/WDMA/CSA 101/I,S,2/A440-05, and AAMA/WDMA/CSA 101/I,S,2/A440-08
  - 2. Window Air Leakage, ASTM E 283: Window air leakage when tested at 1.57 psf (25 mph) shall be 0.05 cfm/ft<sup>2</sup> of frame or less.

3. Window Water Penetration, ASTM E 547: No water penetration through window when tested under static pressure of 7.5 psf after 4 cycles of 5 minutes each, with water being applied at a rate of 5 gallons per hour per square foot.
4. Forced entry resistance not to exceed limits defined by the standard AAMAWDMA/CSA 101/IS.2/A440-05.
5. Field testing to verify compliance shall be performed on units of comparable size to gateway test sizes for designated Performance Classes as listed in Table 1 of Section 4.3 of AAMAWDMA/CSA 101/IS.2/A440-05

B. Thermal Performance

1. Windows shall meet whole-unit U-Value and SHGC Performance determined in accordance with NFRC 100.

C. Windows shall meet Energy Star Performance criteria for the Northern Climate Zone.

## 1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components which fail in materials or workmanship within specified warranty period.
1. Warranty Period: Ten years from date of Substantial Completion.

## 1.7 DELIVERY

- A. Deliver in original packaging and protect from weather.
- B. Storage:
1. Store materials in accordance with manufacturer's instructions.
  2. Store materials off ground and under cover.
  3. Protect materials from weather, direct sunlight, and construction activities.
- C. Handling: Protect materials and finish during handling and installation to prevent damage.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS (FGWIN-1)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Pella Impervia Series Fiberglass Windows or one of the following products that comply with the specifications herein and is approved by Architect.

### 2.2 MATERIALS

- A. Awning, Sliding and Fixed Windows:
1. Factory-assembled fiberglass windows with outward-opening sash installed in frame and fixed unit.
  2. Frame and Sash Material: Duracast. 5-layer, pultruded-fiberglass material, reinforced with interlocking mat.
- B. Frame:
1. Type: Block frame.
  2. Overall Frame Depth: 3-1/4 inches.
  3. Nominal Wall Thickness of Fiberglass Members: 0.050 inch to 0.070 inch.
  4. Frame Corners:
    - a. Mitered.
    - b. Joined and bonded with thermoset polyurethane adhesive, with corner lock.

5. Jamb: Contain factory-drilled installation screw holes.
6. Frame insulation: Foam Insulation

## C. Sash:

1. Sash Corners:
  - a. Mitered.
  - b. Bonded and sealed with injected thermoset polyurethane adhesive.

## D. Glazing

1. Float Glass: ASTM C 1036, Quality I.
  - a. Tempered Glass: ASTM C 1048.
2. Type: Polyurethane reactive (PUR) hot-melt glazed, 1 1/16-inch thick, insulating glass, multi-layer Low-E coated with argon, tempered per code
3. Glazing performance, calculated based on NFRC 100:
  - a. U-factor = 0,27
  - b. Solar Heat Gain Coefficient = 0,29
  - c. Visible Light Transmission = 55%
  - d. Condensation Resistance = 60
  - e. Meets Energy Star performance requirements for Zone N.

## E. Insect Screens: Standard.

1. Compliance: ASTM D 3656 and SMA 1201.
2. Screen Cloth: Vinyl-coated fiberglass, 18/16 mesh.
3. Set in aluminum frame fitted to inside of window.
4. Complete with necessary hardware.
5. Screen Frame Finish: Baked enamel.
  - a. Color: Brown.

## 2.3 HARDWARE

## A. Operator:

1. Steel worm-gear operator with hardened gears.
2. Operator Base: Zinc die cast with painted finish.
3. Operator Linkage, Hinge Slide, and Hinge Arms: 300 series stainless steel.
4. Exposed Fasteners: Stainless steel.
5. External Hardware Salt Spray Exposure, ASTM B 117: Exceed 1,000 hours.

## B. Limited Opening Hardware at all sliders and awning windows:

1. Nominal Opening: 3 inches.
2. Stainless steel.

## C. Finish: Baked enamel, brown

## D. Locking System: SureLock System.

1. Single-handle locking system.
2. Operate positive-acting arms that reach out and pull sash into locked position.
3. Casement Windows: One installed on sash 27.5 inches and smaller in frame height, 2 unison operating locks installed on sash over 27.5 inches in frame height.
4. Awning Windows: One installed on sash 27.5 inches and smaller in frame width, 2 unison operating locks installed on sash over 27.5 inches in frame width.
5. Lock Handle Finish: Baked enamel, brown

## 2.4 TOLERANCES

## A. Windows shall accommodate the following opening tolerances:

1. Vertical Dimensions Between High and Low Points: Plus 1/4-inch, minus 0 inch.
2. Width Dimensions: Plus 1/4-inch, minus 0 inch.
3. Building Columns or Masonry Openings: Plus or minus 1/4-inch from plumb.

## 2.5 FINISH

- A. Exterior and Interior Duracast Finish: Factory-applied powder-coat paint, comply with AAMA 623.
  1. Color: To be selected from manufacturer's standard colors.

## 2.6 INSTALLATION ACCESSORIES

- A. Flashing/Sealant Tape: Pella SmartFlash or equal
  1. Aluminum-foil-backed butyl window and door flashing tape.
  2. Maximum Total Thickness: 0.013 inch.
  3. UV resistant.
  4. Verify sealant compatibility with sealant manufacturer.
- B. Interior Insulating-Foam Sealant: Low-expansion, low-pressure polyurethane insulating window and door foam sealant.
- C. Exterior Perimeter Sealant: "Pella Window and Door Installation Sealant" or equivalent high quality, multi-purpose sealant as specified in the joints sealant section.
- D. Block Frame Installation Accessories: Vinyl installation fin.
- E. Jamb Extensions: None.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification of Conditions: Before Installation, verify openings are plumb, square, and of proper dimension as required in Section 01 71 00. Report frame defects or unsuitable conditions to the General Contractor before proceeding.
- B. Acceptance of Conditions: Beginning of installation confirms acceptance of existing conditions.

### 3.2 INSTALLATION

- A. Assemble and install window unit according to manufacturer's instructions and reviewed shop drawings.
- B. Install windows to be weather-tight.
- C. Maintain alignment with adjacent work.
- D. Secure assembly to framed openings, plumb and square, without distortion.
- E. Integrate window system installation with exterior water-resistant barrier using flashing/sealant tape. Apply subflashing so nailing flanges are completely and continuously embedded on both sides of the membrane. Provide sill weeps, dams, and seals according to manufacturer's recommendations. Apply and integrate flashing/sealant tape with water-resistant barrier using watershed principles in accordance with window manufacturer's instructions.



- F. Place interior seal around window perimeter to maintain continuity of building thermal and air barrier using insulating foam sealant. Provide an air-tight seal.
- G. Seal window to exterior wall cladding with sealant and related backing materials at perimeter of assembly.

### 3.3 FIELD QUALITY CONTROL

- A. Field Testing: Field-test windows in accordance with AAMA 502, Test Method A.
  - I. All failed windows and window installations must be replaced. There is zero tolerance for not meeting this requirement.

### 3.4 CLEANING

- A. Remove visible labels and adhesive residue according to manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that would damage finish or glass.
- C. Leave windows and glass in a clean condition. Final cleaning as required in Section 01.

### 3.5 PROTECTING INSTALLED CONSTRUCTION

- A. Protect windows from damage by chemicals, solvents, paint, or other construction operations that may cause damage.

**END OF SECTION 08 54 | 4**

**SECTION 08 71 00 - DOOR HARDWARE****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Commercial door hardware.
  - 2. Cylinders for doors specified in other Sections.

**1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Details of electrified door hardware, including wiring diagrams.
- C. Samples: For each exposed finish.
- D. Product certificates
- E. Other Action Submittals:
  - 1. Door Hardware Sets: Prepared by or under the supervision of Installer detailing fabrication and assembly of door hardware, as well as procedures and diagrams.
    - a. Format: Use same scheduling sequence and format as in the Contract Documents.
    - b. Content: Include the following information:
      - 1) Identification number, location, hand, fire rating, and material of each door and frame.
      - 2) Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.
      - 3) Complete designations of every item required for each door or opening including name and manufacturer.
      - 4) Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
  - 2. Keying Schedule: Prepared by or under the supervision of Installer. Hardware detailing Owner's final keying instructions for locks.

**1.3 QUALITY ASSURANCE**

- A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.
  - 1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying
- B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
- C. Source Limitations: Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- D. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UBC Standard 7-2.
  - 1. Test Pressure: Test at atmospheric pressure.

E. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system.

F. Preinstallation Conference: Conduct conference at Project site

#### 1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

B. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

#### 1.5 COORDINATION

A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

#### 1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion, except as follows:

a. Locks: Five years from date of Substantial Completion.

b. Exit Devices: Two years from date of Substantial Completion.

c. Manual Closers: 10 years from date of Substantial Completion.

d. Concealed Floor Closers: Five years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products.

2. Finish: All visible hardware to be matte chrome finish. Architect to select final finish from manufacturer's standard finishes to confirm.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Sets" Article.

2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

#### 2.2 HINGES, GENERAL

A. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

B. Hinge Base Metal: Unless otherwise indicated, provide the following:

1. Exterior Hinges: Stainless steel, with stainless-steel pin

- C. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for outswinging exterior doors and outswinging corridor doors with locks.
- D. Fasteners: Comply with the following:
  - 1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
  - 2. Wood Screws: For wood doors and frames.
  - 3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
  - 4. Screws: Phillips flat-head; machine screws (drilled and tapped holes) for metal doors wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

## 2.3 HINGES

- A. Butts and Hinges: BHMA A156.1.
- B. Template Hinge Dimensions: BHMA A156.7.
- C. Manufacturers:
  - 1. Baldwin Hardware Corporation (BH).
  - 2. Bommer Industries, Inc. (BI).
  - 3. Cal-Royal Products, Inc. (CRP).
  - 4. Hager Companies (HAG).
  - 5. Lawrence Brothers, Inc. (LB).
  - 6. McKinney Products Company; an ASSA ABLOY Group company (MCK).
  - 7. PBB, Inc. (PBB).
  - 8. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

## 2.4 LOCKS AND LATCHES, GENERAL

- A. Accessibility Requirements: Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22 N).
- B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf (67 N) to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- C. Electrified Locking Devices: BHMA A156.25.
- D. Lock Trim:
  - 1. Levers:
    - a. Within dwelling units at bedroom, bathroom, and closet doors: Schlage F series or equal by approved manufacturers, Elon, finish 626.
    - b. All other locations: Schlage ND series or equal by approved manufacturers lever, Rhodes, finish 626.
  - 2. Rose: Type A
  - 3. Dummy Trim: Match lever lock trim and escutcheons.
- E. Disability thumb turn that complies with ADA at all locations having a deadbolt.
- F. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors.
- G. Backset: 2-3/4 inches (70 mm), unless otherwise indicated.
- H. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set.

## 2.5 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:
  - 1. Bored Locks: BHMA A156.2.
  - 2. Mortise Locks: BHMA A156.13.
  - 3. Interconnected Locks: BHMA A156.12.
- B. Bored Locks: BHMA A156.2, Grade I
  - 1. Manufacturers:
    - a. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH)
    - b. Sargent Manufacturing Company
    - c. Dorma Architectural Hardware Company
    - d. Other companies pre-approved by Architect prior to bidding
- C. Mortise Locks: Stamped steel case with steel or brass parts; BHMA A156.13 Grade I Security; Series 1000.
  - 1. Manufacturers:
    - a. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
    - b. Security Door Controls (SDC).
    - c. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).
- D. Interconnected Locks: BHMA A156.12, Grade I, Series 5000.
  - a. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).

## 2.6 AUXILIARY LOCKS AND LATCHES

- A. Auxiliary Locks: BHMA A156.5, Grade I unless Grade 2 is indicated.
  - 1. Manufacturers:
    - a. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).

## 2.7 LOCK CYLINDERS

- A. Standard Lock Cylinders: BHMA A156.5, Grade I.
- B. High-Security Lock Cylinders: BHMA A156.30, Grade I
  - 1. Key Control Level: Category B.
  - 2. Destructive Test Level: Category B
  - 3. Surreptitious Entry Resistance Level: B.
- C. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
  - 1. Number of Pins: Seven
  - 2. High-Security Grade: BHMA A156.5, Grade 2 Security, listed and labeled as complying with pick- and drill-resistant testing requirements in UL 437 (Suffix A).
- D. Permanent Cores: Manufacturer's standard; finish face to match lockset; with removable cores.
- E. Construction Keying: Comply with the following:
  - 1. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
  - 2. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
    - a. Furnish permanent cores to Owner for installation.
- F. Manufacturer: Same manufacturer as for locks and latches.

- G. Manufacturers:
  - 1. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).

## 2.8 KEYING

- A. Keying System: Complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference into master key system.
  - 1. Existing System: Master key or grand master key locks to Owner's existing system.
- B. Keys: Nickel silver; permanently inscribed with a visual key control number and including the notation "DO NOT DUPLICATE."
  - 1. Quantity: In addition to one extra key blank for each lock, provide three cylinder change keys and five master keys.

## 2.9 OPERATING TRIM

- A. Standard: BHMA A156.6.
- B. Materials: Fabricate from stainless steel, unless otherwise indicated.
- C. Manufacturers:
  - 1. Burns Manufacturing Incorporated (BM).
  - 2. Don-Jo Mfg, Inc. (DJO).
  - 3. Forms + Surfaces (FS).
  - 4. Hager Companies (HAG).
  - 5. Hiawatha, Inc. (HIA).
  - 6. IVES Hardware; an Ingersoll-Rand Company (IVS).
  - 7. Rockwood Manufacturing Company (RM).
  - 8. Trimco (TBM).

## 2.10 POCKET DOOR HARDWARE

- A. Manufacturers:
  - 1. Hafele Co. (HAF)
  - 2. Or equal.
- B. Product: Pocket Door Framing Kit Futura, HAWA-Junior 80
  - 1. Include top track, carriage units and rattle free floor guide.

## 2.11 BARN DOOR HARDWARE

- A. Manufacturers:
  - 1. Hafele Co. (HAF)
  - 2. Or equal.
- B. Product: Hafele Top Hung System, HAWA-Junior 80
  - 1. Include track, 2 stops per door, rattle free floor guide, and attachment brackets.

## 2.12 PULLS

- A. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long 5/16 inch (8 mm) in diameter, matte chrome finish.

## 2.13 CLOSERS

- A. Accessibility Requirements: Comply with the following maximum opening-force requirements:
  - 1. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
  - 2. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
  - 3. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
- B. All exterior doors at required accessible dwelling units shall have delayed-access closers. Confirm units that are considered accessible with Architect.
- C. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.
- D. Hold-Open Closers/Detectors: Coordinate and interface integral smoke detector and closer device with fire alarm system.
- E. Flush Floor Plates: Provide finish cover plates for floor closers unless thresholds are indicated. Match door hardware finish, unless otherwise indicated.
- F. Recessed Floor Plates: Provide recessed floor plates with insert of floor finish material for floor closers unless thresholds are indicated. Provide extended closer spindle to accommodate thickness of floor finish.
- G. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
- H. Surface Closers: BHMA A156.4, Grade 2 Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.
  - I. Manufacturers:
    - a. Arrow USA; an ASSA ABLOY Group company (ARW).
    - b. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
    - c. DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
    - d. Dor-O-Matic; an Ingersoll-Rand Company (DOR).
    - e. LCN Closers; an Ingersoll-Rand Company (LCN).
    - f. Norton Door Controls; an ASSA ABLOY Group company (NDC).
    - g. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).
    - h. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
    - i. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).
- I. Coordinators: BHMA A156.3.

## 2.14 PROTECTIVE TRIM UNITS

- A. Size: 1-1/2 inches (38 mm) less than door width on push side and 1/2 inch (13 mm) less than door width on pull side, by height specified in door hardware sets.
- B. Metal Protective Trim Units: BHMA A156.6; beveled top and 2 sides; fabricated from the following material:
  - 1. Material: 0.050-inch- (1.3-mm-) thick stainless steel.
  - 2. Manufacturers:
    - a. American Floor Products Co., Inc. (AFP).
    - b. Baldwin Hardware Corporation (BH).
    - c. Burns Manufacturing Incorporated (BM).
    - d. Don-Jo Mfg, Inc. (DJO).
    - e. Hager Companies (HAG).



- f. Hiawatha, Inc. (HIA).
- g. IPC Door and Wall Protection Systems, Inc.; Div. of InPro Corporation (IPC).
- h. IVES Hardware; an Ingersoll-Rand Company (IVS).
- i. Pawling Corporation (PAW).
- j. Rockwood Manufacturing Company (RM).
- k. Trimco (TBM).

- C. Plastic Protective Trim Units: BHMA A156.6; beveled 4 sides; fabricated from the following material:
  - 1. Plastic Laminate: 1/8 inch (3.2 mm) thick; NEMA LD 3, Grade HGS.
  - 2. Rigid Plastic: 0.060-inch- (1.5-mm-) thick, PVC or acrylic-modified vinyl plastic.
  - 3. Acrylic: 1/8 inch (3.2 mm) thick.
  - 4. Color and Texture: As selected by Architect from manufacturer's full range.
  - 5. Manufacturers:
    - a. American Floor Products Co., Inc. (AFP).
    - b. Balco Inc. (BAL).
    - c. Burns Manufacturing Incorporated (BM).
    - d. Construction Specialties, Inc.; a C/S Group company (CS).
    - e. Don-Jo Mfg, Inc. (DJO).
    - f. Hager Companies (HAG).
    - g. Hiawatha, Inc. (HIA).
    - h. IPC Door and Wall Protection Systems, Inc.; Div. of InPro Corporation (IPC).
    - i. IVES Hardware; an Ingersoll-Rand Company (IVS).
    - j. Korogard Wall Protection Systems, Inc.; Div. of RJF International Corporation (KWS).
    - k. Pawling Corporation (PAW).
    - l. Rockwood Manufacturing Company (RM).
    - m. Tepromark International, Inc. (TEP).
    - n. Trimco (TBM).

## 2.15 STOPS AND HOLDERS

- A. Stops and Bumpers: BHMA A156.16, Grade 2
  - 1. Provide wall stops for all existing and new hinged doors unless floor or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.
- B. Mechanical Door Holders: BHMA A156.16, Grade 2 Combination Floor and Wall Stops and Holders; BHMA A156.8, Grade 2 Combination Overhead Stops and Holders: BHMA A156.8, Grade 2.
- C. Silencers for Door Frames: BHMA A156.16, Grade 1; neoprene or rubber; fabricated for drilled-in application to frame.
- D. Manufacturers:
  - 1. Architectural Builders Hardware Mfg, Inc. (ABH).
  - 2. Baldwin Hardware Corporation (BH).
  - 3. Burns Manufacturing Incorporated (BM).
  - 4. Cal-Royal Products, Inc. (CRP).
  - 5. Don-Jo Mfg, Inc. (DJO).
  - 6. Door Controls International (DCI).
  - 7. DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
  - 8. Dor-O-Matic; an Ingersoll-Rand Company (DOR).
  - 9. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
  - 10. Hager Companies (HAG).
  - 11. HES, Inc.; an ASSA ABLOY Group company (HES).
  - 12. Hiawatha, Inc. (HIA).
  - 13. IVES Hardware; an Ingersoll-Rand Company (IVS).

14. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).
15. Rockwood Manufacturing Company (RM).
16. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
17. Stanley Commercial Hardware; Div. of The Stanley Works (STH).
18. Trimco (TBM).

## 2.16 DOOR GASKETING

- A. Standard: BHMA A156.22.
- B. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
  1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
  2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
  3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- C. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.
  1. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Gasketing Materials: ASTM D 2000 and AAMA 701/702.
- G. Manufacturers:
  1. Hager Companies (HAG).
  2. M-D Building Products, Inc. (MD).
  3. National Guard Products (NGP).
  4. Pemko Manufacturing Co. (PEM).
  5. Reese Enterprises (RE).
  6. Sealeze; a unit of Jason Incorporated (SEL).
  7. Zero International (ZRO).

## 2.17 THRESHOLDS

- A. Standard: BHMA A156.21.
- B. Accessibility Requirements: Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
  1. Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum 1/2 inch (13 mm) high.
- C. Manufacturers:
  1. Hager Companies (HAG).
  2. M-D Building Products, Inc. (MD).
  3. National Guard Products (NGP).
  4. Pemko Manufacturing Co. (PEM).
  5. Reese Enterprises (RE).
  6. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).
  7. Sealeze; a unit of Jason Incorporated (SEL).

## 8. Zero International (ZRO).

## 2.18 FABRICATION

- A. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- B. Fasteners: Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
  - 1. Comply with NFPA 80 for fasteners of door hardware in fire-rated applications.
- C. Finishes: BHMA A156.18, as selected by Architect from Manufacturer's full line of standard finishes.

## 2.19 LOW ENERGY ELECTRO-HYDRAULIC AUTOMATIC OPERATORS

- A. Acceptable manufacturers and respective catalog numbers:
 

LCN	
Electro-Hydraulic Operator	4640
- B. Provide Schlage Electronics #653-04 key switch and cylinder as required for each power operator to turn operator on or off. Cylinder shall accommodate owners existing key system.
- C. Where low kinetic energy, as defined by ANSI/BHMA Standard A156.19, power operators are indicated for doors required to be accessible to the disabled, provide electrically powered operators complying with the ADA for opening force and time to close standards.
- D. The closing action shall be controlled by modern type cast iron door closer cylinder filled with a flat viscosity fluid, stable from +120F to -30F that would require no seasonal adjustments. The closer shall have field adjustable spring power; have two independent closing speed adjustment valves, and hydraulic back-check.
- E. Full closing force shall be provided when the power or assist cycle ends.
- F. All power operator systems shall include the following features and functions:
  - 1. Provisions for separate conduits to carry high and low voltage wiring in compliance with the National Electrical Code, section 725-31.
  - 2. The operator will be designed with an electronically controlled mechanical clutching mechanism to prevent damage to the operator if the system is actuated while the door is latched or if the door is forced closed during the opening cycle.
  - 3. All covers, mounting plates and arm systems shall be powder coated and successfully pass a minimum of 100 hours testing as outlined in ANSI/BHMA Standard A156.18.
  - 4. UL listed for use on labeled doors.
  - 5. All operators shall be non-handed with spring power over a range of at least four sizes; either 1 through 4 or 2 through 5.
  - 6. The power operator shall incorporate microprocessor controlled digital controls including: factory default memory settings, on-board diagnostics, non-volital memory, and integrated delay and relay for controlling door release devices.
  - 7. Provisions in the control box or module shall provide control (inputs and outputs) for; electric strike delay, auxiliary contacts, sequential operation, fire alarms systems, actuators, swing side sensors, and stop side sensors.
  - 8. Wall mounted actuators shall consist of a 4-1/2 inch diameter stainless steel touch plate with a blue filled handicapped symbol. Switches shall be weather resistant and mount on a single gang electrical box furnished by Division 16.

- G. All electrically powered operators shall include the following features or functions:
1. When an obstruction or resistance to the opening swing is encountered, the operator will pause at that point, then attempt to continue opening the door. If the obstruction or resistance remains, the operator will again pause the door.
  2. Easily accessible main power and maintain hold open switches will be provided on the operator.
  3. An electronically controlled clutch to provide adjustable opening force.
  4. A microprocessor to control all motor and clutch functions.
  5. An on-board power supply capable of delivering both 12V and 24V outputs up to a maximum of 1.0 ampere combined load.
  6. All input and output power wiring shall be protected by slow blow fuses. These fuses shall be easily replaceable without special tools or component replacement.
  7. If electrical failure occurs, the unit shall operate as a standard door closer.
- H. Power Operators shall be warranted by the manufacture to be free from defects in material and workmanship for a period of two years.

## 2.20 ELECTRONIC ACCESS/LOCK SYSTEMS

- A. Basis of Design Manufacturer and Product:
1. Onity Co.; Advanced RFID System
  2. Or equal as approved by Architect.
- B. System to include the following components at each door indicated to be electronically accessible:
1. Latch mechanism for full and proper operation
  2. RFID reader
- C. Provide units that are ADA compliant.
- D. Provide RFID encoder and all necessary software to fully and properly operate system.
- E. Standard: Complies with FCC and UL requirements for interior and exterior operation.
- F. Provide two hundred fobs.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Steel Doors and Frames: Comply with DHI A115 Series. Drill and tap doors and frames for surface-applied door hardware according to ANSI A250.6.
- B. Wood Doors and Wood Clad Doors: Comply with DHI A115-W Series.
- C. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
  3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- D. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing

work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

- E. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- F. Delete first paragraph and subparagraphs below if electrified door hardware is not required. Verify acceptable location for power supplies with authorities having jurisdiction.
- G. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- H. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  - 1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
  - 2. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

### 3.2 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

### 3.3 HARDWARE SETS

- A. Type 24 (Pair of doors at Storage Shed)
  - 1. Storeroom Lever lock function
  - 2. Lever with Storeroom lock function
  - 3. Deadbolt keyed separately from lever
  - 4. Threshold
  - 5. Weather-stripping
  - 6. Butts as required
- B. Type 25 (Individual Storage Room doors)
  - 1. 4" wire pull, each side of door
  - 2. Hasp lock
  - 3. Butts as required
- C. Type 31 (Dwelling Unit Interior Entry doors) 20-minute rated assembly
  - 1. Lever with Passage lock function
  - 2. Electronic access
  - 3. Deadbolt
  - 4. Closer
  - 5. Smoke gasketing
  - 6. Butts as required
  - 7. Door stop
- D. Type 32 (Dwelling Unit Exterior Access doors)
  - 1. Lever with thumb-turn lock function on interior side of door
  - 2. Fixed Lever on exterior side of door
  - 3. Deadbolt

4. Weather-stripping
  5. Threshold
  6. Butts as required
  7. Door stop
- E. Type 33 (Dwelling Unit Bedroom and Bathroom doors)
1. Lever with Passage lock function
  2. Butts as required
  3. Door stop
- F. Type 34 (Dwelling Unit Closet doors)
1. Fixed lever on pull side of door, nothing on back side of door
  2. Roller catch at door head
  3. Butts as required
  4. Door stop
- G. Type 37 (Dwelling Unit Mechanical Closet doors)
1. Deadbolt
  2. Butts as required
  3. Door stop
- H. Type 38 (Dwelling Unit Closet doors - pair)
1. Fixed lever on pull side of each door leaf, nothing on back side of door leaf
  2. Roller catch at each door head
  3. Butts as required
  4. Door stop for each door leaf
- I. See Sheet A353 for the exterior gate hardware.

END OF SECTION 08 71 00

**SECTION 08 80 00 - GLAZING****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
  - 1. Windows.
  - 2. Doors.
- B. Related Sections:
  - 1. See Division 08 "Fiberglass Windows" for glass types used at factory installed new wood framed windows.

**1.2 DEFINITIONS**

- A. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- B. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

**1.3 PERFORMANCE REQUIREMENTS**

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
  - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
    - a. Specified Design Wind Loads: As indicated, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum Design Loads for Buildings and Other Structures": Section 6.0 "Wind Loads."
    - b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
      - 1) Load Duration: 3 seconds.
    - c. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
  - 1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
  - 2. For laminated-glass lites, properties are based on products of construction indicated.



3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite 6,0 mm thick and a nominal 1/2-inch-wide interspace.
4. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
  - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F.
  - b. Solar Heat Gain Coefficient: NFRC 200.
  - c. Solar Optical Properties: NFRC 300.

#### I.4 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: 12-inch- square, for each type of glass product indicated, other than monolithic clear float glass.
- C. Glazing Schedule: Use same designations indicated on Drawings.
- D. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer.

#### I.5 QUALITY ASSURANCE

- A. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing according to ASTM C 1087, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants.
- B. Glazing for Fire-Rated Door and/or Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.
- C. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.
- D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."
  2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
- E. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the Insulating Glass Certification Council.

#### I.6 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
  1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
  1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

## 2.2 INSULATING-GLASS UNITS (GL-1, GL-2)

- A. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.
1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
  2. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
  3. Sealing System: Dual seal.
  4. Spacer Specifications: Manufacturer's standard spacer material and construction.
  5. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
    - a. Spacer Material: Aluminum with mill or clear anodic finish
    - b. Corner Construction: Manufacturer's standard corner construction.
- B. Low-E Insulating-Glass Units (GL-1):
1. Overall Unit Thickness and Thickness of Each Lite: 1 inch
  2. Interspace Content: Argon.
  3. Outdoor Lite: Class I (clear)
    - a. Annealed.
  4. Indoor Lite: Class I (clear) float glass.
    - a. Annealed.
  5. Low-E Coating: None.
  6. Visible Light Transmittance: 70 percent minimum.
  7. Center of Glass U-Factor: 0.25 maximum.
  8. Solar Heat Gain Coefficient: 0.38 maximum.
- C. Low-E Insulating-Glass Tempered Units (GL-2):
1. Overall Unit Thickness and Thickness of Each Lite: 1 inch
  2. Interspace Content: Argon.
  3. Outdoor Lite: Class I (clear)
    - a. Annealed.
  4. Indoor Lite: Class I (clear) float glass.
    - a. Annealed, Kind FT (fully tempered).
  5. Low-E Coating: Pyrolytic on third surface.
  6. Visible Light Transmittance: 70 percent minimum.
  7. Center of Glass U-Factor: 0.25 maximum.
  8. Solar Heat Gain Coefficient: 0.38 maximum.

## 2.3 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
1. Neoprene, ASTM C 864.
  2. EPDM, ASTM C 864.
  3. Silicone, ASTM C 1115.
  4. Thermoplastic polyolefin rubber, ASTM C 1115.
  5. Any material indicated above.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
1. Neoprene.
  2. EPDM.
  3. Silicone.
  4. Thermoplastic polyolefin rubber.
  5. Any material indicated above.

## 2.4 GLAZING SEALANTS

- A. General:
1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  3. Colors of Exposed Glazing Sealants: Match existing.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
1. Products: Subject to compliance with requirements, provide one of the following
    - a. Dow Corning Corporation; 790.
    - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
    - c. Sika Corporation, Construction Products Division; SikaSil-C990.
    - d. Tremco Incorporated; Spectrem I.
    - e. Or approved equal.

## 2.5 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.
  2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

## 2.6 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

## 2.7 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.
  - I. Visible Light Transmittance: 20 percent minimum.

## PART 3 - EXECUTION

### 3.1 GLAZING

- A. General: Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
  - 1. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
  - 2. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
  - 3. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
  - 4. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
  - 5. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
  - 6. Provide spacers for glass lites where length plus width is larger than 50 inches.
  - 7. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- B. Tape Glazing: Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

1. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
  2. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
  3. Apply heel bead of elastomeric sealant.
  4. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
  5. Apply cap bead of elastomeric sealant over exposed edge of tape.
- C. Gasket Glazing (Dry): Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
1. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
  2. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
  3. Install gaskets so they protrude past face of glazing stops.
- D. Sealant Glazing (Wet): Install continuous spacers, or spacers combined with cylindrical sealant backing between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
1. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
  2. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.2 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- B. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

**END OF SECTION 08 80 00**

**SECTION 09 29 00 - GYPSUM BOARD****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Interior gypsum board.

**1.3 QUALITY ASSURANCE**

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

**1.4 STORAGE AND HANDLING**

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

**1.5 PROJECT CONDITIONS**

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

**PART 2 - PRODUCTS****2.1 PANELS, GENERAL**

- A. Recycled Content: Provide gypsum panel products with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of two percent by weight.
- B. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

## 2.2 INTERIOR GYPSUM BOARD (GYP-1, GYP-2, GYP-3, GYP-4, and GYP-5)

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. American Gypsum Co.
    - b. BPB America Inc.
    - c. G-P Gypsum.
    - d. Lafarge North America Inc.
    - e. National Gypsum Company.
    - f. PABCO Gypsum.
    - g. Temple.
    - h. USG Corporation.
- B. Regular Type (GYP-1):
1. Thickness: 5/8 inch
  2. Long Edges: Tapered
- C. Type X (GYP-2):
1. Thickness: 5/8 inch
  2. Long Edges: Tapered
- D. Moisture- and Mold-Resistant Type (GYP-3): With moisture- and mold-resistant core and surfaces.
1. Thickness: 5/8 inch
  2. Faces: Non-paper faced panels.
  3. Long Edges: Tapered.
  4. Use fire rated product at all walls noted as fire rated.
- E. Ceiling Type (GYP-4): Manufactured to have more sag resistance than regular-type gypsum board.
1. Thickness: 1/2 inch (12.7 mm).
  2. Long Edges: Tapered.
- F. Ceiling Type C (GYP-5): Manufactured to have more sag resistance than regular-type gypsum board.
1. Thickness: 5/8 inch Type C
  2. Long Edges: Tapered.

## 2.3 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
1. Interior Gypsum Wallboard: Paper.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
  2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
    - a. Use setting-type compound for installing paper-faced metal trim accessories.
  3. Fill Coat: For second coat, use setting-type, sandable topping compound.
  4. Finish Coat: For third coat, use setting-type, sandable topping compound.
  5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound



## 2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
  - I. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
  - I. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
- D. Sound Attenuation Blankets: As specified in Division 07 Section "Thermal Insulation."
  - I. Recycled Content: Provide blankets with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 25 percent by weight.
- E. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."
  - I. Provide sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- F. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."
- G. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 GENERAL

- A. STC-Rated Assemblies: Seal construction at entire perimeter, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

### 3.3 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

#### 3.4 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Regular Type: As indicated on Drawings.
  - 2. Type X: As indicated on Drawings and at all locations where required for fire-resistance-rated assembly, unless noted otherwise.
  - 3. Ceiling Type: At all Ceiling surfaces unless noted otherwise
    - a. Type C: As indicated on Drawings and at all locations where required for fire-resistance-rated assembly, unless noted otherwise.
  - 4. Moisture- and Mold-Resistant Type:
    - a. As indicated on Drawings.
    - b. Within 24" of all Kitchen and bathroom countertops.
    - c. At all tubs and shower stalls.
    - d. Within 24" of janitor's sinks.
- B. Single-Layer Application:
  - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
  - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
  - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
  - 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
  3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

### 3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners unless otherwise indicated.
  2. LC-Bead: Use at exposed panel edges
  3. L-Bead: Use where indicated
  4. U-Bead: Use at exposed panel edges.
  5. Curved-Edge Cornerbead: Use at curved openings.

### 3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  2. Level 2: Panels that are substrate for tile
  3. Level 3: Where indicated on Drawings
  4. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated
    - a. Primer and its application to surfaces are specified in other Division 09 Sections.
  5. Level 5: Where indicated on Drawings.

### 3.7 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

**SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
  - 1. Resilient base.

**1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated.

**1.3 QUALITY ASSURANCE**

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Adhesives: Comply with Rule 1168 South Coast Air Quality Management District to control VOC emissions and elimination of other chemical compounds.
- C. Caulks and Sealants: Comply with Regulation 8 Rule 51 of Bay Area Air Quality Management District to control organic compounds emissions.

**1.4 PROJECT CONDITIONS**

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
- C. Install resilient products after other finishing operations, including painting, have been completed.

**PART 2 - PRODUCTS****2.1 RESILIENT BASE (RB-1)**

- A. Resilient Base:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers to be incorporated into the Work:
    - a. Mannington Commercial
    - b. Or approved equal.
- B. Resilient Base Standard: ASTM F 1861.
  - 1. Material Requirement: Type TP (rubber)
  - 2. Manufacturing Method: Group II (layered).
  - 3. Style: Color integrated Cove (base with toe) Style B.
  - 4. Minimum Thickness: 0.125 inch.
  - 5. Height: 4 inches.
  - 6. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.
  - 7. Outside Corners: Job formed or preformed.
  - 8. Inside Corners: Job formed or preformed.
  - 9. Finish: Matte.

10. Colors: Bark #904

## 2.2 INSTALLATION MATERIALS

- A. Adhesives: Non-VOC water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
  - I. Use adhesives that comply have no VOC emissions or VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are same temperature as the space where they are to be installed.
  - I. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

### 3.2 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.

### 3.3 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Cover resilient products until Substantial Completion.

**END OF SECTION 09 65 13**

**SECTION 09 65 16 - RESILIENT SHEET FLOORING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
  - 1. Sheet linoleum flooring
    - a. RSF-01 and RSF-02 are LBC compliant materials.
  - 2. Sheet vinyl flooring.
  - 3. Transition strips used with resilient flooring.

**1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each type of floor sheet goods. Include seam layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
- C. Samples: 12" x 12" units of each color and pattern of floor tile required.
- D. Maintenance data.

**1.3 QUALITY ASSURANCE**

- A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
  - 1. Engage installer certified as a certified Resilient Installer by manufacturer.
  - 2. Certificate: Submit certificate indicating installer qualification.
- B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- C. Pre-Installation Testing: Conduct pre-installation testing as follows:
  - 1. Moisture test
  - 2. Bond test

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
  - 1. Material should be stored in areas that are fully enclosed and weathertight. The permanent HVAC should be fully operational, controlled and set at a minimum of 68° F (20° C) for at least 48 hours prior to the installation.

**1.5 PROJECT CONDITIONS**

- A. Environmental Requirements/Conditions: In accordance with manufacturer's recommendations, areas to receive flooring should be clean, fully enclosed and weathertight. The permanent HVAC must be fully operational, controlled and set at a minimum of 68° F (20° C) for a minimum of seven days prior to, during

and seven days after the installation. The flooring material should be conditioned in the same manner for at least 48 hours prior to the installation. Areas to receive flooring shall be adequately lighted to allow for proper inspection of the substrate, installation and seaming of the flooring, and for final inspection.

- B. Temperature Requirements: Maintain air temperature in spaces where products will be installed for time period before, during and after installation as recommended by manufacturer.
  - 1. Temperature Conditions: 68o F (20o C) for a minimum of seven days prior to, during and seven days after the installation.
- C. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

#### 1.6 SEQUENCING AND SCHEDULING

- A. Finishing Operations: Install flooring after finishing operations, including painting and ceiling operations, have been completed.
- B. Concrete Curing: Do not install flooring over concrete substrates until substrates have cured and are dry to bond with adhesive as determined by resilient flooring manufacturer's recommended bond, moisture test, and pH test.

#### 1.7 WARRANTY

- A. Project Warranty: Refer to "Conditions of the Contract" for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
  - 1. Warranty Period: Five (5) year limited warranty commencing on Date of Substantial Completion.

#### 1.8 MAINTENANCE

- A. Extra Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals (Maintenance Materials) Section.
  - 1. Quantity: Furnish quantity of flooring units equal to 5% of amount installed.
  - 2. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra materials.

### PART 2 - PRODUCTS

#### 2.1 SHEET VINYL

- A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
  - 1. C. I. Takiron
- B. Resilient Sheet Flooring (RSV-1): Heterogeneous, light Commercial grade PVC-free sheet polyolefin. Pattern and color shall extend throughout total thickness of material.
  - 1. Product: WELS sheet
  - 2. Gauge: 2.0mm (0.080")
  - 3. Color: To be selected from manufacturer's full spectrum of colors.
  - 4. Adhesive: Mannington V-8 I/Full Spread Adhesive
  - 5. Chemical Seam Sealer: As recommended by manufacturer.



## PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions (i.e. moisture tests, bond test, pH test, etc.).
- C. Material Inspection: In accordance with manufacturer's installation requirements, visually inspect materials prior to installation. Material with visual defects shall not be installed and shall not be considered as a legitimate claim.
- D. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.
- E. Surface Preparation:
  - 1. General: Prepare floor substrate in accordance with manufacturer's instructions.
  - 2. Floor Substrate: Floors shall be sound, smooth, flat, permanently dry, clean, and free of all foreign materials including, but not limited to, dust, paint, grease, oils, solvents, curing and hardening compounds, sealers, asphalt and old adhesive residue.
  - 3. Concrete Floor Substrate: Concrete floor substrate shall have a minimum compressive strength of 3,000 psi. Refer to Division 3 Concrete sections for patching and repairing crack materials, and leveling compounds with portland cement based compounds.
    - a. Reference Standard: Comply with ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
- F. Concrete Moisture Testing: Conduct moisture tests on all concrete floors regardless of the age, grade level or the presence of existing flooring. Conduct calcium chloride tests in accordance with ASTM F 1869. Measure the internal relative humidity of the concrete slab in accordance with ASTM F 2170. One test of each type should be conducted for every 1,000 square feet of flooring (minimum of 3). The tests should be conducted around the perimeter of the room, at columns, and anywhere moisture may be evident. Concrete moisture vapor emissions must not exceed 8.0 lbs. per 1,000 square feet in 24 hours when using Forbo L 885 adhesive. Concrete internal relative humidity must not exceed 85% when using Forbo L 885 adhesive. A diagram of the area showing the location and results of each test should be submitted to the Architect, General Contractor or End User. If the test results exceed these limitations, the installation must not proceed until the problem has been corrected.
- G. Concrete pH Test: Perform pH tests on concrete floors regardless of the age or grade level. If the pH is greater than 11, it must be neutralized prior to beginning the installation.
- H. Wood Subfloors: Wood floors should be double construction with a minimum total thickness of 1 inch. Wood floors must be rigid, free from movement and have at least 18" of well-ventilated air space below. Forbo floor coverings should not be installed over wooden subfloors built on sleepers over on or below grade concrete floors without first making sure that adequate precautions have been taken to ensure the structural integrity of the system, and to prevent moisture migration from the concrete slab.
  - 1. Refer to Division 6 Carpentry sections for wood subfloor construction.
  - 2. Reference Standard: Comply with ASTM F 1482 Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring

## 3.2 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing sheet flooring.

- B. Adhesive Flooring Installation: Cut required length of linoleum flooring from roll, allowing enough material to extend up the wall 4 to 6 inches at either end. Layout and position sheet flooring so that any seams will fall at least 6 inches from underlayment joints or saw cuts in concrete substrate. Scribe and cut flooring material to shape of vertical surfaces, including walls and partitions. Apply adhesive and lay sheet flooring into wet adhesive and roll with a 100 pound roller. Install sheet flooring square with room axis.
- C. Adhesive, Seamless Flooring Installation: Rout out seams and heat weld together with complementary colored heat welding rod of complimentary composition in accordance with resilient flooring manufacturer's recommendations.
- D. Adhesive Material Installation: Use trowel as recommended by flooring manufacturer for specific adhesive. Spread at a rate of approximately 150ft<sup>2</sup>/gallon, as recommended by flooring manufacturer.
- E. Installation Techniques:
  - 1. Scribe, cut, fit flooring to butt tightly to vertical surfaces, permanent fixtures and built-in furniture, including pipes, outlets, edgings, thresholds, nosings, and cabinets.
  - 2. Extend flooring into toe spaces, door reveals, closets, and similar openings.
  - 3. Install flooring on covers for telephone and electrical ducts, and similar items occurring within finish floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers.
  - 4. Do not install resilient flooring over expansion joints. Use expansion joint covers manufactured for use with resilient flooring. Refer to other specification sections for expansion joint covers.
  - 5. Adhere resilient flooring to substrate without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed installation.
    - a. Use adhesive applied to substrate in compliance with flooring manufacturer's recommendations, including those for trowel notching adhesive mixing and adhesive open and working times.
  - 6. Roll resilient flooring as required by resilient flooring manufacturer.

### 3.3 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of sheet flooring
- B. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
  - 1. Remove visible adhesive and other surface blemishes using cleaning methods recommended by floor manufacturer.
  - 2. Sweep and vacuum floor after installation.
  - 3. Do not wash floor until after time period recommended by flooring manufacturer.
  - 4. Damp mop flooring to remove black marks and soil.
- C. Floor Polish/sealer/wax: Remove soil, visible adhesive and surface blemishes from floor tile surfaces before applying sealant.
  - 1. Apply three coats of manufacturer's recommend product.
- D. Protection: Protect installed product and finish surfaces from damage during construction. Remove and legally dispose of protective covering at time of Substantial Completion.

**END OF SECTION 09 65 16**

**SECTION 09 65 19 - RESILIENT TILE FLOORING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
  - I. Resilient Tile.

**1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
- C. Samples: Full-size units of each color and pattern of floor tile required.
- D. Maintenance data.

**1.3 QUALITY ASSURANCE**

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  - I. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

**1.4 PROJECT CONDITIONS**

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive floor tile.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

**1.5 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - I. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

**PART 2 - PRODUCTS****2.1 TILE**

- A. Resilient Tile Floor Covering (RT-1): Tile composed of polyester resin binder, fillers and pigments with colors and pattern dispersed uniformly throughout its thickness. Bio-flooring tile shall conform to the requirements of ASTM F 2982 Standard Specification for Polyester Composition Floor Tile.

1. Manufacturer: Armstrong Flooring, Inc.
2. Product: Striations BBT
3. Tile size: 12 inch by 24 inch
4. Gauge: 3.2mm (0.125")
5. Color: TO be selected by Architect from full line of manufacturer's colors
6. Adhesive: Full Spread: Provide Armstrong S-525 BBT® Bio-Flooring Adhesive under the tile as recommended by the flooring manufacturer.

## 2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
  1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
- C. Floor Polish: As recommended by manufacturer.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
  3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
  4. Moisture Testing: Perform tests recommended by floor covering manufacturer. Proceed with installation only after substrates pass testing.
    - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are same temperature as space where they are to be installed.
  1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

### 3.2 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.

- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  - I. Lay tiles square with room axis.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
  - I. Lay tiles in pattern of colors and sizes indicated.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- H. The area to receive resilient flooring should be maintained at a minimum of 65°F (18°C) and a maximum of 100°F (38°C) for 48 hours before, during and for 48 hours after completion.

### 3.3 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Floor Polish/sealer/wax: Remove soil, visible adhesive and surface blemishes from floor tile surfaces before applying sealant.
  - I. Apply three coats of manufacturer's recommend product.
- C. Cover floor tile until Substantial Completion.

**END OF SECTION 09 65 19**

**SECTION 09 91 13 - EXTERIOR PAINTING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. All paint are the be Zero VOC paint: base plus tint. Low VOC paint is not acceptable.
- B. This Section includes surface preparation and the application of paint systems on the following exterior substrates:
  - 1. PT-1 Flat Semi-Gloss Latex Paint
- C. Related Sections include the following:
  - 1. Division 09 Section "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

**1.3 REFERENCES**

- A. Green Promise © 2010
- B. Green Seal Standard GS-11; May 20, 1993.
- C. MPI (APL) - Master Painters Institute.
- D. SCAQMD 1168 - South Coast Air Quality Management District Rule # 1168; October 3, 2003.
- E. SSPC (PM1) - Steel Structures Painting Manual, Vol. 1, Good Painting Practice; Society for Protective Coatings; 1993, Third Edition.
- F. SSPC (PM2) - Steel Structures Painting Manual, Vol. 2, Systems and Specifications; Society for Protective Coatings; 1995, Seventh Edition.
- G. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

**1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Green Seal Standard GS-11 Certified Product certificates.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Step coats on Samples to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

#### 1.5 QUALITY ASSURANCE

- A. MPI Standards:
  1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
  2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- B. All paints to comply with Green Promise protocols and meet Green Seal GS-11 2010 protocols.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F .
  1. Maintain containers in clean condition, free of foreign materials and residue.
  2. Remove rags and waste from storage areas daily.

#### 1.7 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F .
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

#### 1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
  1. Quantity: Furnish an additional 5 percent, but not less than 1 gal, of each material and color applied.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Benjamin Moore & Co.: Eco-Spec WB Zero-VOC Paint
  2. Equivalent products will only be acceptable if pre-approved by Architect prior to construction.
- B. Material Compatibility:
  1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content of Field-Applied Exterior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
  1. Flat Paints, Coatings, and Primers: VOC content of not more than 0 g/L



2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 0 g/L.
3. Flat Topcoat Paints: VOC content of not more than 0 g/L.
4. Nonflat Topcoat Paints: VOC content of not more than 0 g/L.

D. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:

1. Flat Paints and Coatings: VOC content of not more than 0 g/L.
2. Nonflat Paints and Coatings: VOC content of not more than 0 g/L.
3. Restricted Components: Paints and coatings shall not contain any of the following:
  - a. Acrolein.
  - b. Acrylonitrile.
  - c. Antimony.
  - d. Benzene.
  - e. Butyl benzyl phthalate.
  - f. Cadmium.
  - g. Di (2-ethylhexyl) phthalate.
  - h. Di-n-butyl phthalate.
  - i. Di-n-octyl phthalate.
  - j. 1,2-dichlorobenzene.
  - k. Diethyl phthalate.
  - l. Dimethyl phthalate.
  - m. Ethylbenzene.
  - n. Formaldehyde.
  - o. Hexavalent chromium.
  - p. Isophorone.
  - q. Lead.
  - r. Mercury.
  - s. Methyl ethyl ketone.
  - t. Methyl isobutyl ketone.
  - u. Methylene chloride.
  - v. Naphthalene.
  - w. Toluene (methylbenzene).
  - x. 1,1,1-trichloroethane.
  - y. Vinyl chloride.

E. Colors: As indicated in a color schedule.

## 2.2 WOOD PRIMERS

- A. Exterior Latex Wood Primer: MPI #6.
  1. VOC Content: 0

## 2.3 EXTERIOR LATEX PAINTS

- A. Exterior Latex (Semi-Glass): MPI # 10 (Gloss Level 5).
  1. VOC Content: 0

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Concrete: 12 percent.
  - 2. Masonry (Clay and CMU): 12 percent.
  - 3. Wood: 15 percent.
  - 4. Plaster: 12 percent.
  - 5. Gypsum Board: 12 percent.
- C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
  - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
  - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Clay Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content of surfaces or alkalinity of mortar joints to be painted exceed that permitted in manufacturer's written instructions.
- F. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- G. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove surface oxidation.
- J. Wood Substrates:
  - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  - 2. Sand surfaces that will be exposed to view, and dust off.
  - 3. Prime edges, ends, faces, undersides, and backsides of wood.
  - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

- K. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.
- L. Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.
- M. Exterior Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Fiber-Cement Substrates:
  - 1. Prime edges, ends, faces, undersides, and backsides of panels.
  - 2. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

### 3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
  - 1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
  - 2. Testing agency will perform tests for compliance of paint materials with product requirements.
  - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

### 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing replacing and refinishing, as approved by Architect, and leave in an undamaged condition.

- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.6 EXTERIOR PAINTING SCHEDULE

- A. Exterior Cement Fiber and wood Substrates:
  - 1. Latex System: MPI EXT 9.2A.
    - a. Prime Coat: Exterior latex matching topcoat.
    - b. Intermediate Coat: Exterior latex matching topcoat.
    - c. Topcoat: Exterior latex.

### 3.7 EXTERIOR COLOR SCHEDULE

- A. PT-A
  - 1. Mfr: Benjamin Moore
  - 2. Color Number: TBD
  - 3. Color Name: TBD

**END OF SECTION 09 91 13**

**SECTION 09 91 23 - INTERIOR PAINTING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. All paint are the be Zero VOC paint: base plus tint. Low VOC paint is not acceptable.
- B. This Section includes surface preparation and the application of paint systems on the following interior substrates:
  - 1. PT-2 Eggshell Latex Paint for all walls
  - 2. PT-3 Semi-Gloss Latex Paint for all walls
  - 3. PT-4 Flat Latex Paint at all ceilings
- C. Related Sections include the following:
  - 1. Division 06 Sections for shop priming carpentry with primers specified in this Section.
  - 2. Division 09 Section "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

**1.3 REFERENCES**

- A. Green Promise © 2010
- B. Green Seal Standard GS-1 I; May 20, 1993.
- C. MPI (APL) - Master Painters Institute.
- D. SCAQMD 1168 - South Coast Air Quality Management District Rule # 1168; October 3, 2003.
- E. SSPC (PM1) - Steel Structures Painting Manual, Vol. 1, Good Painting Practice; Society for Protective Coatings; 1993, Third Edition.
- F. SSPC (PM2) - Steel Structures Painting Manual, Vol. 2, Systems and Specifications; Society for Protective Coatings; 1995, Seventh Edition.
- G. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

**1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Green Seal Standard GS-1 I Certified Product certificates.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Step coats on Samples to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.

- D. Product List: For each product indicated, include the following:
  1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
  2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

#### 1.5 QUALITY ASSURANCE

- A. MPI Standards:
  1. Products:
    - a. Complying with MPI standards indicated and listed in "MPI Approved Products List."
    - b. Complying with MPI's "Green Promise" and "Green Seal" designations.
  2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- B. All paints to comply with Green Promise protocols and meet Green Seal GS-11 2010 protocols.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  1. Maintain containers in clean condition, free of foreign materials and residue.
  2. Remove rags and waste from storage areas daily.

#### 1.7 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

#### 1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
  1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

### PART 2 - PRODUCTS

#### 2.1 PAINT, GENERAL

- A. Paint Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Benjamin Moore & Co.: Eco-Spec WB Zero-VOC Paint
  2. Equivalent products will only be acceptable if pre-approved by Architect prior to construction.
- B. Material Compatibility:
  1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to

40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Flat Paints, Coatings, and Primers: VOC content of not more than 0 g/L
2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 0 g/L.
3. Flat Topcoat Paints: VOC content of not more than 0 g/L.
4. Nonflat Topcoat Paints: VOC content of not more than 0 g/L.

D. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:

1. Flat Paints and Coatings: VOC content of not more than 0 g/L
2. Nonflat Paints and Coatings: VOC content of not more than 0 g/L
3. Restricted Components: Paints and coatings shall not contain any of the following:
  - a. Acrolein.
  - b. Acrylonitrile.
  - c. Antimony.
  - d. Benzene.
  - e. Butyl benzyl phthalate.
  - f. Cadmium.
  - g. Di (2-ethylhexyl) phthalate.
  - h. Di-n-butyl phthalate.
  - i. Di-n-octyl phthalate.
  - j. 1,2-dichlorobenzene.
  - k. Diethyl phthalate.
  - l. Dimethyl phthalate.
  - m. Ethylbenzene.
  - n. Formaldehyde.
  - o. Hexavalent chromium.
  - p. Isophorone.
  - q. Lead.
  - r. Mercury.
  - s. Methyl ethyl ketone.
  - t. Methyl isobutyl ketone.
  - u. Methylene chloride.
  - v. Naphthalene.
  - w. Toluene (methylbenzene).
  - x. 1,1,1-trichloroethane.
  - y. Vinyl chloride.

E. Colors: As indicated in a color schedule.

## 2.2 BLOCK FILLERS

- A. Interior/Exterior Latex Block Filler: MPI #4.
1. VOC Content: 0

## 2.3 PRIMERS/SEALERS

- A. Interior Latex Primer/Sealer: MPI #50.
1. VOC Content: 0

B. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.



## 2.4 WOOD PRIMERS

- A. Interior Latex-Based Wood Primer: MPI #39,
  - I. VOC Content: 0

## 2.5 LATEX PAINTS

- A. Institutional Low-Odor/VOC Latex (Flat): MPI # 143 (Gloss Level 1).
  - I. VOC Content: 0
- B. Institutional Low-Odor/VOC Latex (Eggshell): MPI # 145 (Gloss Level 3).
  - I. VOC Content: 0
- C. Institutional Low-Odor/VOC Latex (Semi-Gloss): MPI # 147 (Gloss Level 5).
  - I. VOC Content: 0

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Concrete: 12 percent.
  - 2. Masonry (Clay and CMU): 12 percent.
  - 3. Wood: 15 percent.
  - 4. Gypsum Board: 12 percent.
  - 5. Plaster: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
  - I. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
  - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

E. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
1. Use applicators and techniques suited for paint and substrate indicated.
  2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following
1. Mechanical Work:
    - a. Pipe hangers and supports.
    - b. Sprinkler piping exposed to view.
    - c. Tanks that do not have factory-applied final finishes.
    - d. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
    - e. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    - f. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
  2. Electrical Work:
    - a. Electrical equipment that is indicated to have a factory-primed finish for field painting.

### 3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
  2. Testing agency will perform tests for compliance with product requirements.
  3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

### 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing replacing and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.6 INTERIOR PAINTING SCHEDULE

- A. Gypsum Board Wall Substrates:
  - I. Institutional No VOC Latex System: MPI INT 9.2M.
    - a. Prime Coat: Interior latex primer/sealer.
    - b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
    - c. Topcoat: Institutional low-odor/zero VOC interior latex (eggshell).
- B. Gypsum Board Ceiling Substrates:
  - I. Institutional No VOC Latex System: MPI INT 9.2M.
    - a. Prime Coat: Interior latex primer/sealer.
    - b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
    - c. Topcoat: Institutional low-odor/zero VOC interior latex (flat).
- C. Composite Wood Trim Substrates:
  - I. Institutional No VOC Latex System: MPI INT 9.2M.
    - a. Prime Coat: Interior latex primer/sealer.
    - b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
    - c. Topcoat: Institutional low-odor/zero VOC interior latex (semi-gloss).

### 3.7 COLOR SCHEDULE

- A. PT-B
  - 1. Mfr: Benjamin Moore
  - 2. Color Number: OC-17
  - 3. Color Name: White Dove
- B. PT-C
  - 1. Mfr: Benjamin Moore
  - 2. Color Number: TBD
  - 3. Color Name: TBD

END OF SECTION 09 91 23

## SECTION 10 14 00 - SIGNAGE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - a. Dimensional character street number at each dwelling unit, front and rear

### PART 2 - PRODUCTS

#### 2.1 DIMENSIONAL CHARACTERS (SIGN-1)

- A. Dimensional Street Numbers:
  - 1. Manufacturer: The Hillman Group
  - 2. Product: 84319x Floating Mount House (x = numeral)
  - 3. Size: 5-Inch
  - 4. Color: Black
  - 5. Anchors and Inserts: Provide nonferrous-metal black anchors for corrosion resistance.
  - 6. Copy: Match street number for each dwelling unit

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.

#### 3.2 CLEANING, PROTECTION, AND REPAIR

- A. Repair scratches and other damage which might have occurred during installation.
- B. Remove temporary coverings and protection to adjacent work areas.

**END OF SECTION 10 14 00**

**SECTION 10 28 00 – TOILET, BATH & CLOSET ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Bathroom accessories.
  - 2. Wire shelving for closets.

**1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Product Schedule:
  - 1. Identify locations using room designations indicated on Drawings.
  - 2. Identify products using designations indicated on Drawings.

**PART 2 - PRODUCTS****2.1 DWELLING UNIT BATHROOM ACCESSORIES**

- A. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by other manufacturers with prior approval by Owner.
- B. Toilet Tissue Dispenser in dwelling units (TA-02):
  - 1. Manufacturer/Product: Lahara (Delta)
  - 2. Model: 73850
  - 3. Mounting: Surface mounted.
  - 4. Material and Finish: Brushed chrome or similar.
  - 5. Quantity: Supply one per bathroom.
- C. Mirror in dwelling units (TA-3)
  - 1. Size: 36" high x full length of lav countertop
  - 2. Material: 1/4" clear, polished glass
  - 3. Attachment: 1-1/8" satin chrome button rosettes
- D. Shower Rod in dwelling units (TA-20)
  - 1. Basis-of-Design Product: Creative Specialties (Moen)
  - 2. Description: Curved Shower Curtain Rod with pivoting hinges, Model: DN2145.
  - 3. Mounting: Concealed fasteners.
  - 4. Length: 60"
  - 5. Material: Brushed chrome or similar.
  - 6. Quantity: Supply one for each bath tub and/or shower.
- E. Medicine Cabinets in dwelling units (TA-24)
  - 1. Basis-of-Design Product: NuTone, Frameless Recess Mount, Model: 781053.
  - 2. Size: 16" x 26"
  - 3. Material: Stainless steel door, polypropylene housing
- F. Towel Bar in dwelling units (TA-26):
  - 1. Manufacturer/Product: Lahara (Delta)
  - 2. Model: 73824.
  - 3. Mounting: Concealed fasteners.

4. Length: 24 inches.
5. Material and Finish: Brushed chrome or similar.
6. Quantity: Supply two per bathroom.

G. Grab bars (TA-12)

1. Manufacturer/Product: Universal Grab Bar (Delta)
2. Model: 40024
3. Size: see drawings
4. Material: Chrome
5. Quantity: Install in every bathroom at shower and at toilet

H. Hook (TA-19)

1. Manufacturer/Product: Lahara (Delta)
2. Model: 73835
1. Mounting: Surface mounted.
2. Material and Finish: Brushed chrome or similar.
3. Quantity: Install one hook at bathroom side of door at every bathroom door

## 2.2 WIRE SHELVING FOR CLOSETS (SHELF-1)

- A. Basis-of-Design Product: The design for wire shelving is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by other manufacturers with prior approval by Owner.

B. Wire Shelving

1. Basis-of-Design Product: ClosetMaid, Shelf track system
2. Material: Epoxy coated wire
3. Size: 12" depth, width to match closet width
4. Shelf Style: Close mesh
5. Color: White
6. Locations:
  - a. Install one shelf and rod full closet width at each dwelling unit bedroom closet
  - b. Install one shelf and rod full closet width at each dwelling unit entry closet
  - c. Install five shelves full closet width at each dwelling unit linen closet
  - d. Provide adjustable shelving at all closets in ADA designed dwelling units

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

**END OF SECTION 10 28 00**

## SECTION 10 55 00 - POSTAL SPECIALTIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Individual mailboxes for each townhome.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

#### 1.3 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of postal specialties that fail in materials or workmanship within Five years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Aluminum: Manufacturer's standard alloy and temper for type of use and finish indicated.
- B. Mailboxes (POST-1)
  - 1. Manufacturer: Salsbury Industries
  - 2. Product: 4615BLK Traditional Mailbox
  - 3. Color: Beige

#### 2.2 FABRICATION

- A. Form postal specialties to required shapes and sizes, with true lines and angles, square, rigid, and without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges and corners free of sharp edges and burrs and safe to touch.
- B. Form joints exposed to weather to exclude water penetration.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. General:
  - 1. Where dissimilar metals will be in permanent contact with each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation.
  - 2. Where aluminum will contact grout, concrete, masonry, or wood, protect against corrosion by painting contact surfaces with bituminous coating
  - 3. Final acceptance of postal specialties depends on compliance with USPS requirements.
- B. Mailbox mounting: Install mailbox with top of mailbox at 48 inches above finished floor.

END OF SECTION 10 55 00

**SECTION 11 31 00 - RESIDENTIAL APPLIANCES****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Ranges.
  - 2. Ventilation range hoods.
  - 3. Dishwashers.
  - 4. Accessible Dishwashers.
  - 5. Refrigerator/freezers.

**1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Samples: For each exposed finish.
- C. Appliance Schedule: Use same designations indicated on Drawings.
- D. Maintenance data.

**1.3 QUALITY ASSURANCE**

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer for 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. Residential Appliances: Comply with NAECA standards.
- D. Energy Ratings: Provide clothes washer, refrigerator/freezer and dish washer appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.

**1.4 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer of each appliance specified agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
  - 1. Electric Range: Five-year limited warranty for in-home service on surface-burner elements.
  - 2. Refrigerator/Freezer: Five-year limited warranty for in-home service on the sealed refrigeration system.

**PART 2 - PRODUCTS****2.1 APPLIANCES**

- A. Refrigerator/Freezer (RES-1):
  - 1. Products:
    - a. GE Appliances; Freezer over Refrigerator. Stainless Steel, ADA compliant. Frost free. 18.2 cu ft capacity. Model: GTE18ISHSS.
    - b. Energy Star Rated.



- c. No Ice-maker;
  - d. Or approved equal.
- B. Stacking washer and dryer (RES-2).
- I. Products:
    - a. Frigidaire Appliances.
    - b. Washer Dryer Combination: : 27"W x 31.5"D x 76"H, White, Model: FFLG3911QW
    - c. Energy Star Rated Washer
    - d. Gas dryer
    - e. Or approved equal.
- C. Side by side washer and dryer (RES-2A).
- I. Products:
    - a. Frigidaire Appliances.
    - b. Washer: 27"W x 30"D x 36"H (nominal), White, Model: FFFW5000QW
    - c. Dryer: 7 cu. ft., 27"W x 30"D x 36"H (nominal), White, Model: FFQG5000QW
    - d. Energy Star Rated Washer
    - e. ADA Compliant Washer and Dryer
    - f. Or approved equal.
- D. Range: Freestanding, slide-in, gas (RES-3).
- I. Products:
    - a. GE Appliances; 30" Free-standing, sealed burner Gas Range, Model: JGB450REKSS, Stainless Steel.
    - b. ADA compliant.
    - c. Self-cleaning.
    - d. Or approved equal.
- E. Dishwasher: Built-in (RES-4).
- I. Products:
    - a. GE Appliances; 24" Built-in Dishwasher, Stainless Steel, Model: GLDT696JSS
    - b. ADA compliant.
    - c. Energy Star rated.
    - d. Or approved equal.
- F. Exhaust Range Hood (RES-5):
- 1. Products:
    - a. Air King; 30" Under the Cabinet Exhaust Hood, Model: AV Series, Stainless Steel.
    - b. Or approved equal.
  - 2. Exhausting: Exhaust to exterior
  - 3. Provide and install one pair of StoveTop Firestop Microhood #667 at each apartment.
- G. (RES-6): Not Used
- H. Exhaust Range Hood at Dwelling units designated ADA compliant (RES-7):
- 1. Products:
    - a. Air King; 30" Under the Cabinet Exhaust Hood, Model: AV Series, Stainless Steel.
    - b. Or approved equal.
  - 2. Exhausting: Exhaust to exterior
  - 3. Provide ADA compliant switch within ADA reach ranges at nearby base cabinet or wall to operate light and fan.
  - 4. Provide and install one pair of StoveTop Firestop Rangehood #675-3d at each apartment.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.
- B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- C. Utilities: Refer to Divisions 22 and 23 for plumbing and electrical requirements.

**END OF SECTION 11 31 00**

**SECTION 11 68 00 - PLAY FIELD EQUIPMENT AND STRUCTURES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Freestanding playground equipment and structures.
  - 2. Organic Loose Fill surfacing.

**1.3 DEFINITIONS**

- A. Fall Height: According to ASTM F 1487, "the vertical distance between a designated play surface and the protective surfacing beneath it."
- B. HDPE: High-density polyethylene.
- C. IPEMA: International Play Equipment Manufacturers Association.
- D. LLDPE: Linear low-density polyethylene.
- E. MDPE: Medium-density polyethylene.
- F. Use Zone: According to ASTM F 1487, "the area beneath and immediately adjacent to a play structure that is designated for unrestricted circulation around the equipment and on whose surface it is predicted that a user would land when falling from or exiting the equipment."

**1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for playground equipment and structures.
- C. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Extent of surface systems and use zones for equipment.
  - 2. Critical heights for playground surface, or fall heights for equipment.
- D. Samples for Initial Selection: For each type of playground equipment and structure indicated.
  - 1. Manufacturer's color charts.
  - 2. Include similar Samples of playground equipment and accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
  - 1. Posts and Rails: Not less than 6 inches (150 mm) long.
  - 2. Platforms: Not less than 6 inches (150 mm) square.
  - 3. Molded Plastic: Not less than 3 inches (75 mm) square.
- F. Product Certificates: For each type of playground equipment, signed by product manufacturer..

- G. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- H. Qualification Data: For Installer.
- I. Material Certificates: For the following items, signed by manufacturers:
  - 1. Shop finishes.
  - 2. Recycled plastic.
- J. Field quality-control test reports.
- K. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for playground equipment.
- L. Maintenance Data: For playground equipment and finishes to include in maintenance manuals.
- M. Warranty: Special warranty specified in this Section.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Manufacturer Qualifications: A firm whose playground equipment components have been certified by IPEMA's third-party product certification service.
  - 1. Provide playground equipment and play structure components bearing the IPEMA Certification Seal.
- C. Testing Agency Qualifications: An independent agency qualified according to ANSI Z34.1 for testing indicated.
- D. Safety Standards: Provide playground equipment complying with or exceeding requirements in the following:
  - 1. ASTM F 1487.
  - 2. CPSC No. 325.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

#### 1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of playground equipment that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following
    - a. Structural failures.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 2. Warranty Period: Five years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS (PLAY-1)

- A. Basis-of-Design Product: The design is based on Rainbow Play Systems play field equipment and structures designed for ages 2 to 12. Subject to compliance with requirements, provide either the following named product and accessories or comparable product and accessories by another manufacturer.
  - 1. Rainbow Play Systems, Model: Rainbow Play Village Design #109A

2. Engineered, non-toxic, crushed wood fiber surface material that complies with ASTM F1487-05 and CPSC 325. Install to thickness recommended by manufacturer.
3. Recycled Plastic Border Timbers. Provide quantity per manufacturer's recommendations for size of play area.
4. Galvanized Steel Stakes. Provide quantity per manufacturer's recommendations for size of play area.
5. Rainbow Play Systems age appropriate sign. Manufacturer's standard sign panels, fabricated from opaque plastic with graphics molded in attached to upright support posts.

## 2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  1. Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
  2. Cast Aluminum: ASTM B 179.
  3. Flat Sheet: ASTM B 209 (ASTM B 209M).
- B. Steel: Comply with the following:
  1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
  2. Steel Pipe: ASTM A 53/A 53M or ASTM A 135, standard-weight.
  3. Steel Tubing: ASTM A 500 or ASTM A 513, cold formed.
  4. Steel Sheet: ASTM A 1011/A 1011M.
  5. Perforated Metal: Steel sheet not less than 0.0747-inch (1.9-mm) uncoated thickness; manufacturer's standard perforation pattern.
  6. Expanded Metal: ASTM F 1267, Type II (expanded and flattened), manufacturer's standard carbon-steel sheets, deburred after expansion.
  7. Woven Wire Mesh: Manufacturer's standard, with wire complying with ASTM A 510 (ASTM A 510M).
- C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666; Type 304.
- D. Chain and Fittings: ASTM A 467/A 467M, Class CS, 4/0 or 5/0, welded-straight-link coil chain; hot-dip galvanized. With commercial-quality, hot-dip galvanized steel connectors and swing or ring hangers.
- E. Castings and Hangers: Malleable iron, ASTM A 47/A 47M, Grade 325 10, hot-dip galvanized.
- F. Post Caps: color-impregnated, UV-stabilized, mold-resistant polyethylene or polypropylene; color to match posts.
- G. Platform Clamps and Hangers: Cast aluminum.
- H. Hardware: Manufacturer's standard; commercial-quality, corrosion-resistant; hot-dip galvanized steel and iron, stainless steel, or aluminum; of a secure and vandal-resistant design.
- I. Fasteners: Manufacturer's standard; corrosion-resistant; hot-dip galvanized or plated steel and iron, or stainless steel; permanently capped, and theft resistant.
- J. Softwood Plywood: DOC PS 1, exterior.
- K. Opaque Plastic: Color impregnated, UV stabilized, and mold resistant.
  1. Polyethylene: Fabricated from virgin or recycled, purified, fractional-melt plastic resin; rotationally molded HDPE, LLDPE, or MDPE with not less than 1/4-inch (6-mm) wall thickness.
- L. Transparent Plastic: Abrasion-resistant, UV-stabilized monolithic polycarbonate sheet; clear, colorless; not less than 3/16 inch (5 mm) thick.

## 2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment: Pressure-treat wood according to AWPA C2 (lumber) and AWPA C9 (plywood) and the following:
1. Use preservative chemicals acceptable to authorities having jurisdiction and containing no arsenic or chromium. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
  2. Kiln-dry lumber and plywood after treatment to a maximum moisture content, respectively, of 19 and 15 percent. Do not use materials that are warped or do not comply with requirements for untreated materials.
  3. Mark each treated item with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
  4. Do not preservative treat redwood or cedar.

## 2.4 PLAYGROUND EQUIPMENT FABRICATION

- A. Assemble items in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- B. Metal Frame: Fabricate main-frame upright support posts from metal pipe or tubing with manufacturer's standard cross-section profile and dimensions. Form metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.
1. Fabricate secondary frame members, bracing, and connections from either steel or aluminum. Unless otherwise indicated, provide each pipe or tubing main-frame member with manufacturer's standard drainable bottom plate or support flange.
  2. Form simple and compound curves in bars and extruded shapes by bending members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces.
  3. Cut, drill, and punch metals cleanly and accurately. Remove sharp or rough areas on exposed surfaces.
  4. Mill joints to a tight, hairline fit. Cope or miter corner joints. Fabricate connections that will be exposed to weather in a manner to exclude water.
  5. Comply with AWS recommended practices for shop welding and brazing. Weld and braze behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed joints of flux, and dress exposed and contact surfaces.
  6. Provide weep holes where water may accumulate.
- C. Provide necessary rebates, lugs, and brackets to assemble units and to attach to other work. Cut, reinforce, drill, and tap to receive finish hardware, screws, and similar items, unless otherwise indicated.
- D. Composite Frame: Fabricate main-frame upright support posts from metal and plastic with profile and dimensions as indicated. Fabricate secondary frame members, bracing, and connections from either steel or aluminum.
- E. Play Surfaces: Provide manufacturer's standard elevated drainable decks, platforms, landings, walkways, ramps, and similar transitional play surfaces, designed to withstand loads; fabricated from perforated or expanded metal made into floor units with slip-resistant foot surfaces. Fabricate units in manufacturer's standard modular sizes and shapes to form assembled play surfaces indicated.
- F. Elevated Play Surfaces: Guardrails or protective barriers completely surround elevated play surface except for access openings, if play-surface heights above protective surfacing exceed the following for use by age group indicated:

- I. Elevated surface greater than 30 inches (510 mm) intended for use by children aged 5 through 12.
- G. Stepped Play Surfaces: Provide manufacturer's standard infill between stepped platforms according to referenced standards.
- H. Protective Barriers and Guardrails: Fabricate according to ASTM F 1487 and as follows:
  1. Welded metal pipe or tubing with vertical bars.
  2. Steel sheet with openings for vision and ventilation.
  3. Welded metal-pipe or -tubing frame with woven wire mesh infill panels.
- I. Handrails: Welded metal pipe or tubing, OD between 0.95 and 1.55 inches (24.1 and 39.4 mm). Provide handrails at height for use by age group indicated below:
  1. Ages: Between 5 and 12 years.
  2. Height of Top Surface: 29 inches (737 mm) intended for use by children aged 5 through 12.
  3. Close exposed ends of handrails with returns with clearance of 1/4 inch (6 mm) or less.
- J. Roofs and Canopies: Manufacturer's standard plastic.

## 2.5 PLAY SURFACE

- A. Double-Shredded Bark Mulch: Random-sized bark, shredded twice, suitable for using on play surfaces, free of metal scrap and other impurities that can cause injuries; complying with the testing and performance requirements for hazardous metals and tramp metal according to ASTM F 2075.
- B. Edging: Anchored-in-place, weather-resistant containment barrier designed to minimize sharp edges, protrusions, and tripping hazards; formed by interconnected, modular, rubber units.
  1. Color: As selected by Architect from manufacturer's full range
  2. Anchor Stakes: Manufacturer's standard, of corrosion-resistant-coated metal or noncorrodible material, designed to be nonprotruding when installed, for connecting units and securing in-place.

## 2.6 CAST-IN-PLACE CONCRETE

- A. Concrete Materials and Properties: Comply with requirements in ACI 301 to produce normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi (20.7 MPa), 3-inch (75-mm) slump, and 1-inch- (25-mm-) maximum-size aggregate.
- B. Concrete Materials and Properties: Dry-packaged concrete mix complying with ASTM C 387 and mixed at site with potable water, according to manufacturer's written instructions, to produce normal-weight concrete with a minimum 28-day compressive strength of 3000 psi (20.7 MPa), 3-inch (75-mm) slump, and 1-inch- (25-mm-) maximum-size aggregate.

## 2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.8 ALUMINUM FINISHES

- A. Baked-Enamel Finish: Prepare, treat, and coat metal to comply with paint manufacturer's written instructions and as follows:
  - 1. Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness not less than 1.5 mils (0.04 mm), medium gloss.
- B. PVC Finish: Manufacturer's standard, UV-stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added, complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness of 80 mils (2 mm).
- C. Color: As selected by Architect from manufacturer's full range.

## 2.9 IRON AND STEEL FINISHES

- A. Galvanizing: Hot-dip galvanize products made from rolled-, pressed-, and forged-steel shapes, castings, plates, bars, and strips indicated to be galvanized to comply with ASTM A 123/A 123M.
  - 1. Hot-dip galvanize steel and iron hardware indicated to be galvanized to comply with ASTM A 153/A 153M.
  - 2. Galvanized Steel Sheet: Commercial steel sheet, hot-dip galvanized, complying with ASTM A 653/A 653M for not less than G60 (Z 180) coating designation; mill phosphatized.
- B. Powder-Coat Finish: Prepare, treat, and coat ferrous metal to comply with resin manufacturer's written instructions and as follows:
  - 1. Apply thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils (0.04 mm).
- C. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).
- D. Color: As selected by Architect from manufacturer's full range.

## 2.10 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, site surface and subgrade drainage, and other conditions affecting performance.
  - 1. Do not begin installation before final grading required for placing protective surfacing is completed, unless otherwise permitted by Architect.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Verify locations of playground perimeter and pathways. Verify that playground layout and equipment locations comply with requirements for each type and component of equipment.



### 3.3 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions, unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.
  - 1. Maximum Equipment Height: Coordinate installed heights of equipment and components with finished elevations of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that playground equipment elevations comply with requirements for each type and component of equipment.
- B. Post and Footing Excavation: Excavate holes for posts and footings as required in firm, undisturbed or compacted subgrade soil.
- C. Post Set with Concrete Footing: Comply with ACI 301 for measuring, batching, mixing, transporting, forming, and placing concrete.
  - 1. Set equipment posts on concrete footing. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at the correct angle, alignment, height, and spacing. Retain first subparagraph below for posts set in concrete.
  - 2. Embedded Items: Use setting drawings and manufacturer's written instructions to ensure correct installation of anchorages for equipment.
  - 3. Concrete Footings: Smooth top, and shape to shed water.

### 3.4 INSTALLATION OF LOOSE-FILL SURFACING

- A. Apply components of loose-fill surfacing according to manufacturer's written instructions to produce a uniform surface.
- B. Edging: Place and permanently secure edging in place, and attach units to each other.
- C. Loose Fill: Place loose-fill materials to required depth after installation of playground equipment support posts and foundations. Include manufacturer's recommended amount of additional material to offset natural compaction over time. Include manufacturer's recommended amount of additional material to offset mechanical compaction.
- D. Compaction: After initial grading, mechanically compact loose fill before finish grading.
- E. Finish Grading: Hand rake to a uniformly smooth finished surface and to required elevations.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Arrange for playground equipment manufacturer's technical personnel to inspect playground and playground equipment and components at final completion and to certify compliance with the following:
  - 1. ASTM F 1487.
  - 2. CPSC No. 325.
  - 3. Comply with state and local authorities having jurisdiction.
- C. Notify Owner 48 hours in advance of date and time of final inspection.

**END OF SECTION || 68 00**

**SECTION 12 24 13 - ROLLER WINDOW SHADES****PART 1 - GENERAL****1.1 SUMMARY****1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, details of installation, operational clearances, wiring diagrams, and relationship to adjoining Work.
  - 1. Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.
- C. Coordination Drawings: Drawn to scale and coordinating penetrations and ceiling-mounted items.
- D. Samples: For each exposed finish and for each color and texture required.
- E. Window Treatment Schedule: Use same designations indicated on Drawings.
- F. Maintenance data.

**1.3 QUALITY ASSURANCE**

- A. Installer Qualifications: Fabricator of products.
- B. Fire-Test-Response Characteristics: Provide products passing flame-resistance testing according to NFPA 701 by a testing agency acceptable to authorities having jurisdiction.
- C. Comply with WCMA A 100.1.

**PART 2 - PRODUCTS****2.1 ROLLER SHADES (BLIND-1)**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Mecho Shade EcoVeil Shade or a comparable product by one of the following:
  - 1. Draper Inc;
  - 2. Hunter Douglas, Inc.; Hunter Douglas Window Fashions Division;
  - 3. Levolor; Levolor-Kirsch Window Fashions; a Newell Rubbermaid Company;
  - 4. Lutron Shading Solutions by VIMCO;
  - 5. Product:
    - a. Series: EcoVeil
    - b. Shade cloth: Dense Basket Weave Shadecloth
    - c. Series: 1550 Series, 3% openness
    - d. Color: To be selected by Architect from manufacturer's full range of solid color options.
- B. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets. Provide capacity for two roller shade band(s) per roller.
- C. Direction of Roll: To be determined by filed verification.

- D. Mounting Brackets: Fascia end caps, fabricated from steel finished to match fascia or headbox.
- E. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; removable design for access.
- F. Top/Back Cover: L-shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.
- G. Bottom Bar: Steel or extruded aluminum. Provide concealed, by pocket of shade material, internal-type.
- H. Mounting: Wall extension brackets.
- I. Shade Operation: Manual; with continuous-loop bead-chain, clutch, and cord tensioner and bracket lift operator.

## 2.2 ROLLER SHADE FABRICATION

- A. Unit Sizes: Obtain units fabricated in sizes to fill window openings as follows, measured at 74 deg F:
  - 1. Shade Units Installed between (Inside) Jamb: Edge of shade not more than 1/4 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
  - 2. Shade Units Installed Outside Jamb: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- B. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting fascia, roller, and operating hardware and for hardware position and shade mounting method indicated.
- C. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

## PART 3 - EXECUTION

### 3.1 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.
- B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
- C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

**END OF SECTION 12 24 13**

**SECTION 12 35 30 - RESIDENTIAL CASEWORK****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Bathroom vanity cabinets at dwelling units.
  - 2. Kitchen cabinets at dwelling units
- B. Related Sections:
  - 1. See Section 06 40 23 for plastic laminate countertop information.

**1.2 SUBMITTALS**

- A. Product Data: For countertop material.
- B. Shop Drawings: For cabinets and countertops. Include plans, elevations, details, and attachments to other work. Show materials, finishes, filler panels, hardware, edge and backsplash profiles, methods of joining countertops, and cutouts for plumbing fixtures.
- C. Samples: For each type of material exposed to view.

**1.3 QUALITY ASSURANCE**

- A. All composite wood materials must be Urea Formaldehyde-free and certified per ANSI A208.1 and A208.2.
- B. Quality Standards: Unless otherwise indicated, comply with the following standards:
  - 1. Cabinets: KCMA A161.1.
    - a. KCMA Certification: Provide cabinets with KCMA's "Certified Cabinet" seal affixed in a semiexposed location.
  - 2. Plastic-Laminate Countertops: KCMA A161.2.
  - 3. No urea formaldehyde permitted in any wood product.
  - 4. MDF and particleboard are not permitted to be used.

**PART 2 - PRODUCTS****2.1 COUNTERTOP MATERIALS**

- A. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

**2.2 KITCHEN CABINETS (CAB-1)**

- 1. Manufacturers: Subject to compliance with requirements, provide cabinets by Rosebud Wood Products or comparable products from:
  - a. Equal approved by Architect.
- 2. CAB-1
  - a. Style: Traditional Series
  - b. Species: Birch
  - c. Finish: To be selected by Architect from manufacturer's standard line of finishes
  - d. Construction: Plywood and hardwood
    - 1) Solid hardwood face frames
    - 2) Veneered plywood backs and sides
  - e. Birch veneer plywood back and face boards
- 3. Interiors:
  - a. Material: Manufacturer's standard interior finish.

- b. Melamine shelving
- 4. Pulls: wire pulls provided and installed by Owner after cabinet installation
- 5. Drawer Locks: BHMA A156.11, E07041.
- 6. Hinges: 110-degree opening swing
- 7. Drawer Slides: BHMA A156.9, B05091.
  - a. Standard Duty (Grade 1, Grade 2, and Grade 3): Side mounted; ¾-extension type; zinc-plated steel with polymer rollers.
- 8. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
  - a. Brushed chrome.

### 2.3 CABINET ACCESSORIES

- A. Provide drip pan adhered to cabinet base at all Kitchen sink cabinets.
  - 1. Material: 22 gauge sheet metal with crimped and sealed edges, or continuous plastic with sealed edges
  - 2. Lap up 1" on all sides.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Adjust cabinets and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as needed.

**END OF SECTION 12 35 30**

**SECTION 12 93 00 - SITE FURNISHINGS****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Bicycle racks.
  - 2. Secure bicycle lockers.

**1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Samples: For each exposed finish.
- C. Material Certificates: For site furnishings, signed by manufacturers.
- D. Maintenance Data.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes.
- B. Steel and Iron: Free of surface blemishes.
- C. Fiberglass: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and manufacturer's standard finish.
- D. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality, concealed, recessed, and capped or plugged.
- E. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107; recommended in writing by manufacturer, for exterior applications.
- F. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring patching and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.
- G. Galvanizing:
  - 1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil thick.
  - 2. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

**2.2 BICYCLE RACKS**

- A. Grouped Bicycle Racks

1. Basis-of-Design Product (BRACK-1): Subject to compliance with requirements, provide Dero Bike Racks model: Campus Rack model #S6.
  2. Frame: Steel
  3. Capacity: Designed to accommodate six bicycles.
  4. Security: Designed to lock wheel and frame.
  5. Installation Method: Bolted into cast-in-place concrete pad.
  6. Steel Finish: Powder Coat.
  7. Color: Silver
- B. Individual Securable Bicycle Lockers
1. Basis-of-Design Product (BRACK-2): Subject to compliance with requirements, provide Dero Bike Racks model: Bicycle Locker Model 301.
  2. Frame: Molded fiberglass reinforced composite plastic
  3. Capacity: Designed to accommodate one bicycle in each locker.
  4. Handle: Padlock handle.
  5. Installation Method: Bolted into cast-in-place concrete pad.
  6. Color: Color to be selected from manufacturer's standard colors.

### 2.3 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- E. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Anchor into walls: Attach only at locations with solid wood in-wall blocking to provide a secure anchoring point.

**END OF SECTION 12 93 00**

## SECTION 21 13 13 - WET-PIPE SPRINKLER SYSTEMS

## PART I - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SUMMARY

- A. Section Includes:
  - 1. Pipes, fittings, and specialties.
  - 2. Specialty valves.
  - 3. Sprinklers.
  - 4. Pressure gages.

## I.3 DEFINITIONS

- A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

## I.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For wet-pipe sprinkler systems.
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Include diagrams for power, signal, and control wiring.
- C. Delegated-Design Submittal: For wet-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the NICET IV designer responsible for their preparation.

## I.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Domestic water piping.
- B. Qualification Data: For qualified Installer and design professional.
- C. Design Data:
  - 1. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13R, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- D. Welding certificates.
- E. Field Test Reports:



1. Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13R. Include "Contractor's Material and Test Certificate for Aboveground Piping."
  2. Fire-hydrant flow test report.
- F. Field quality-control reports.
- I.6 CLOSEOUT SUBMITTALS
- A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.
- I.7 MAINTENANCE MATERIAL SUBMITTALS
- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.
- I.8 QUALITY ASSURANCE
- A. Installer Qualifications:
1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
    - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.
- I.9 FIELD CONDITIONS
- A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:
1. Notify Architect no fewer than two days in advance of proposed interruption of sprinkler service.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
1. NFPA 13R.
- B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
- C. Delegated Design: Engage a NICET IV designer, to design wet-pipe sprinkler systems.
1. Sprinkler system design shall be approved by authorities having jurisdiction.
    - a. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
    - b. Sprinkler Occupancy Hazard Classifications:
      - 1) Residential Living Areas.
  2. Minimum Density for Automatic-Sprinkler Piping Design:
    - a. Residential (Dwelling) Occupancy: 0.05 gpm over 400-sq. ft. area.
  3. Maximum Protection Area per Sprinkler: According to UL listing.
  4. Maximum Protection Area per Sprinkler:

- a. Residential Areas: 400 sq. ft..

## 2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Cast-Copper, Solder-Joint Fittings: ASME B1 6.18 pressure fittings.
- C. Wrought-Copper, Solder-Joint Fittings: ASME B1 6.22 pressure fittings.
- D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- E. Bronze Flanges: ASME B1 6.24, Class 150, with solder-joint ends.
- F. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
- G. Copper Pressure-Seal Fittings:
  - 1. Standard: UL 213.
  - 2. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
  - 3. NPS 2-1/2 to NPS 4: Cast-bronze fitting with EPDM-rubber O-ring seal in each end.
- H. Copper-Tube, Extruded-Tee Connections:
  - 1. Description: Tee formed in copper tube according to ASTM F 2014.

## 2.3 CPVC PIPE AND FITTINGS

- A. CPVC Pipe: ASTM F 442/F 442M and UL 1821, SDR 13.5, for 175-psig rated pressure at 150 deg F, with plain ends. Include "LISTED" and "CPVC SPRINKLER PIPE" markings.
- B. CPVC Fittings: UL listed or FM Global approved, for 175-psig rated pressure at 150 deg F, socket type. Include "LISTED" and "CPVC SPRINKLER FITTING" markings.
  - 1. NPS 3/4 to NPS 1-1/2: ASTM F 438 and UL 1821, Schedule 40, socket type.
  - 2. CPVC-to-Metal Transition Fittings: CPVC, one piece, with dimensions equivalent to pipe; one end with threaded brass insert, and one socket end.
  - 3. CPVC-to-Metal Transition Unions: CPVC, with dimensions equivalent to pipe; one end with threaded brass insert, and one socket end.
  - 4. Flanges: CPVC, one or two pieces.
- C. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F 493 solvent cement recommended by pipe and fitting manufacturer, and made for joining CPVC sprinkler pipe and fittings. Include cleaner or primer recommended by pipe and fitting manufacturer.
- D. Plastic Pipe-Flange Gasket and Bolts and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

## 2.4 SPECIALTY VALVES

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Pressure Rating:
  - 1. Standard-Pressure Piping Specialty Valves: 175-psig minimum.

- C. Body Material: Cast or ductile iron.
- D. Size: Same as connected piping.
- E. End Connections: Flanged or grooved.
- F. Automatic (Ball Drip) Drain Valves:
  - 1. Standard: UL 1726.
  - 2. Pressure Rating: 175-psig minimum.
  - 3. Type: Automatic draining, ball check.
  - 4. Size: NPS 3/4.
  - 5. End Connections: Threaded.

## 2.5 SPRINKLER PIPING SPECIALTIES

- A. Branch Outlet Fittings:
  - 1. Standard: UL 213.
  - 2. Pressure Rating: 175-psig minimum.
  - 3. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
  - 4. Type: Mechanical-tee and -cross fittings.
  - 5. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
  - 6. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
  - 7. Branch Outlets: Grooved, plain-end pipe, or threaded.
- B. Branch Line Testers:
  - 1. Standard: UL 199.
  - 2. Pressure Rating: 175 psig.
  - 3. Body Material: Brass.
  - 4. Size: Same as connected piping.
  - 5. Inlet: Threaded.
  - 6. Drain Outlet: Threaded and capped.
  - 7. Branch Outlet: Threaded, for sprinkler.
- C. Sprinkler Inspector's Test Fittings:
  - 1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
  - 2. Pressure Rating: 175-psig minimum.
  - 3. Body Material: Cast- or ductile-iron housing with sight glass.
  - 4. Size: Same as connected piping.
  - 5. Inlet and Outlet: Threaded.
- D. Adjustable Drop Nipples:
  - 1. Standard: UL 1474.
  - 2. Pressure Rating: 250-psig minimum.
  - 3. Body Material: Steel pipe with EPDM-rubber O-ring seals.
  - 4. Size: Same as connected piping.
  - 5. Length: Adjustable.
  - 6. Inlet and Outlet: Threaded.

## 2.6 SPRINKLERS

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Pressure Rating for Residential Sprinklers: 175-psig maximum.

- C. Pressure Rating for Automatic Sprinklers: 175-psig minimum.
- D. Automatic Sprinklers with Heat-Responsive Element:
  - 1. Residential Applications: UL 1626.
  - 2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.
- E. Sprinkler Finishes: Chrome plated bronze and painted.
- F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
  - 1. Ceiling Mounting: Chrome-plated steel, one piece, flat or plastic, white finish, one piece, flat.
  - 2. Sidewall Mounting: Chrome-plated steel or plastic, white finish, one piece, flat.

## 2.7 PRESSURE GAGES

- A. Standard: UL 393.
- B. Dial Size: 3-1/2- to 4-1/2-inch diameter.
- C. Pressure Gage Range: 0- to 250-psig minimum.
- D. Label: Include "WATER" label on dial face.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13R and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.

### 3.2 WATER-SUPPLY CONNECTIONS

- A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Section 22 11 16 "Domestic Water Piping."
- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-distribution piping.
- C. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

### 3.3 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.
  - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
  - 2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
- B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

- C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- E. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13R.
- F. Install sprinkler piping with drains for complete system drainage.
- G. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
- H. Install hangers and supports for sprinkler system piping according to NFPA 13R. Comply with requirements for hanger materials in NFPA 13R.
- I. Install pressure gages on riser or feed main, and at each sprinkler test connection. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.
- J. Fill sprinkler system piping with water.
- K. Install electric heating cables and pipe insulation on sprinkler piping in areas subject to freezing.
- L. Install sleeves for piping penetrations of walls, ceilings, and floors.
- M. Install escutcheons for piping penetrations of walls, ceilings, and floors.

#### 3.4 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- D. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- E. 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.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- F. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.
- G. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Braze Joints" Chapter.
- H. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and copper pressure-seal fittings with tools recommended by fitting manufacturer.

- I. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2104. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.
- K. 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. Apply primer.
  - 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

### 3.5 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13R and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
  - 1. Install valves in vertical position for proper direction of flow, in main supply to system.

### 3.6 SPRINKLER INSTALLATION

- A. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

### 3.7 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13R.

### 3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Flush, test, and inspect sprinkler systems according to NFPA 13R.
- B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.9 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.10 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

3.11 PIPING SCHEDULE

- A. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.
- B. Copper-tube, extruded-tee connections may be used for tee branches in copper tubing instead of specified copper fittings. Branch-connection joints must be brazed.
- C. CPVC pipe, Schedule 40 CPVC fittings, and solvent-cemented joints may be used for light-hazard and residential occupancies.
- D. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:
  - 1. Type L, hard copper tube with plain ends; cast- or wrought-copper, solder-joint fittings; and brazed joints.
  - 2. Type L, hard copper tube with plain ends; copper pressure-seal fittings; and pressure-sealed joints.

3.12 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
  - 1. Rooms without Ceilings: Upright sprinklers.
  - 2. Rooms with Suspended Ceilings: Concealed sprinklers.
  - 3. Wall Mounting: Sidewall sprinklers.
  - 4. Spaces Subject to Freezing: Upright sprinklers.
  - 5. Special Applications: Attic sprinklers.
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
  - 1. Residential Sprinklers: Dull chrome.

END OF SECTION 21 13 13

## SECTION 22 05 17 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

## PART 1 - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SUMMARY

- A. Section Includes:
  - 1. Sleeves.
  - 2. Stack-sleeve fittings.
  - 3. Grout.
  - 4. Silicone sealants.

## I.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

## I.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

## PART 2 - PRODUCTS

## 2.1 SLEEVES

- A. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop collar.

## 2.2 STACK-SLEEVE FITTINGS

- A. Description: Manufactured, Dura-coated or Duco-coated cast-iron sleeve with integral clamping flange for use in waterproof floors and roofs. Include clamping ring, bolts, and nuts for membrane flashing.
  - 1. Underdeck Clamp: Clamping ring with setscrews.

## 2.3 GROUT

- A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.



## 2.4 SILICONE SEALANTS

- A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant, ASTM C 920, Type S, Grade NS, Class 25, Use NT.
- B. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT. Grade P Pourable (self-leveling) formulation is for opening in floors and other horizontal surfaces that are not fire rated.
- C. Silicone Foam: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

## PART 3 - EXECUTION

### 3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
  - 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
  - 2. 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.
  - 3. Using grout or silicone sealant, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- C. Install sleeves for pipes passing through interior partitions.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
  - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
  - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.
- D. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 07 84 13 "Penetration Firestopping."

### 3.2 STACK-SLEEVE-FITTING INSTALLATION

- A. Install stack-sleeve fittings in new slabs as slabs are constructed.
  - 1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
  - 2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 07 62 00 "Sheet Metal Flashing and Trim."
  - 3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
  - 4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 5. Use silicone sealant to seal the space around outside of stack-sleeve fittings.
- B. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of floors at pipe penetrations. Seal pipe penetrations with fire- and

smoke-stop materials. Comply with requirements for firestopping specified in Section 07 84 13 "Penetration Firestopping."

### 3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - I. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.
- B. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves for the following piping-penetration applications:
  - I. Concrete Slabs-on-Grade:
    - a. Piping Smaller Than NPS 6: Cast-iron pipe sleeves with sleeve-seal system.
      - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
  - 2. Interior Partitions:
    - a. Piping Smaller Than NPS 6: Steel pipe sleeves.

END OF SECTION 22 05 17

## SECTION 22 05 23.12 - BALL VALVES FOR PLUMBING PIPING

## PART 1 - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SUMMARY

- A. Section Includes:
  - 1. Bronze ball valves.

## I.3 DEFINITIONS

- A. CWP: Cold working pressure.

## I.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
  - 1. Certification that products comply with NSF 61 Annex G and NSF 372.

## I.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, and soldered ends.
  - 3. Set ball valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

## PART 2 - PRODUCTS

## 2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
  - 1. ASME B1.20.1 for threads for threaded end valves.
  - 2. ASME B1 6.1 for flanges on iron valves.
  - 3. ASME B1 6.5 for flanges on steel valves.
  - 4. ASME B1 6.10 and ASME B1 6.34 for ferrous valve dimensions and design criteria.
  - 5. ASME B1 6.18 for solder-joint connections.
  - 6. ASME B31.9 for building services piping valves.

- C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
  - 1. Handlever: For quarter-turn valves smaller than NPS 4.
- H. Valves in Insulated Piping:
  - 1. Include 2-inch stem extensions.
  - 2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
  - 3. Memory stops that are fully adjustable after insulation is applied.

## 2.2 BRONZE BALL VALVES

- A. Bronze Ball Valves, Two-Piece with Full Port and Stainless-Steel Trim:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane; Crane Energy Flow Solutions.
    - b. Milwaukee Valve Company.
    - c. NIBCO INC.
    - d. WATTS.
  - 2. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig.
    - c. Body Design: Two piece.
    - d. Body Material: Bronze.
    - e. Ends: Threaded or soldered.
    - f. Seats: PTFE.
    - g. Stem: Stainless steel.
    - h. Ball: Stainless steel, vented.
    - i. Port: Full.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Do not attempt to repair defective valves; replace with new valves.

### 3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install valve tags. Comply with requirements in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

### 3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. Select valves with the following end connections:
  - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

### 3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
  - 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
  - 2. Bronze ball valves, two-piece with full port and stainless-steel trim.

END OF SECTION 22 05 23.12

SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

I.2 SUMMARY

- A. Section Includes:
  - 1. Metal pipe hangers and supports.
  - 2. Thermal-hanger shield inserts.
  - 3. Fastener systems.

I.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

I.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

I.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

I.6 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Copper Pipe Hangers:
  - 1. Description: MSS SP-58, Types I through 58, copper-coated-steel, factory-fabricated components.
  - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.

- C. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

### PART 3 - EXECUTION

#### 3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- C. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- D. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- E. Install hangers and supports to allow controlled thermal and seismic 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.
- F. Install lateral bracing with pipe hangers and supports to prevent swaying.
- 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 to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- I. Insulated Piping:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
  - 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 an arc of 180 degrees.
    - 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.
  - 4. 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.
  - 5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

#### 3.2 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

### 3.3 PAINTING

- A. Touchup: 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.
  - I. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

### 3.4 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- F. Use padded hangers for piping that is subject to scratching.
- G. Use thermal-hanger shield inserts for insulated piping and tubing.
- H. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

**END OF SECTION 22 05 29**



## SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

## PART 1 - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SUMMARY

- A. Section Includes:
  - 1. Equipment labels.
  - 2. Pipe labels.
  - 3. Valve tags.
  - 4. Warning tags.

## I.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

## PART 2 - PRODUCTS

## 2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
  - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
  - 2. Letter Color: Black.
  - 3. Background Color: White.
  - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
  - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
  - 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
  - 7. Fasteners: Stainless-steel rivets.
  - 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

## 2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: White.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- G. Fasteners: Stainless-steel rivets.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information plus emergency notification instructions.

## 2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
  - 1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
  - 2. Lettering Size: Size letters according to ASME A13.1 for piping.

## 2.4 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
  - 1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  - 2. Fasteners: Brass wire-link chain.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
  - 1. Valve-tag schedule shall be included in operation and maintenance data.

## 2.5 WARNING TAGS

- A. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.
  - 1. Size: 3 by 5-1/4 inches minimum.
  - 2. Fasteners: Brass grommet and wire.
  - 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
  - 4. Color: Safety yellow background with black lettering.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

### 3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

### 3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

### 3.4 PIPE LABEL INSTALLATION

- A. Piping Color Coding: Painting of piping is specified in Section 09 91 23 "Interior Painting."
- B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
  - 1. Near each valve and control device.
  - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
  - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
  - 5. Near major equipment items and other points of origination and termination.
  - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
  - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- C. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- D. Pipe Label Color Schedule:
  - 1. Domestic Water Piping
    - a. Background: Safety green.

- b. Letter Colors: White.
- 2. Sanitary Waste Piping:
  - a. Background Color: Safety black.
  - b. Letter Color: White.

### 3.5 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
  - 1. Valve-Tag Size and Shape:
    - a. Cold Water: 1-1/2 inches.
    - b. Hot Water: 1-1/2 inches.
  - 2. Valve-Tag Colors:
    - a. Cold Water: Natural.
    - b. Hot Water: Natural.
  - 3. Letter Colors:
    - a. Cold Water: White.
    - b. Hot Water: White.

### 3.6 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 22 05 53

## SECTION 22 07 19 - PLUMBING PIPING INSULATION

## PART I - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SUMMARY

- A. Section includes insulating the following plumbing piping services:
  - 1. Domestic cold-water piping.
  - 2. Domestic hot-water piping.

## I.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

## I.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

## I.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
- C. Comply with the following applicable standards and other requirements specified for miscellaneous components:
  - 1. Supply and Drain Protective Shielding Guards: ICCA I 17.1.

## I.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

## 1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

## 1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- E. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
  - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
- F. Mineral-Fiber, Preformed Pipe Insulation:
  - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
  - 2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, [~~without factory-applied jacket~~] [**with factory-applied ASJ**] [**with factory-applied ASJ-SSL**]. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

### 2.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
  - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

### 2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
  - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
  - 2. [<Double click to insert sustainable design text for adhesive for flexible elastomeric and polyolefin VOC content.>](#)
  - 3. [<Double click to insert sustainable design text for low-emitting adhesives and sealants.>](#)
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
  - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
  - 2. [<Double click to insert sustainable design text for mineral fiber adhesive VOC content.>](#)
  - 3. [<Double click to insert sustainable design text for low-emitting adhesives and sealants.>](#)

## 2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
  - 1. [<Double click to insert sustainable design text for insulation mastics VOC content.>](#)
  - 2. [<Double click to insert sustainable design text for low-emitting mastics VOC content.>](#)
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
  - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
  - 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
  - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
  - 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
  - 5. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
  - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
  - 2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
  - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
  - 4. Solids Content: 60 percent by volume and 66 percent by weight.
  - 5. Color: White.

## 2.5 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
  - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
  - 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

## 2.6 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
  - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
  - 2. Width: 3 inches.
  - 3. Thickness: 11.5 mils.
  - 4. Adhesion: 90 ounces force/inch in width.
  - 5. Elongation: 2 percent.
  - 6. Tensile Strength: 40 lbf/inch in width.
  - 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

## 2.7 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers;
  - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
  - 2. Description: Manufactured plastic wraps for covering plumbing fixture hot-water supply and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  - 1. Verify that systems to be insulated have been tested and are free of defects.
  - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
  - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
  - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.



- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
    - a. For below-ambient services, apply vapor-barrier mastic over staples.
  - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
  - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
  - 1. Vibration-control devices.
  - 2. Testing agency labels and stamps.
  - 3. Nameplates and data plates.
  - 4. Cleanouts.

### 3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  - 1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
  4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
  2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
  4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping and fire-resistant joint sealers.
- E. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
  2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

### 3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
  2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
  7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
  8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
  9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
  2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
  3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
  4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
  5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

### 3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
  2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
  3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
  4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of pipe insulation.
  2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

- D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed valve covers manufactured of same material as pipe insulation when available.
  2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  3. Install insulation to flanges as specified for flange insulation application.
  4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

### 3.7 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
  2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
  3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
  4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
  2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
  3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
  4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
  2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
  2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
  3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  4. Install insulation to flanges as specified for flange insulation application.

### 3.8 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."
1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
    - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

### 3.9 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
  - 1. Drainage piping located in crawl spaces.
  - 2. Underground piping.
  - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### 3.10 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold Water:
  - 1. NPS 1 and Smaller: Insulation shall be one of the following:
    - a. Flexible Elastomeric: [1/2 inch] [3/4 inch] [1 inch] <Insert dimension> thick.
    - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: [1/2 inch] [1 inch] <Insert dimension> thick.
- B. Domestic Hot Water:
  - 1. NPS 1-1/4 and Smaller: Insulation shall be one of the following:
    - a. Flexible Elastomeric: [3/4 inch] [1 inch] <Insert dimension> thick.
    - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: [1/2 inch] [1 inch] <Insert dimension> thick.

END OF SECTION 22 07 19

## SECTION 22 11 16 - DOMESTIC WATER PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Copper tube and fittings.
  - 2. PEX-AL-PEX tube and fittings.
  - 3. PEX-AL-HDPE tube and fittings.
  - 4. Transition fittings.
  - 5. Dielectric fittings.
- B. Related Requirements:
  - 1. Section 22 11 13 "Facility Water Distribution Piping" for water-service piping outside the building from source to the point where water-service piping enters the building.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

## 1.4 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

## PART 2 - PRODUCTS

## 2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."
- C. Comply with NSF 372 for low lead.

## 2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.
- C. Bronze Flanges: ASME B1 6.24, Class 150, with solder-joint ends.

- D. Copper Unions:
  - 1. MSS SP-123.
  - 2. Cast-copper-alloy, hexagonal-stock body.
  - 3. Ball-and-socket, metal-to-metal seating surfaces.
  - 4. Solder-joint or threaded ends.

### 2.3 PEX TUBE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. REHAU.
  - 2. Uponor.
  - 3. Viega LLC.
- B. Tube Material: PEX plastic according to ASTM F 876 and ASTM F 877.
- C. Fittings: ASTM F 1807, metal insert and copper crimp rings ASTM F 1960, cold expansion fittings and reinforcing rings.
- D. Fittings: ASSE 1061, push-fit fittings.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. SharkBite.
    - b. Zurn Industries, LLC.
- E. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 876; with plastic or corrosion-resistant-metal valve for each outlet.

### 2.4 PEX-AL-PEX TUBE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. REHAU.
  - 2. Uponor.
  - 3. Viega LLC.
- B. Tube Material: PEX plastic bonded to the inside and outside of a welded aluminum tube according to ASTM F 1281.
- C. Oxygen Barrier: Limit oxygen diffusion through the pipe to maximum 0.10 mg per cu. m/day at 104 deg F according to DIN 4726.
- D. Fittings: ASTM F 1974, metal insert fittings with split ring and compression nut (compression joint) or metal insert fittings with copper crimp rings (crimp joint).

### 2.5 PIPING JOINING MATERIALS

- A. Solder Filler Metals: ASTM B 32, lead-free alloys.
- B. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- C. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

## 2.6 TRANSITION FITTINGS

- A. General Requirements:
  - 1. Same size as pipes to be joined.
  - 2. Pressure rating at least equal to pipes to be joined.
  - 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Sleeve-Type Transition Coupling: AWWA C219.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Cascade Waterworks Mfg. Co.
    - b. Dresser, Inc.
    - c. Ford Meter Box Company, Inc. (The).
    - d. Jay R. Smith Mfg. Co.
    - e. JCM Industries, Inc.
    - f. Romac Industries, Inc.
    - g. Smith-Blair, Inc.
    - h. Viking Johnson.
- D. Plastic-to-Metal Transition Fittings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Charlotte Pipe and Foundry Company.
    - b. Harvel Plastics, Inc.
    - c. Spears Manufacturing Company.
    - d. Uponor.
  - 2. Description:
    - a. PVCone-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
    - b. One end with threaded brass insert and one solvent-cement-socket or threaded end.

## 2.7 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. A.Y. McDonald Mfg. Co.
    - b. Capitol Manufacturing Company.
    - c. Central Plastics Company.
    - d. HART Industrial Unions, LLC.
    - e. Matco-Norca.
    - f. WATTS.
    - g. Wilkins.
    - h. Zurn Industries, LLC.
  - 2. Standard: ASSE 1079.



3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous.

### PART 3 - EXECUTION

#### 3.1 EARTHWORK

- A. Comply with requirements in Section 31 20 00 "Earth Moving" for excavating, trenching, and backfilling.

#### 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.
- D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 22 05 19 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 22 11 19 "Domestic Water Piping Specialties."
- E. Install shutoff valve immediately upstream of each dielectric fitting.
- F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 22 11 19 "Domestic Water Piping Specialties."
- G. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.
- H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- I. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- K. 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.
- L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- M. Install piping to permit valve servicing.
- N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- O. Install piping free of sags and bends.

- P. Install fittings for changes in direction and branch connections.
- Q. Install PEX tubing with loop at each change of direction of more than 90 degrees.
- R. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- S. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 22 05 19 "Meters and Gages for Plumbing Piping."
- T. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 22 11 23 "Domestic Water Pumps."
- U. Install thermometers on outlet piping from each water heater. Comply with requirements for thermometers in Section 22 05 19 "Meters and Gages for Plumbing Piping."
- V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

### 3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. 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.
  2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Joints for PEX Tubing: Join according to ASTM F 1807 for metal insert and copper crimp ring fittings and ASTM F 1960 for cold expansion fittings and reinforcing rings.
- G. Joints for PEX Tubing: Join according to ASSE 1061 for push-fit fittings.
- H. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

### 3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition.

### 3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

### 3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger, support products, and installation in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:
  - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
  - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
  - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.
7. NPS 8: 10 feet with 3/4-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

F. Install vinyl-coated hangers for PEX tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.

G. Install hangers for vertical PEX tubing every 48 inches.

H. Support piping and tubing not listed in this article according to MSS SP-58 and manufacturer's written instructions.

### 3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
  - 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
  - 2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
  - 3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

### 3.8 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 22 05 53 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

### 3.9 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Piping Inspections:
    - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
    - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
      - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
      - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
    - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
    - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
  - 2. Piping Tests:
    - a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
    - b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
    - c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
    - d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
    - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
    - f. Prepare reports for tests and for corrective action required.
- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.10 ADJUSTING

- A. Perform the following adjustments before operation:
1. Close drain valves, hydrants, and hose bibbs.
  2. Open shutoff valves to fully open position.
  3. Open throttling valves to proper setting.
  4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
    - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
    - b. Adjust calibrated balancing valves to flows indicated.
  5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
  6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
  7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
  8. Check plumbing specialties and verify proper settings, adjustments, and operation.

### 3.11 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
  2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Fill and isolate system according to either of the following:
      - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
      - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
    - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    - d. Repeat procedures if biological examination shows contamination.
    - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Clean non-potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
  2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

### 3.12 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be the following:
  - 1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
- E. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be the following:
  - 1. Soft copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
- F. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:
  - 1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed joints.
  - 2. PEX tube, NPS 1 and smaller.
    - a. Fittings for PEX tube:
      - 1) ASTM F 1807, metal insert and copper crimp rings.
      - 2) ASTM F 1960, cold expansion fittings and reinforcing rings.
      - 3) ASSE 1061, push-fit fittings.
  - 3. PE-AL-PE tube, NPS 1 and smaller; fittings for PE-AL-PE tube; and crimped joints
  - 4. PEX-AL-PEX tube, NPS 1 and smaller; fittings for PEX-AL-PEX tube; and crimped joints.

### 3.13 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - 1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.
  - 2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
  - 3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
  - 4. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 22 11 16

## SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## 1.2 SUMMARY

- A. Section Includes:
  1. Outlet boxes.
  2. Hose bibbs.
  3. Wall hydrants.
- B. Related Requirements:
  1. Section 22 11 16 "Domestic Water Piping" for water meters.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

## PART 2 - PRODUCTS

## 2.1 OUTLET BOXES

- A. Clothes Washer Outlet Boxes:
  1. Mounting: Recessed.
  2. Material and Finish: Enameled-steel or epoxy-painted-steel Plastic box and faceplate.
  3. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
  4. Supply Shutoff Fittings: NPS 1/2 gate, globe, or ball valves and NPS 1/2 copper, water tubing.
  5. Drain: NPS 1-1/2 standpipe and P-trap for direct waste connection to drainage piping.
  6. Inlet Hoses: Two 60-inch-long, rubber household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.
  7. Drain Hose: One 48-inch-long, rubber household clothes washer drain hose with hooked end.

## 2.2 WALL HYDRANTS

- A. Nonfreeze Wall Hydrants <Insert drawing designation if any>:
  1. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
  2. Pressure Rating: 125 psig.
  3. Operation: Loose key.
  4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
  5. Inlet: NPS 3/4 or NPS 1.
  6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
  7. Box: Deep, flush mounted with cover.
  8. Box and Cover Finish: Polished nickel bronze.
  9. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.

- 10. Nozzle and Wall-Plate Finish: Polished nickel bronze.
- 11. Operating Keys(s): One with each wall hydrant.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install outlet boxes recessed in wall or surface mounted on wall. Install 2-by-4-inch fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 06 10 00 "Rough Carpentry."
- B. Set nonfreeze, nondraining-type post hydrants in concrete or pavement.
- C. Set freeze-resistant yard hydrants with riser pipe in concrete or pavement. Do not encase canister in concrete.

#### 3.2 CONNECTIONS

- A. Comply with requirements for ground equipment in Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- B. Fire-retardant-treated-wood blocking is specified in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

#### 3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 22 11 19



## SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Hub-and-spigot, cast-iron soil pipe and fittings.
  - 2. Hubless, cast-iron soil pipe and fittings.
  - 3. PVC pipe and fittings.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For hubless, single-stack drainage system. Include plans, elevations, sections, and details.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

## PART 2 - PRODUCTS

## 2.1 PIPING MATERIALS

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

## 2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service class(es).
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

## 2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. Cast-Iron, Hubless-Piping Couplings:
  - 1. Standard: ASTM C 1277.
  - 2. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

## 2.4 PVC PIPE AND FITTINGS

- A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.
- B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- D. Adhesive Primer: ASTM F 656.
- E. Solvent Cement: ASTM D 2564.

## PART 3 - EXECUTION

### 3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 31 20 00 "Earth Moving."

### 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
  - 1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
  - 2. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. 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.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
  - 1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
  - 2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
    - a. Straight tees, elbows, and crosses may be used on vent lines.

3. Do not change direction of flow more than 90 degrees.
  4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
    - a. Reducing size of waste piping in direction of flow is prohibited.
- K. Lay buried building waste piping beginning at low point of each system.
1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
  2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
  3. Maintain swab in piping and pull past each joint as completed.
- L. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
1. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 3 and smaller; 2 percent downward in direction of flow for piping NPS 4 and larger.
  2. Horizontal Sanitary Waste Piping: 2 percent downward in direction of flow.
  3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- M. Install aboveground PVC piping according to ASTM D 2665.
- N. Install engineered soil and waste and vent piping systems as follows:
1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
  2. Hubless, Single-Stack Drainage System: Comply with ASME B16.45 and hubless, single-stack aerator fitting manufacturer's written installation instructions.
  3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- O. Plumbing Specialties:
1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
    - a. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
    - b. Comply with requirements for cleanouts specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
  2. Install drains in sanitary waste gravity-flow piping.
    - a. Comply with requirements for drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
- P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors.
1. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- R. Install sleeve seals for piping penetrations of concrete walls and slabs.
1. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors.
1. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

### 3.3 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

- B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.
- C. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- D. Plastic, Nonpressure-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. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
  - 3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendixes.

### 3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
  - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
  - 2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
  - 3. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 4. Install individual, straight, horizontal piping runs:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
  - 5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 6. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
  - 2. NPS 3: 60 inches with 1/2-inch rod.
  - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
  - 4. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
  - 2. NPS 3: 48 inches with 1/2-inch rod.
  - 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
- I. Install supports for vertical PVC piping every 48 inches.
- J. Support piping and tubing not listed above according to MSS SP-58 and manufacturer's written instructions.

### 3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect waste and vent piping to the following:
  - 1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
  - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
  - 3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
  - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

### 3.6 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping.
- B. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

### 3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
  - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
    - a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  - 2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.
    - a. Expose work that was covered or concealed before it was tested.
  - 3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
    - a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
    - b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.

- c. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.
  - a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg.
  - b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
  - c. Air pressure must remain constant without introducing additional air throughout period of inspection.
  - d. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

### 3.8 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Repair damage to adjacent materials caused by waste and vent piping installation.

### 3.9 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:
  1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
  2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
  3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
- C. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
  1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
  2. joints.
  3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
- D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:
  1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
  2. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

END OF SECTION 22 13 16

SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

I.2 SUMMARY

- A. Section Includes:
  - 1. Cleanouts.
  - 2. Roof flashing assemblies.

I.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene.
- B. PVC: Polyvinyl chloride.

I.4 ACTION SUBMITTALS

- A. Shop Drawings:
  - 1. Show fabrication and installation details for frost-resistant vent terminals.

I.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

I.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For sanitary waste piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

- A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

2.2 CLEANOUTS

- A. Cast-Iron Exposed Cleanouts:
  - 1. Standard: ASME A112.36.2M.
  - 2. Size: Same as connected drainage piping
  - 3. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
  - 4. Closure: Countersunk, brass plug.
  - 5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

- B. Plastic Floor Cleanouts:
  1. Size: Same as connected branch.
  2. Body: PVC.
  3. Closure Plug: PVC.
  4. Riser: Drainage pipe fitting and riser to cleanout of same material as drainage piping.

### 2.3 ROOF FLASHING ASSEMBLIES

- A. Roof Flashing Assemblies:
  1. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 6 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
    - a. Open-Top Vent Cap: Without cap.
    - b. Low-Silhouette Vent Cap: With vandal-proof vent cap.
    - c. Extended Vent Cap: With field-installed, vandal-proof vent cap.

### 2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

- A. Vent Caps:
  1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
  2. Size: Same as connected stack vent or vent stack.
- B. Frost-Resistant Vent Terminals:
  1. Description: Manufactured or shop-fabricated assembly constructed of copper, lead-coated copper, or galvanized steel.
  2. Design: To provide 1-inch enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. 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.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim."
- D. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim."
- E. Install vent caps on each vent pipe passing through roof.
- F. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.



- G. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

### 3.2 CONNECTIONS

- A. Comply with requirements in Section 22 13 16 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

### 3.3 FLASHING INSTALLATION

- A. Comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim."
- B. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required.
- C. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
  - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
  - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
  - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- D. Set flashing on floors and roofs in solid coating of bituminous cement.
- E. Secure flashing into sleeve and specialty clamping ring or device.
- F. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 07 62 00 "Sheet Metal Flashing and Trim."
- G. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

### 3.4 LABELING AND IDENTIFYING

- A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
  - 1. Nameplates and signs are specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

### 3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections, and prepare test reports.
- B. Tests and Inspections:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### 3.6 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 19

## SECTION 22 13 19.13 - SANITARY DRAINS

### PART 1 - GENERAL

#### I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

#### I.2 SUMMARY

- A. Section Includes:
  - 1. Floor drains.

#### I.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene styrene.
- B. FRP: Fiberglass-reinforced plastic.
- C. HDPE: High-density polyethylene.
- D. PE: Polyethylene.
- E. PP: Polypropylene.
- F. PVC: Polyvinyl chloride.

#### I.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

### PART 2 - PRODUCTS

#### 2.1 DRAIN ASSEMBLIES

- A. Sanitary drains shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14 for plastic sanitary piping specialty components.

#### 2.2 FLOOR DRAINS

- A. Cast-Iron Floor Drains:
  - 1. Standard: ASME A112.6.3 with backwater valve.
  - 2. Pattern: Area drain.
  - 3. Body Material: Gray iron.
  - 4. Seepage Flange: Not required.
  - 5. Anchor Flange: Not required.
  - 6. Clamping Device: Not required.
  - 7. Outlet: Bottom.
  - 8. Top or Strainer Material: Bronze.

9. Top of Body and Strainer Finish: Nickel bronze.
10. Top Shape: Round.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
  1. Position floor drains for easy access and maintenance.
  2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.
  3. Install floor-drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.
    - a. Maintain integrity of waterproof membranes where penetrated.
  4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

#### 3.2 CONNECTIONS

- A. Comply with requirements in Section 22 13 16 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

#### 3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

**END OF SECTION 22 13 19.13**

## SECTION 22 34 00 - FUEL-FIRED, DOMESTIC-WATER HEATERS

## PART I - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SUMMARY

- A. Section Includes:
  - 1. Residential, direct-vent, gas-fired, storage, domestic-water heaters.
  - 2. Domestic-water heater accessories.

## I.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of domestic-water heater indicated.

## I.4 INFORMATIONAL SUBMITTALS

- A. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
- B. Source quality-control reports.
- C. Field quality-control reports.
- D. Warranty: Sample of special warranty.

## I.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.

## I.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE/IESNA Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.
- C. ASME Compliance:
  - 1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division I.
  - 2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.
- D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

## 1.7 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Structural failures including storage tank and supports.
    - b. Faulty operation of controls.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal use.

## PART 2 - PRODUCTS

### 2.1 RESIDENTIAL, GAS-FIRED, STORAGE, DOMESTIC-WATER HEATERS

- A. Residential, Power-Vent, Gas-Fired, Storage, Domestic-Water Heaters:
1. Standard: ANSI Z21.10.1/CSA 4.1.
  2. Storage-Tank Construction: Steel.
    - a. Tappings: ASME B1.20.1 pipe thread.
    - b. Pressure Rating: 150 psig.
    - c. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending lining material into tappings.
  3. Factory-Installed Storage-Tank Appurtenances:
    - a. Anode Rod: Replaceable magnesium.
    - b. Dip Tube: Required unless cold-water inlet is near bottom of tank.
    - c. Drain Valve: ASSE 1005.
    - d. Insulation: Comply with ASHRAE/IESNA 90.1.
    - e. Jacket: Steel with enameled finish.
    - f. Heat-Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
    - g. Burner: For use with power-vent, gas-fired, domestic-water heaters and natural-gas fuel.
    - h. Automatic Ignition: ANSI Z21.20/CSA C22.2 No. 199, electric, automatic, gas-ignition system.
    - i. Temperature Control: Adjustable thermostat.
    - j. Combination Temperature-and-Pressure Relief Valve: ANSI Z21.22/CSA 4.4-M. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.
  4. Power-Vent System: Exhaust fan, interlocked with burner.

### 2.2 DOMESTIC-WATER HEATER ACCESSORIES

- A. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.
- B. Comply with requirements for ball-, butterfly-, or gate-type shutoff valves specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping," Section 22 05 23.13 "Butterfly Valves for Plumbing Piping," and Section 22 05 23.15 "Gate Valves for Plumbing Piping."
1. Comply with requirements for balancing valves specified in Section 22 11 19 "Domestic Water Piping Specialties."
- C. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.

- D. Gas Pressure Regulators: ANSI Z21.18/CSA 6.3, appliance type. Include 1/2-psig pressure rating as required to match gas supply.
- E. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.
- F. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
  - I. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.
- G. Pressure Relief Valves: Include pressure setting less than domestic-water heater working-pressure rating.
  - I. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.
- H. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4-M.

### 2.3 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect assembled domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test domestic-water heaters to minimum of one and one-half times pressure rating before shipment.
- C. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 01 40 00 "Quality Requirements" for retesting and re-inspecting requirements and Section 01 73 00 "Execution" for requirements for correcting the Work.
- D. Prepare test and inspection reports.

## PART 3 - EXECUTION

### 3.1 DOMESTIC-WATER HEATER INSTALLATION

- A. Residential, Domestic-Water Heater Mounting: Install residential domestic-water heaters on floor.
  - 1. Maintain manufacturer's recommended clearances.
  - 2. Arrange units so controls and devices that require servicing are accessible.
  - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 5. Anchor domestic-water heaters to substrate.
- B. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
  - 1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping," Section 22 05 23.13 "Butterfly Valves for Plumbing Piping," and Section 22 05 23.15 "Gate Valves for Plumbing Piping."
- C. Install gas-fired, domestic-water heaters according to NFPA 54.
  - 1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
  - 2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.

3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.
  4. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in Section 23 11 23 "Facility Natural-Gas Piping."
- D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
  - E. Install combination temperature-and-pressure relief valves in water piping for domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
  - F. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 22 11 19 "Domestic Water Piping Specialties."
  - G. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."
  - H. Assemble and install inlet and outlet piping manifold kits for multiple domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each domestic-water heater outlet. Comply with requirements for valves specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping," Section 22 05 23.13 "Butterfly Valves for Plumbing Piping," and Section 22 05 23.15 "Gate Valves for Plumbing Piping," and comply with requirements for thermometers specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."
  - I. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.
  - J. Fill domestic-water heaters with water.

### 3.2 CONNECTIONS

- A. Comply with requirements for domestic-water piping specified in Section 22 11 16 "Domestic Water Piping."
- B. Comply with requirements for gas piping specified in Section 23 11 23 "Facility Natural-Gas Piping."
- C. Drawings indicate general arrangement of piping, fittings, and specialties.
- D. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

### 3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

### 3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.



1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
  2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
  4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 01 40 00 "Quality Requirements" for retesting and re-inspecting requirements and Section 01 73 00 "Execution" for requirements for correcting the Work.
- C. Prepare test and inspection reports.

### 3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain domestic-water heaters.

**END OF SECTION 22 34 00**

## SECTION 22 40 00 - PLUMBING FIXTURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Sinks.
  - 2. Supply fittings.
  - 3. Waste fittings.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include diagrams for power, signal, and control wiring.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted plumbing fixtures.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

### PART 2 - PRODUCTS

#### 2.1 PLUMBING FIXTURES

- A. Refer to schedule in drawings.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install plumbing fixtures level and plumb according to roughing-in drawings.
- B. Install floor-mounted water closets on closet flange attachments to drainage piping.
- C. Install counter-mounting fixtures in and attached to casework.
- D. Install pedestal lavatories on pedestals and secured to wood blocking in wall.

- 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 or gate valves if supply stops are not specified with fixture. Comply with valve requirements specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping" and Section 22 05 23.15 "Gate Valves for Plumbing Piping."
- F. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
- G. Install toilet seats on water closets.
- H. Install faucet flow-control 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 shower flow-control fittings with specified maximum flow rates in shower arms.
- J. Install traps on fixture outlets.
  - 1. Exception: Omit trap on fixtures with integral traps.
  - 2. Exception: Omit trap on indirect wastes unless otherwise indicated.
- K. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
- L. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."
- M. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

### 3.2 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."
- D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 22 07 19 "Plumbing Piping Insulation."

### 3.3 ADJUSTING

- A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.4 CLEANING AND PROTECTION

- A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.
- B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed plumbing fixtures and fittings.
- D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

**END OF SECTION 22 40 00**

## SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Equipment labels.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

## PART 2 - PRODUCTS

## 2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
  - 1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  - 2. Letter Color: Black.
  - 3. Background Color: White.
  - 4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
  - 5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
  - 6. Fasteners: Stainless-steel rivets or self-tapping screws.
  - 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

## PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

END OF SECTION 23 05 53

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART I - GENERAL

I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

I.2 SUMMARY

- A. Section Includes:
  - I. Balancing Air Systems:
    - a. Constant-volume air systems.

I.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- F. TDH: Total dynamic head.

I.4 ACTION SUBMITTALS

- A. Sustainable Design Submittals:
  - I. TAB Report: Documentation indicating that Work complies with ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

I.5 INFORMATIONAL SUBMITTALS

- A. Certified TAB reports.
- B. Instrument calibration reports, to include the following:
  - 1. Instrument type and make.
  - 2. Serial number.
  - 3. Application.
  - 4. Dates of use.
  - 5. Dates of calibration.

I.6 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC or NEBB.
  - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC or NEBB.
  - 2. TAB Technician: Employee of the TAB specialist and certified by AABC or NEBB as a TAB technician.
- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

- C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

#### 1.7 FIELD CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.
- B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

#### PART 2 - PRODUCTS (Not Applicable)

#### PART 3 - EXECUTION

##### 3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine the approved submittals for HVAC systems and equipment.
- C. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- D. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- E. Examine operating safety interlocks and controls on HVAC equipment.
- F. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

##### 3.2 PREPARATION

##### 3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
- B. Cut ducts, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
  - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

##### 3.4 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
  - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
  - 2. Include a list of instruments used for procedures, along with proof of calibration.
  - 3. Certify validity and accuracy of field data.



- B. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
  2. Name and address of the TAB specialist.
  3. Project name.
  4. Project location.
  5. Architect's name and address.
  6. Engineer's name and address.
  7. Contractor's name and address.
  8. Report date.
  9. Signature of TAB supervisor who certifies the report.
  10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
  11. Summary of contents including the following:
    - a. Indicated versus final performance.
    - b. Notable characteristics of systems.
    - c. Description of system operation sequence if it varies from the Contract Documents.
  12. Nomenclature sheets for each item of equipment.
  13. Data for terminal units, including manufacturer's name, type, size, and fittings.
  14. Notes to explain why certain final data in the body of reports vary from indicated values.

END OF SECTION 23 05 93

## SECTION 23 11 23 - FACILITY NATURAL-GAS PIPING

## PART I - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SUMMARY

- A. Section Includes:
  - 1. Pipes, tubes, and fittings.
  - 2. Piping specialties.
  - 3. Piping and tubing joining materials.
  - 4. Manual gas shutoff valves.
  - 5. Pressure regulators.
  - 6. Dielectric fittings.

## I.3 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.

## I.4 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
  - 1. Piping specialties.
  - 2. Corrugated, stainless-steel tubing with associated components.
  - 3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
  - 4. Pressure regulators. Indicate pressure ratings and capacities.
  - 5. Dielectric fittings.

## I.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans and details, drawn to scale, on which natural-gas piping is shown and coordinated with other installations, using input from installers of the items involved.
- B. Site Survey: Plans, drawn to scale, on which natural-gas piping is shown and coordinated with other services and utilities.
- C. Qualification Data: For qualified professional engineer.
- D. Welding certificates.
- E. Field quality-control reports.

## I.6 QUALITY ASSURANCE

- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

## I.7 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 and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.
- C. Protect stored PE pipes and valves from direct sunlight.

## I.8 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

## I.9 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.
- B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Section 08 31 13 "Access Doors and Frames."

## PART 2 - PRODUCTS

- A. Delegated Design: Design restraints and anchors for natural-gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

## 2.2 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
  - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
  - 2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
  - 3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
  - 4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
    - a. Material Group: 1.1.
    - b. End Connections: Threaded or butt welding to match pipe.
    - c. Lapped Face: Not permitted underground.
    - d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
    - e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.
  - 5. Mechanical Couplings:
    - a. Stainless-steel flanges and tube with epoxy finish.
    - b. Buna-nitrile seals.
    - c. Stainless-steel bolts, washers, and nuts.
    - d. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
    - e. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.
- B. Drawn-Temper Copper Tube: Comply with ASTM B 88, Type L (ASTM B 88M, Type B).
  - 1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
- C. Annealed-Temper Copper Tube: Comply with ASTM B 88, Type L (ASTM B 88M, Type B).

- I. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.

## 2.3 PIPING SPECIALTIES

- A. Appliance Flexible Connectors:
  - I. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
- B. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

## 2.4 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for natural gas.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

## 2.5 MANUAL GAS SHUTOFF VALVES

- A. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.
  1. CWP Rating: 125 psig.
  2. Threaded Ends: Comply with ASME B1.20.1.
  3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
  4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
  5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
  6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.
- B. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.
  1. Body: Bronze, complying with ASTM B 584.
  2. Ball: Chrome-plated bronze.
  3. Stem: Bronze; blowout proof.
  4. Seats: Reinforced TFE; blowout proof.
  5. Packing: Threaded-body packnut design with adjustable-stem packing.
  6. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
  7. CWP Rating: 600 psig.
  8. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
  9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

## 2.6 PRESSURE REGULATORS

- A. General Requirements:
  1. Single stage and suitable for natural gas.
  2. Steel jacket and corrosion-resistant components.
  3. Elevation compensator.
  4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.
- B. Appliance Pressure Regulators: Comply with ANSI Z21.18.

## 2.7 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

- B. Dielectric Unions:
  - I. Description:
    - a. Standard: ASSE 1079.
    - b. Pressure Rating: 125 psig minimum at 180 deg F.
    - c. End Connections: Solder-joint copper alloy and threaded ferrous.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Close equipment shutoff valves before turning off natural gas to premises or piping section.
- B. Inspect natural-gas piping according to NFPA 54 and the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.
- C. Comply with NFPA 54 and the International Fuel Gas Code requirements for prevention of accidental ignition.

#### 3.3 OUTDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Steel Piping with Protective Coating:
  - 1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
  - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
  - 3. Replace pipe having damaged PE coating with new pipe.
- C. Install fittings for changes in direction and branch connections.

#### 3.4 INDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. 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.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.
- H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.
- I. Install piping free of sags and bends.

- J. Install fittings for changes in direction and branch connections.
  - K. Verify final equipment locations for roughing-in.
  - L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
  - M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
    - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
  - N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
  - O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
  - P. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.
    - 1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
    - 2. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
    - 3. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
    - 4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.
      - a. Exception: Tubing passing through partitions or walls does not require striker barriers.
    - 5. Prohibited Locations:
      - a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
      - b. Do not install natural-gas piping in solid walls or partitions.
  - Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
  - R. Connect branch piping from top or side of horizontal piping.
  - S. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
  - T. Do not use natural-gas piping as grounding electrode.
  - U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 23 05 17 "Sleeves and Sleeve Seals for HVAC Piping."
  - V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 23 05 18 "Escutcheons for HVAC Piping."
- 3.5 VALVE INSTALLATION
- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
  - B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

### 3.6 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
  - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
  - 2. Cut threads full and clean using sharp dies.
  - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
  - 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
  - 5. 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.

### 3.7 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hangers and supports specified in Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment."
- B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
  - 1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
  - 2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.

### 3.8 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

### 3.9 LABELING AND IDENTIFYING

- A. Comply with requirements in Section 23 05 53 "Identification for HVAC Piping and Equipment" for piping and valve identification.
- B. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

### 3.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
  - 1. Test, inspect, and purge natural gas according to NFPA 54 and the International Fuel Gas Code and authorities having jurisdiction.
- C. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.11 OUTDOOR PIPING SCHEDULE

- A. Aboveground natural-gas piping shall be the following:
  - I. Steel pipe with malleable-iron fittings and threaded joints.

3.12 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG AND LESS THAN 5 PSIG

- A. Aboveground, piping shall be the following:
  - I. Drawn-temper copper tube with wrought-copper fittings and brazed joints.

3.13 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Valves for pipe sizes NPS 2 and smaller shall be the following:
  - I. Two-piece, full-port, bronze ball valves with bronze trim.

END OF SECTION 23 | 23



## SECTION 23 31 13 - METAL DUCTS

## PART 1 - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SUMMARY

- A. Section Includes:
  - 1. Single-wall rectangular ducts and fittings.
  - 2. Sheet metal materials.
  - 3. Sealants and gaskets.
  - 4. Hangers and supports.
- B. Related Sections:
  - 1. Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
  - 2. Section 23 33 00 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

## I.3 PERFORMANCE REQUIREMENTS

- A. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

## I.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

## I.5 QUALITY ASSURANCE

- A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- B. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

## PART 2 - PRODUCTS

## 2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

## 2.2 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G60.
  - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
  - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

## 2.3 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
  - 1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
  - 2. Tape Width: 3 inches.
  - 3. Sealant: Modified styrene acrylic.
  - 4. Water resistant.
  - 5. Mold and mildew resistant.
  - 6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
  - 7. Service: Indoor and outdoor.
  - 8. Service Temperature: Minus 40 to plus 200 deg F.
  - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
  - 10. <Double click to insert sustainable design text for sealant.>
  - 11. <Double click to insert sustainable design text for sealants.>
- C. Water-Based Joint and Seam Sealant:
  - 1. Application Method: Brush on.
  - 2. Solids Content: Minimum 65 percent.
  - 3. Shore A Hardness: Minimum 20.
  - 4. Water resistant.
  - 5. Mold and mildew resistant.
  - 6. VOC: Maximum 75 g/L (less water).
  - 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
  - 8. Service: Indoor or outdoor.
  - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- D. Flanged Joint Sealant: Comply with ASTM C 920.
  - 1. General: Single-component, acid-curing, silicone, elastomeric.
  - 2. Type: S.
  - 3. Grade: NS.
  - 4. Class: 25.
  - 5. Use: O.

- 6. <Double click to insert sustainable design text for sealant.>
- 7. <Double click to insert sustainable design text for sealants.>

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

## 2.4 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

## PART 3 - EXECUTION

### 3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- J. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

### 3.2 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- B. Seal ducts at a minimum to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
  1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  2. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
  3. Conditioned Space, Exhaust Ducts: Seal Class B.
  4. Conditioned Space, Return-Air Ducts: Seal Class C.

### 3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
  1. Where practical, install concrete inserts before placing concrete.
  2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
  3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
  4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
  5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

### 3.4 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 23 33 00 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

### 3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Duct System Cleanliness Tests:
  1. Visually inspect duct system to ensure that no visible contaminants are present.

### 3.6 START UP

- A. Air Balance: Comply with requirements in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC."

### 3.7 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
- B. Supply Ducts:
  1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
    - a. Pressure Class: Positive 1-inch wg.

- C. Return Ducts:
  - I. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
    - a. Pressure Class: Positive or negative 1-inch wg.
- D. Exhaust Ducts:
  - I. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
    - a. Pressure Class: Negative 1-inch wg.
- E. Elbow Configuration:
  - I. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
    - a. Velocity 1000 fpm or Lower:
      - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
      - 2) Mitered Type RE 4 without vanes.
    - b. Velocity 1000 to 1500 fpm:
      - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
      - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
      - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
  - 2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
    - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
    - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
    - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
- F. Branch Configuration:
  - I. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
    - a. Rectangular Main to Rectangular Branch: 45-degree entry.
    - b. Rectangular Main to Round Branch: Spin in.
  - 2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
    - a. Velocity 1000 fpm or Lower: 90-degree tap.
    - b. Velocity 1000 to 1500 fpm: Conical tap.

END OF SECTION 23 31 13

## SECTION 23 33 00 - AIR DUCT ACCESSORIES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Manual volume dampers.
  - 2. Flange connectors.
  - 3. Flexible connectors.
  - 4. Duct accessory hardware.

- B. Related Requirements:

## 1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

## 2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

## 2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G60.
  - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

## 2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
  - 1. Standard leakage rating.
  - 2. Suitable for horizontal or vertical applications.
  - 3. Frames:
    - a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
    - b. Mitered and welded corners.
    - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
  - 4. Blades:
    - a. Multiple or single blade.
    - b. Parallel- or opposed-blade design.

- c. Stiffen damper blades for stability.
- d. Galvanized-steel, 0.064 inch thick.
- 5. Blade Axles: Galvanized steel.
- 6. Bearings:
  - a. Molded synthetic.
  - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
- 7. Tie Bars and Brackets: Galvanized steel.

B. Jackshaft:

- 1. Size: 0.5-inch diameter.
- 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
- 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:

- 1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
- 2. Include center hole to suit damper operating-rod size.
- 3. Include elevated platform for insulated duct mounting.

## 2.4 FLANGE CONNECTORS

- A. Description: Add-on, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- B. Material: Galvanized steel.
- C. Gage and Shape: Match connecting ductwork.

## 2.5 FLEXIBLE CONNECTORS

- A. Materials: Flame-retardant or noncombustible fabrics.
- B. Coatings and Adhesives: Comply with UL 181, Class I.
- C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
  - 1. Minimum Weight: 26 oz./sq. yd.
  - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
  - 3. Service Temperature: Minus 40 to plus 200 deg F.

## 2.6 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Compliance with ASHRAE/IESNA 90.1-2004 includes Section 6.4.3.3.3 - "Shutoff Damper Controls," restricts the use of backdraft dampers, and requires control dampers for certain applications. Install control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
  - I. Install steel volume dampers in steel ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install flexible connectors to connect ducts to equipment.
- H. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- I. Connect terminal units to supply ducts directly.
- J. Install duct test holes where required for testing and balancing purposes.
- K. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - I. Operate dampers to verify full range of movement.

END OF SECTION 23 33 00



## SECTION 23 37 13.23 - REGISTERS AND GRILLES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Adjustable blade face registers and grilles.
  - 2. Fixed face registers and grilles.
- B. Related Requirements:
  - 1. Section 23 33 00 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to registers and grilles.
  - 2. Section 23 37 13.13 "Air Diffusers" for various types of air diffusers.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
  - 2. Register and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.
- B. Source quality-control reports.

## PART 2 - PRODUCTS

## 2.1 REGISTERS

- A. Adjustable Blade Face Register:
  - 1. Material: Aluminum.
  - 2. Finish: Baked enamel, color selected by Architect.
  - 3. Face Blade Arrangement: Horizontal.
  - 4. Core Construction: Integral.
  - 5. Rear-Blade Arrangement: Vertical.
  - 6. Damper Type: Adjustable opposed blade.
- B. Fixed Face Register:
  - 1. Material: Aluminum.
  - 2. Finish: Baked enamel, color selected by Architect.
  - 3. Face Blade Arrangement: Horizontal.
  - 4. Core Construction: Integral.
  - 5. Damper Type: Adjustable opposed blade.

## 2.2 GRILLES

- A. Adjustable Blade Face Grille:
  - 1. Material: Aluminum.
  - 2. Finish: Baked enamel, color selected by Architect.
  - 3. Face Blade Arrangement: Horizontal.
  - 4. Core Construction: Integral.

5. Rear-Blade Arrangement: Vertical.

B. Fixed Face Grille:

1. Material: Aluminum.
2. Finish: Baked enamel, color selected by Architect.
3. Face Blade Arrangement: Horizontal.

### 2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate registers and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas where registers and grilles are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install registers and grilles level and plumb.
- B. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install registers and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

### 3.3 ADJUSTING

- A. After installation, adjust registers and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13.23

## SECTION 23 54 16.13 - GAS-FIRED FURNACES

## PART I - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016 version) of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SUMMARY

- A. Section Includes:
  - 1. Gas-fired, condensing furnaces and accessories complete with controls.
  - 2. Air filters.

## I.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

## I.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

## I.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each furnace to include in emergency, operation, and maintenance manuals.
  - 1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
    - a. Furnace and accessories complete with controls.
    - b. Air filter.

## I.6 MAINTENANCE MATERIAL SUBMITTALS

- 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. Disposable Air Filters: Furnish two complete sets.

## I.7 QUALITY ASSURANCE

- A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- B. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- C. Comply with NFPA 70.

## I.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace the following components of furnaces that fail in materials or workmanship within specified warranty period:
  - 1. Warranty Period, Commencing on Date of Substantial Completion:
    - a. Furnace Heat Exchanger: 10 years.
    - b. Integrated Ignition and Blower Control Circuit Board: Five years.
    - c. Draft-Inducer Motor: Five years.

## PART 2 - PRODUCTS

## 2.1 ASSEMBLY DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a qualified testing agency, and marked for intended location and application.
- B. General Requirements for Noncondensing Gas-Fired Furnaces: Factory assembled, piped, wired, and tested; complying with ANSI Z21.47/CSA 2.3 and NFPA 54.

## 2.2 GAS-FIRED FURNACES, CONDENSING

- A. Cabinet: Steel.
  - 1. Cabinet interior around heat exchanger shall be factory-installed insulation.
  - 2. Lift-out panels shall expose burners and all other items requiring access for maintenance.
  - 3. Factory paint external cabinets in manufacturer's standard color.
  - 4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- B. Fan: Centrifugal, factory balanced, resilient mounted, direct drive.
  - 1. Fan Motors: Comply with requirements in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."
  - 2. Special Motor Features: Single speed, premium efficiency, as defined in Section 23 05 13 "Common Motor Requirements for HVAC Equipment," and with internal thermal protection and permanent lubrication.
  - 3. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.
  - 4. Special Motor Features: Electronically controlled motor (ECM) controlled by integrated furnace/blower control.
- C. Type of Gas: Natural.
- D. Heat Exchanger:
  - 1. Primary: Stainless steel.
  - 2. Secondary: Stainless steel.
- E. Burner:
  - 1. Gas Valve: 100 percent safety modulating main gas valve, main shutoff valve, pressure regulator, safety pilot with electronic flame sensor, limit control, transformer, and combination ignition/fan timer control board.
  - 2. Ignition: Electric pilot ignition, with hot-surface igniter or electric spark ignition.
- F. Gas-Burner Safety Controls:
  - 1. Electronic Flame Sensor: Prevents gas valve from opening until pilot flame is proven; stops gas flow on ignition failure.
  - 2. Flame Rollout Switch: Installed on burner box; prevents burner operation.
  - 3. Limit Control: Fixed stop at maximum permissible setting; de-energizes burner on excessive bonnet temperature; automatic reset.
- G. Combustion-Air Inducer: Centrifugal fan with thermally protected motor and sleeve bearings prepurges heat exchanger and vents combustion products; pressure switch prevents furnace operation if combustion-air inlet or flue outlet is blocked.
- H. Furnace Controls: Solid-state board integrates ignition, heat, cooling, and fan speeds; adjustable fan-on and fan-off timing; terminals for connection to accessories; diagnostic light with viewport.
- I. Accessories:
  - 1. Combination Combustion-Air Intake and Vent: PVC plastic fitting to combine combustion-air inlet and vent through roof.
  - 2. CPVC Plastic Vent Materials:
    - a. CPVC Plastic Pipe: Schedule 40, complying with ASTM F 441/F 441M.
    - b. CPVC Plastic Fittings: Schedule 40, complying with ASTM F 438, socket type.
    - c. CPVC Solvent Cement: ASTM F 493.
      - 1) <Double click to insert sustainable design text for adhesive.>

3. PVC Plastic Vent Materials:
  - a. PVC Plastic Pipe: Schedule 40, complying with ASTM D 1785.
  - b. PVC Plastic Fittings: Schedule 40, complying with ASTM D 2466, socket type.
  - c. PVC Solvent Cement: ASTM D 2564.

## 2.3 THERMOSTATS

- A. Controls shall comply with requirements in ASHRAE/IES 90.1, "Controls."
- B. Solid-State Thermostat: Wall-mounted, programmable, microprocessor-based unit with switching from heating to cooling, preferential rate control, seven-day programmability with minimum of four temperature presets per day, vacation mode, and battery backup protection against power failure for program settings.

## 2.4 AIR FILTERS

- A. Disposable Filters: 1-inch-thick fiberglass media with ASHRAE 52.2 MERV rating of 6 or higher, in sheet metal frame.
- B. Charged Media Air Filters: Sheet metal housing arranged to be ducted in return-air duct connection to furnace; generates electrostatic charge; MERV 10 rating.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine factory-installed insulation before furnace installation. Reject units that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for gas piping systems to verify actual locations of piping connections before equipment installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install gas-fired furnaces and associated fuel and vent features and systems according to NFPA 54.
- B. Base-Mounted Units: Secure units to substrate. Provide optional bottom closure base if required by installation conditions.
  - I. Anchor furnace to substrate to resist code-required seismic acceleration.
- C. Controls: Install thermostats and humidistats at mounting height of 60 inches above floor.
- D. Wiring Method: Install control wiring in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal control wiring except in unfinished spaces.

### 3.3 CONNECTIONS

- A. Gas piping installation requirements are specified in Section 23 11 23 "Facility Natural-Gas Piping." Drawings indicate general arrangement of piping, fittings, and specialties. Connect gas piping with union or flange and appliance connector valve.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Water piping installation requirements are specified in Section 22 11 16 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties. Connect water piping with union and ball valve.

- D. Vent Connection, Noncondensing, Gas-Fired Furnaces: Connect Type B vents to furnace vent connection and extend outdoors. Type B vents and their installation requirements are specified in Section 23 51 23 "Gas Vents."
- E. Vent and Outside-Air Connection, Condensing, Gas-Fired Furnaces: Connect plastic piping vent material to furnace connections and extend outdoors. Terminate vent outdoors with a cap and in an arrangement that will protect against entry of birds, insects, and dirt.
  - 1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
  - 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
  - 3. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
    - a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
    - b. CPVC Piping: Join according to ASTM D 2846/D 2846M, Appendix.
    - c. 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. Slope pipe vent back to furnace or to outside terminal.
- F. Connect ducts to furnace with flexible connector. Comply with requirements in Section 23 33 00 "Air Duct Accessories."

### 3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Perform electrical test and visual and mechanical inspection.
  - 2. Leak Test: After installation, charge systems with refrigerant and test for leaks. Repair leaks, replace lost refrigerant, and retest until no leaks exist.
  - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
  - 4. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
  - 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

### 3.5 STARTUP SERVICE

- A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
  - 1. Inspect for physical damage to unit casings.
  - 2. Verify that access doors move freely and are weathertight.
  - 3. Clean units and inspect for construction debris.
  - 4. Verify that all bolts and screws are tight.
  - 5. Adjust vibration isolation and flexible connections.
  - 6. Verify that controls are connected and operational.
- B. Adjust fan belts to proper alignment and tension.
- C. Start unit according to manufacturer's written instructions and complete manufacturer's operational checklist.
- D. Measure and record airflows.
- E. Verify proper operation of capacity control device.
- F. After startup and performance test, lubricate bearings.

### 3.6 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Set controls, burner, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

3.7 CLEANING

- A. After completing installation, clean furnaces internally according to manufacturer's written instructions.
- B. Install new filters in each furnace within 14 days after Substantial Completion.

3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain condensing units. Refer to Section 01 79 00 "Demonstration and Training."

**END OF SECTION 23 54 16.13**

## SECTION 23 62 00 - PACKAGED COMPRESSOR AND CONDENSER UNITS

## PART 1 - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016 version) of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SUMMARY

- A. Section includes packaged, air-cooled, refrigerant compressor and condenser units.

## I.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Submittals:
  - 1. Product Data: For energy performance.
  - 2. Product Data: For refrigerants, indicating compliance with refrigerant management practices.

## I.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Fabricate and label refrigeration system according to ASHRAE 15, "Safety Standard for Refrigeration Systems."
- C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6, "Heating, Ventilating, and Air-Conditioning."

## I.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of compressor and condenser units that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Compressor failure.
    - b. Condenser coil leak.
  - 2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 COMPRESSOR AND CONDENSER UNITS, AIR COOLED, 1 TO 5 TONS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Carrier Corporation; a unit of United Technologies Corp.
  - 2. Lennox Industries, Inc.; Lennox International.
  - 3. Rheem Manufacturing Company; Heating and Cooling Products.
  - 4. Ruud Air Conditioning Division.
  - 5. Trane.



- 6. YORK; a Johnson Controls company.
- B. Description: Factory assembled and tested; consisting of compressor, condenser coil, fan, motors, refrigerant reservoir, and operating controls.
- C. Compressor: Scroll, hermetically sealed, with rubber vibration isolators.
  - 1. Motor: Twospeed, and includes thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
  - 2. Two-Speed Compressor: Include manual-reset, high-pressure switch and automatic-reset, low-pressure switch.
  - 3. Accumulator: Suction tube.
- D. Refrigerant: R-407C or R-410A.
- E. Condenser Coil: Seamless copper-tube, aluminum-fin coil; circuited for integral liquid subcooler, with removable drain pan and brass service valves with service ports.
- F. Condenser Fan: Direct-drive, aluminum propeller fan; with permanently lubricated, totally enclosed fan motor with thermal-overload protection.
- G. Accessories:
  - 1. Cycle Protector: Automatic-reset timer to prevent rapid compressor cycling.
  - 2. Electronic programmable thermostat to control compressor and condenser unit and evaporator fan.
  - 3. Evaporator Freeze Thermostat: Temperature-actuated switch that stops unit when evaporator reaches freezing temperature.
  - 4. Filter-dryer.
  - 5. High-Pressure Switch: Automatic-reset switch cycles compressor off on high refrigerant pressure.
  - 6. Liquid-line solenoid.
  - 7. Low-Pressure Switch: Automatic-reset switch cycles compressor off on low refrigerant pressure.
  - 8. Precharged and insulated suction and liquid tubing.
  - 9. Sound Hood: Wraps around sound attenuation cover for compressor.
  - 10. Thermostatic expansion valve.
  - 11. Time-Delay Relay: Continues operation of evaporator fan after compressor shuts off.
- H. Unit Casing: Galvanized steel, finished with baked enamel; with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Mount service valves, fittings, and gage ports on exterior of casing.

## 2.2 SOURCE QUALITY CONTROL

- A. Energy Efficiency: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," Section 6, "Heating, Ventilating, and Air-Conditioning."
- B. Energy Star rated product.
- C. Testing Requirements: Factory test sound-power-level ratings according to ARI 270.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install units level and plumb, firmly anchored in locations indicated.
- B. Equipment Mounting:
  - 1. Install compressor and condenser units on cast-in-place concrete equipment bases.
- C. Maintain manufacturer's recommended clearances for service and maintenance.

- D. Loose Components: Install electrical components, devices, and accessories that are not factory mounted.

### 3.2 CONNECTIONS

- A. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- B. Provide and connect precharged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.
- C. Connect refrigerant piping to air-cooled compressor and condenser units; maintain required access to unit. Install furnished field-mounted accessories.

### 3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.
  - 2. Leak Test: After installation, charge system with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
  - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor operation and unit operation, product capability, and compliance with requirements.
  - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  - 5. Verify proper airflow over coils.
- C. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

END OF SECTION 23 62 00

## SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

## PART I - GENERAL

## I.1 SECTION INCLUDES

- A. The electrical work included in all other Divisions is the responsibility of the Contractor performing the Division 26 work unless noted otherwise.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SCOPE

- A. The work under this section includes basic electrical requirements, which are applicable to all Division 26 sections. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections.

## I.3 RELATED WORK

- A. Applicable provisions of Division 01 govern work under this Section.

## I.4 REFERENCE STANDARDS

- A. Abbreviations of standards organizations referenced in this and other sections are as follows:
  1. ANSI American National Standards Institute.
  2. ASTM American Society for Testing and Materials.
  3. EPA Environmental Protection Agency.
  4. ETL Electrical Testing Laboratories, Inc.
  5. IEEE Institute of Electrical and Electronics Engineers.
  6. IES Illuminating Engineering Society.
  7. ISA Instrument Society of America.
  8. NBS National Bureau of Standards.
  9. NEC National Electric Code.
  10. NEMA National Electrical Manufacturers Association.
  11. NESC National Electrical Safety Code.
  12. NFPA National Fire Protection Association.
  13. UL Underwriters Laboratories Inc.

## I.5 REGULATORY REQUIREMENTS

- A. All work and materials are to conform in every detail to applicable rules and requirements of the State of Minnesota Electrical Code, the National Electrical Code (ANSI/NFPA 70), Minnesota Energy Code, Minnesota Guide to the 2015 Enterprise Green Communities Criteria, and other applicable National Fire Protection Association codes, the National Electrical Safety Code, and present manufacturing standards (including NEMA).
- B. All Division 26 work shall be done under the direction of a currently certified State of Minnesota Certified Master Electrician.

## I.6 QUALITY ASSURANCE

- A. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed.
- B. Manufacturer references used herein are intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply. Where two or more manufacturers are specified and no reference is made to "or equal" other manufacturers, other manufacturers will be considered for prior approval with ten day prior approval submittals.

- C. All materials shall be listed by and shall bear the label of an approved electrical testing laboratory.
- 1.7 CONTINUITY OF EXISTING SERVICES AND SYSTEMS
- A. This Contractor shall restore any circuit interrupted as a result of this work to proper operation as soon as possible. Note that Owner operations are on a seven-day week schedule, unless otherwise specified.
- 1.8 PROTECTION OF FINISHED SURFACES
- A. Furnish one can of touch-up paint for each different color factory finish furnished by the Contractor. Deliver touch-up paint with other "loose and detachable parts" as covered in the General Requirements.
- 1.9 APPROVED ELECTRICAL TESTING LABORATORIES
- A. The following laboratories are approved for providing electrical product safety testing and listing services as required in these specifications:
    - 1. Underwriters Laboratories Inc.
    - 2. Electrical Testing Laboratories, Inc.
- 1.10 SLEEVES AND OPENINGS
- A. Below Grade Wall Penetrations.
  - B. Conduit Penetrations.
- 1.11 SEALING AND FIRESTOPPING
- A. Sealing and firestopping of sleeves/openings between conduits, wireways, troughs, etc. and the structural or partition opening shall be the responsibility of the Contractor whose work penetrates the opening. The Contractor responsible shall hire individuals skilled in such work to do the sealing and firestopping. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.
- 1.12 INTENT
- A. The Contractor shall furnish and install all the necessary materials, apparatus, and devices to complete the electrical equipment and systems installation herein specified, except such parts as are specifically exempted herein.
  - B. If an item is either called for in the specifications or shown on the plans, it shall be considered sufficient for the inclusion of said item in this contract. If a conflict exists within the Specifications or exists within the Drawings, the Contractor shall furnish the item, system, or workmanship, which is the highest quality, largest, or most closely fits the Owner's intent (as determined by the Owner / Project Manager). Refer to the General Conditions of the Contract for further clarification.
  - C. It must be understood that the details and drawings are diagrammatic. The Contractor shall verify all dimensions at the site and be responsible for their accuracy.
  - D. All sizes as given are minimum except as noted.
  - E. Materials and labor shall be new (unless noted or stated otherwise), first class, and workmanlike, and shall be subject at all times to the Owner's and/or Engineer's inspections, tests and approval from the commencement until the acceptance of the completed work.
  - F. Whenever a particular manufacturer's product is named, it is intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply.
- 1.13 OMISSIONS
- A. No later than ten (10) days before bid opening, the Contractor shall call the attention of the Owner to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

## I.14 SUBMITTALS

- A. Refer to 01 33 00 - Submittal Procedures, for submittal procedures.
- B. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. Failure to do this may result in the submittal(s) being returned to the Contractor for correction and resubmission. Failing to follow these instructions does not relieve the Contractor from the requirement of meeting the project schedule.
- C. On request from the Owner or Engineer, the successful bidder shall furnish additional drawings, illustrations, catalog data, performance characteristics, etc.
- D. Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.
- E. The submittals must be approved before fabrication is authorized.

## I.15 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Owner before proceeding.
- C. Tools, materials and equipment shall be confined to areas designated by the Owner.

## I.16 WORK SEQUENCE AND SCHEDULING

- A. Install work in phases to accommodate Owner's occupancy requirements. During the construction period coordinate electrical schedule and operations with Owner's Construction Representatives.

## I.17 WORK BY OTHER TRADES

- A. Every attempt has been made to indicate in this trade's specifications and drawings all work required of this Contractor. However, there may be additional specific paragraphs in other trade specifications and addenda, and additional notes on drawings for other trades which pertain to this Trade's work, and thus those additional requirements are hereby made a part of these specifications and drawings.
- B. Electrical details on drawings for equipment to be provided by others are based on preliminary design data only. This Contractor shall lay out the electrical work and shall be responsible for its correctness to match equipment actually provided by others.

## I.18 OFFSITE STORAGE

- A. If payment will be requested for approved offsite stored material, then the Contractor shall complete an "Off-site Storage Agreement" which the Owner will consider on a case by case basis. Prior approval by Owner personnel for offsite storage will be needed. No material will be accepted for offsite storage unless submittals for the material have been approved.

## I.19 REQUEST AND CERTIFICATE FOR PAYMENT

- A. Refer to the General Conditions of the Contract for all payment request requirements. A cost breakdown of the proposed values for work performed which may be required by the Owner and if approved by the Owner, will become the basis for construction progress and monthly payments. The cost breakdown items shall reflect actual work progress stages as closely as feasible.

## I.20 CERTIFICATES AND INSPECTIONS

- A. Obtain and pay for all required State installation inspections. Deliver originals of these certificates to the Owner.

- B. This Contractor is responsible for coordination of Owner electrical inspection. Inspection requirements will be issued at a pre-installation meeting, arranged by this Contractor and the Electrical Inspector having jurisdiction.

#### 1.21 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified under Section 01 77 00 - Closeout Procedures.
- B. In addition to the general content specified under Section 01 77 00 - Closeout Procedures supply the following additional documentation:
  - 1. Manufacturer's wiring diagrams for electrically powered equipment.

#### 1.22 RECORD DRAWINGS

- A. The Contractor shall maintain at least one copy each of the specifications and drawings on the job site at all times.
- B. The Owner or Engineer will provide the Contractor with a suitable set of contract drawings on which daily records of changes and deviations from contract shall be recorded. Dimensions and elevations on the record drawings shall locate all buried or concealed piping, conduit, or similar items.
- C. The daily record of changes shall be the responsibility of Contractor's field superintendent. No arbitrary mark-ups will be permitted.
- D. At completion of the project, the Contractor shall submit the marked-up record drawings to the Owner prior to final payment.

### PART 2 - PRODUCTS

#### 2.1 SEALING AND FIRESTOPPING

- A. Fire and/or Smoke Rated Penetrations:
  - 1. Whenever possible, avoid penetrations of fire and smoke rated partitions. When they cannot be avoided, verify that sufficient space is available for the penetration to be effectively fire and smoke stopped.
- B. Manufacturers:
  - 1. 3M: [www.3m.com](http://www.3m.com).
  - 2. STI/SpecSeal: [www.stifirestop.com](http://www.stifirestop.com).
  - 3. Tremco: [www.tremcosealants.com](http://www.tremcosealants.com).
  - 4. Hilti: [www.hilti.com](http://www.hilti.com).
  - 5. Substitutions: Refer to Section 01 61 00 - Common Product Requirements.
  - 6. All firestopping systems shall be by the same manufacturer.
- C. Submittals:
  - 1. Refer to 01 33 00 - Submittal Procedures, for submittal procedures.
  - 2. Contractor shall submit product data for each firestop system. Submittals shall include product characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and procedures for each method of installation applicable to this project. For non-standard conditions where no UL tested system exists, submit manufacturer's drawings for UL system with known performance for which an engineering judgment can be based upon.
- D. Product:
  - 1. Firestop systems shall be UL listed or tested by an independent testing laboratory approved by the Department of Commerce.
- E. Contractor shall use firestop putty, caulk sealant, intumescent wrap strips, intumescent firestop collars, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.
- F. Non-Rated Penetrations:
  - 1. Conduit Penetrations Through Below Grade Walls:

- a. In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the uninsulated conduit and the cored opening or a water-stop type wall sleeve.
- 2. Conduit and Cable Tray Penetrations:
  - a. At conduit and cable tray penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between conduit and sleeve, or the core drilled opening.

### PART 3 - EXECUTION

#### 3.1 EXCAVATION AND BACKFILL

- A. Perform all excavation and backfill work to accomplish indicated electrical systems installation in accordance with Section 31 23 16.13 - Trenching. Blasting will not be allowed without written permission of the Owner.

#### 3.2 CONCRETE WORK

- A. The Division 3 Contractor will perform all cast-in-place concrete unless noted otherwise elsewhere. Provide all layout drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for the support of electrical equipment.

#### 3.3 CUTTING AND PATCHING

- A. Refer to Division 01, General Requirements, Cutting and Patching.

#### 3.4 BUILDING ACCESS

- A. Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged and must be provided by this Contractor, restore any opening to its original condition after the apparatus has been brought into the building.

#### 3.5 EQUIPMENT ACCESS

- A. Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster or drywall walls or ceilings, furnish the access doors to the General Contractor and reimburse the General Contractor for installation of those access doors.

#### 3.6 COORDINATION

- A. The Contractor shall cooperate with other trades and Owner's personnel in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the electrical work to better fit the general installation, such work shall be done at no extra cost to the Owner, provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.
- B. The Contractor shall verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to light fixtures, panelboards, devices, etc. and recessed or semi-recessed heating units installed in/on architectural surfaces. Coordinate all work with other Contractors prior to installation. Any installed work that is not coordinated and that interferes with other Contractor's work shall be removed or relocated at the installing Contractor's expense.
- C. Cooperate with the testing consultant in ensuring specification Section 26-0504 compliance. Verify system completion to the testing consultant. Demonstrate the starting, interlocking and control features of each system so the testing Contractor can perform its work.

#### 3.7 SLEEVES

- A. Pipe sleeves for conduits 6" in diameter and smaller, in new poured concrete construction, shall be schedule 40 steel pipe, plastic removable sleeve or sheet metal sleeve, all cast in place.
- B. In wet area floor penetrations, top of sleeve to be 2 inches above the adjacent floor. In existing wet area floor penetrations, core drill sleeve openings large enough to insert schedule 40 sleeve and grout the area around the sleeve. If a pipe clamp

resting on the sleeve supports the pipe penetrating the sleeve, weld a collar or struts to the sleeve that will transfer weight to the existing floor structure. Wet areas for this paragraph are rooms or spaces containing air handling unit coils, converters, pumps, chillers, boilers, and similar waterside equipment.

- C. Pipe penetrations in existing concrete floors that are not in wet areas may omit the use of schedule 40 sleeve and use the core drilled opening as the sleeve.

### 3.8 SEALING AND FIRESTOPPING

#### A. Fire and/or Smoke Penetrations:

- 1. Install approved product in accordance with the manufacturer's instructions where a pipe (i.e. cable tray, bus, cable bus, conduit, wireway, trough, etc.) penetrates a fire rated surface.

- B. Where firestop mortar is used to infill large fire-rated floor openings that could be required to support weight, provide permanent structural forming. Firestop mortar alone is not adequate to support any substantial weight.

#### C. Non-Rated Surfaces:

- 1. When the opening is through a non-fire rated wall, floor, ceiling or roof the opening must be sealed using an approved type of material.
- 2. Install escutcheons or floor/ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces for this paragraph include only those rooms with finished ceilings and the penetration occurs below the ceiling.
- 3. In exterior wall openings below grade, assemble rubber links of mechanical seal to the proper size for the conduit and tighten in place, in accordance with the manufacturer's instructions. Install so that the bolts used to tighten the seal are accessible from the interior of the building or vault.
- 4. At interior partitions, conduit penetrations are required to be sealed for all clean rooms, laboratories, computer rooms, communication rooms and similar spaces where the room pressure or odor transmission must be controlled. Apply sealant to both sides of the penetration in such a manner that the annular space between the conduit sleeve and the conduit is completely filled.

### 3.9 HOUSEKEEPING AND CLEAN UP

- A. The Contractor shall clean up and remove from the premises, on a daily basis, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

END OF SECTION 26 05 00



## SECTION 26 05 04 - CLEANING, INSPECTION, AND TESTING OF ELECTRICAL EQUIPMENT

## PART 1 - GENERAL

## 1.1 SCOPE

- A. The work under this section includes the required cleaning, repair, adjustment, calibration, maintenance and testing of electrical equipment, as specified herein. This applies only to new electrical and existing electrical equipment being furnished, modified, worked on or serviced by this Contractor for this project

## 1.2 RELATED DOCUMENTS

- A. Applicable provisions of Division 01 govern work under this Section.
- B. Comply with the current (April 2016 version) of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## PART 2 - PRODUCTS – NOT USED

## PART 3 - EXECUTION

## 3.1 General Inspection and Cleaning of all Electrical Equipment

- A. Inspect for physical damage and abnormal mechanical and electrical conditions.
- B. Any item found to be out of tolerance, or in any other way defective as a result of the required testing, shall be reported to the Engineer and Owner. Procedure for repair and/or replacement will be outlined. After appropriate corrective action is completed the item shall be re-tested.
- C. Compare equipment nameplate information with the latest single line diagram and report any discrepancies.
- D. Verify proper auxiliary device operation and indicators.
- E. Check tightness of accessible bolted electrical joints. Use torque wrench method.
- F. Make a close examination of equipment and remove any shipping brackets, insulation, packing, etc. that may not have been removed during original installation.
- G. Make a close examination of equipment and remove any dirt or other forms of debris that may have collected in existing equipment or in new equipment during installation.
- H. Clean All Equipment:
  - 1. Vacuum inside of panelboards, and wall devices, etc.
  - 2. Loosen attached particles and vacuum them away.
  - 3. Wipe all insulators with a clean, dry, lint free rag.
  - 4. Clean insulator grooves.
  - 5. Re-vacuum inside surfaces as directed by the Owner's Construction Representative or Inspector.

## 3.2 GROUNDING SYSTEMS

- A. Inspect the ground system for adequate termination at all devices.

## 3.3 CABLES

- A. Visual and Mechanical Inspections:
  - 1. Inspect exposed sections for physical damage.
  - 2. Verify cable is supplied and connected in accordance with single line diagram.
  - 3. Inspect for shield grounding, cable support and termination.

4. If cables are terminated through window type C.T.'s make an inspection to verify that neutrals and grounds are properly terminated for normal operation of protective devices.
5. Inspect for visual jacket and insulation condition.
6. Visible cable bends shall be checked against ICEA or manufacturer's minimum allowable bending radii -- 12 times the diameter for tape shielded cables.
7. Inspect for proper fireproofing in common cable areas.
8. Electrical Tests -- Below 600 Volts:
9. Visually inspect cables, lugs, connectors and all other components for physical damage and proper connections.

END OF SECTION 26 05 24

## SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

## PART 1 - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SUMMARY

- A. Section Includes:
  - 1. Copper building wire rated 600 V or less.
  - 2. Metal-clad cable, Type MC, rated 600 V or less.
  - 3. Connectors, splices, and terminations rated 600 V and less.

## B. DEFINITIONS

- C. RoHS: Restriction of Hazardous Substances.

## I.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA.
  - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

## PART 2 - PRODUCTS

## 2.1 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Standards:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. RoHS compliant.
  - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- C. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- D. Conductor Insulation:
  - 1. Type NM: Comply with UL 83 and UL 719.
  - 2. Type RHH and Type RHW-2: Comply with UL 44.
  - 3. Type USE-2 and Type SE: Comply with UL 854.
  - 4. Type TC-ER: Comply with NEMA WC 70/ICEA S-95-658 and UL 1277.
  - 5. Type THHN and Type THWN-2: Comply with UL 83.
  - 6. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
  - 7. Type UF: Comply with UL 83 and UL 493.
  - 8. Type XHHW-2: Comply with UL 44.
  - 9. METAL-CLAD CABLE, TYPE MC.

- 2.2 METAL-CLAD CABLE, TYPE MC
- 2.3 Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
- 2.4 Standards:
- 2.5 Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- 2.6 Comply with UL 1569.
- 2.7 Not all Type MC cable will comply with RoHS requirements, such as some types with galvanized-steel armor. Consult manufacturer.
- 2.8 RoHS compliant.
- 2.9 See the Evaluations for discussion of UL's "Wire and Cable Marking and Application Guide."
- 2.10 Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- 2.11 Circuits:
- 2.12 Single circuit [and].
- 2.13 Power-Limited Fire-Alarm Circuits: Comply with UL 1424.
- 2.14 Conductors: [Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors]. [Aluminum, complying with ASTM B 800 and ASTM B 801].
- 2.15 Ground Conductor: [Bare] [Insulated] [None].
- 2.16 Conductor Insulation:
- 2.17 Type TFN/THHN/THWN-2: Comply with UL 83.
- 2.18 Armor: [Steel] [Aluminum], interlocked.
- 2.19 Jacket: PVC applied over armor.
- 2.20 CONNECTORS AND SPLICES
- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
1. Material: Copper.
  2. Type: One or Two hole with standard barrels.
  3. Termination: Compression or Crimp.

### PART 3 - EXECUTION

#### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

- B. Feeders: Copper for feeders. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- C. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- D. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.
- E. VFC Output Circuits Cable: Extra-flexible stranded for all sizes.
- F. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

### 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type XHHW-2, single conductors in raceway.
- B. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.
- C. NFPA 70 restricts use of exposed Type NM cable in some types of construction. See NFPA 70, Article 334, for complete listing of restrictions.
- D. Exposed Branch Circuits, Including in Crawlspace: [Metal-clad cable, Type MC] Nonmetallic-sheathed cable, Type NM.
- E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: [Nonmetallic-sheathed cable, Type NM]. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

### 3.4 CONNECTIONS

- A. 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-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
  - I. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

### 3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

END OF SECTION 26 05 19

## SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## 1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

## 1.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Certified by NETA.

## PART 2 - PRODUCTS

## 2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

## 2.2 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Stranded Conductors: ASTM B 8.
  - 3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
  - 4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
  - 5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
  - 6. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

## 2.3 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

## 2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

## PART 3 - EXECUTION

## 3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
  - 1. Bury at least 24 inches below grade.
- C. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.

## 3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

## 3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  - 1. Feeders and branch circuits.
  - 2. Lighting circuits.
  - 3. Receptacle circuits.
  - 4. Single-phase motor and appliance branch circuits.
  - 5. Armored and metal-clad cable runs.
  - 6. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- C. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

## 3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
  - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
  - 2. Use exothermic welds for all below-grade connections.
  - 3. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
  - 4.
  - 5. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- C. Grounding and Bonding for Piping:
  - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
  - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.



3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Grounding system will be considered defective if it does not pass tests and inspections.

END OF SECTION 26 05 26

## SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Conduit and cable support devices.
  - 2. Support for conductors in vertical conduit.
  - 3. Structural steel for fabricated supports and restraints.
  - 4. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.

## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- B. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- C. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
  - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
  - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
  - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
  - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
  - 6. Toggle Bolts: All -steel springhead type.

## PART 3 - EXECUTION

## 3.1 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
  - 1. NECA I.
  - 2. NECA 101
  - 3. NECA 102.
  - 4. NECA 105.
  - 5. NECA 111.
- B. Comply with requirements in Section 07 84 00 – Firestopping, for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

- C. Comply with requirements for raceways and boxes specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as scheduled in NECA I, where its Table I lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

### 3.2 SUPPORT INSTALLATION

- A. Comply with NECA I and NECA I01 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA I, EMT, IMC and RMC may be supported by openings through structure members, according to NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  - 4. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
  - 5. To Light Steel: Sheet metal screws.
  - 6. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, pull and junction boxes, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

### 3.3 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 30 10 "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base as follows:
  - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

END OF SECTION 26 05 29

## SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

## PART I - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SUMMARY

- A. Section Includes:
  1. Metal conduits and fittings.
  2. Nonmetallic conduits and fittings.
  3. Metal wireways and auxiliary gutters.
  4. Boxes, enclosures, and cabinets.
- B. Related Requirements:
  1. Section 26 05 43 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.
  2. Section 27 05 28 "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.
  3. Section 28 05 28 "Pathways for Electronic Safety and Security" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving electronic safety and security.

## I.3 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid steel conduit.
- C. IMC: Intermediate metal conduit.

## I.4 ACTION SUBMITTALS

- A. Product Data: For wireways.

## PART 2 - PRODUCTS

## 2.1 METAL CONDUITS AND FITTINGS

- A. Metal Conduit:
  1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  2. GRC: Comply with ANSI C80.1 and UL 6.
  3. IMC: Comply with ANSI C80.6 and UL 1242.
    - a. EMT: Comply with ANSI C80.3 and UL 797.
  4. FMC: Comply with UL 1; zinc-coated steel or aluminum.
  5. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- B. Metal Fittings:
  1. Comply with NEMA FB 1 and UL 514B.
  2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  3. Fittings, General: Listed and labeled for type of conduit, location, and use.
  4. Fittings for EMT:
    - a. Material: die cast.

- b. Type: Setscrew.
- 5. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
- C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

## 2.2 NONMETALLIC CONDUITS AND FITTINGS

- A. Nonmetallic Conduit:
  - 1. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
    - a. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
  - 2. LFNC: Comply with UL 1660.
  - 3. Rigid HDPE: Comply with UL 651A.
  - 4. Continuous HDPE: Comply with UL 651A.
- B. Nonmetallic Fittings:
  - 1. Fittings, General: Listed and labeled for type of conduit, location, and use.
  - 2. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
    - a. Fittings for LFNC: Comply with UL 514B.
  - 3. Solvents and Adhesives: As recommended by conduit manufacturer.

## 2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 or **Type 3** unless otherwise indicated, and sized according to NFPA 70.
  - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- C. Wireway Covers: Hinged type unless otherwise indicated.
- D. Finish: Manufacturer's standard enamel finish.

## 2.4 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- C. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- D. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb (32 kg).
  - 1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- G. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
- H. Gangable boxes are allowed.

## PART 3 - EXECUTION

## 3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
  - 1. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
  - 2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  - 3. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
  - 1. Exposed, Not Subject to Physical Damage: EMT.
    - a. Concealed in Ceilings and Interior Walls and Partitions: EMT or RNC, Type EPC-40-PVC.
  - 2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
  - 3. Damp or Wet Locations: IMC.
  - 4. Boxes and Enclosures: NEMA 250, Type 1.
- C. Minimum Raceway Size: 1/2-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
  - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
  - 3. EMT: Use setscrew, cast-metal fittings. Comply with NEMA FB 2.10.
  - 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

## 3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches of enclosures to which attached.
- I. Raceways Embedded in Slabs:
  - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
  - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

3. Arrange raceways to keep a minimum of 1 inch of concrete cover in all directions.
  4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
  5. Change from ENT to GRC or IMC before rising above floor.
- J. Stub-ups to Above Recessed Ceilings:
1. Use EMT, IMC, or RMC for raceways.
  2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- S. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  2. Where an underground service raceway enters a building or structure.
  3. Where otherwise required by NFPA 70.
- U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- V. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
  2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    - d. Attics: 135 deg F temperature change.
    - e. Formula in first subparagraph below provides about 15 percent safety factor (extra expansion-contraction capability).
  3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
  5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- W. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- X. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- Y. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- Z. Locate boxes so that cover or plate will not span different building finishes.
- AA. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- BB. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- CC. Set metal floor boxes level and flush with finished floor surface.

### 3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 31 20 00 "Earth Moving" for pipe less than 6 inches in nominal diameter.
  2. Install backfill as specified in Section 31 20 00 "Earth Moving."
  3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 31 20 00 "Earth Moving."
  4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
  5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
    - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
    - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
  6. Underground Warning Tape: Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."

### 3.4 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION 26 05 33



## SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Color and legend requirements for raceways, conductors, and warning labels and signs.
  - 2. Labels.
  - 3. Cable ties.
  - 4. Paint for identification.
  - 5. Fasteners for labels and signs.

## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

## 2.2 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 600 V or Less:
  - 1. Black letters on an orange field.
  - 2. Legend: Indicate voltage and system or service type.
- B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
  - 1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
  - 2. Colors for 240-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
  - 3. Color for Neutral: White.
  - 4. Color for Equipment Grounds: Green.
- C. Warning Label Colors:
  - 1. Identify system voltage with black letters on an orange background.
- D. Warning labels and signs shall include, but are not limited to, the following legends:
  - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
  - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

- E. Equipment Identification Labels:
  - 1. Black letters on a white field.

## 2.3 LABELS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
- B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.
- C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- thick, vinyl flexible label with acrylic pressure-sensitive adhesive.
  - 1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
  - 2. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
  - 3. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
- D. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil- thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
  - 1. Minimum Nominal Size:
    - a. 1-1/2 by 6 inches for raceway and conductors.
    - b. 3-1/2 by 5 inches for equipment.
    - c. As required by authorities having jurisdiction.

## 2.4 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
  - 1. Minimum Width: 3/16 inch.
  - 2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
  - 3. Temperature Range: Minus 40 to plus 185 deg F.
  - 4. Color: Black, except where used for color-coding.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

### 3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- D. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
  - 1. Secure tight to surface of conductor, cable, or raceway.
  - 2. Secure tight to surface of conductor, cable, or raceway.
- E. Cable Ties: General purpose, for attaching tags, except as listed below:
  - 1. Outdoors: UV-stabilized nylon.

3.3 IDENTIFICATION SCHEDULE

- A. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- B. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive vinyl tape applied in bands.
- C. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- D. Equipment Identification Labels:
  - 1. Indoor Equipment: Self-adhesive label.
  - 2. Outdoor Equipment: Laminated acrylic or melamine sign.
  - 3. Equipment to Be Labeled:
    - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a laminated acrylic or melamine label.
    - b. Enclosures and electrical cabinets.
    - c. UPS equipment.

END OF SECTION 26 05 53

## SECTION 26 24 16 - PANELBOARDS

## PART I - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SUMMARY

- A. Section Includes:
  - 1. Load centers.

## I.3 DEFINITIONS

- A. ATS: Acceptance testing specification.
- B. AFCI: Arc-fault circuit interrupter.
- C. GFCI: Ground-fault circuit interrupter.
- D. GFEP: Ground-fault equipment protection.
- E. HID: High-intensity discharge.
- F. MCCB: Molded-case circuit breaker.

## I.4 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
  - 1. Include materials, switching and overcurrent protective devices, accessories, and components indicated.
  - 2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details.
  - 2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
  - 3. Detail bus configuration, current, and voltage ratings.
  - 4. Short-circuit current rating of panelboards and overcurrent protective devices.

## I.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 77 00 - Closeout Procedures, include the following:
  - 1. Manufacturer's written instructions for testing overcurrent protective devices.

## I.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Circuit Breakers Including GFCI, AFCI, and GFEP Types spares for each panelboard as indicated in the drawings.

## I.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NECA 407 and NEMA PB 1.

## 1.9 PROJECT CONDITIONS

- A. Environmental Limitations:
  - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
  - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
    - a. Ambient Temperature: Not exceeding minus 22 deg F to plus 104 deg F.
    - b. Altitude: Not exceeding 6600 feet.
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
  - 1. Ambient temperatures within limits specified.
  - 2. Altitude not exceeding 6600 feet.

## 1.10 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
  - 1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 GENERAL REQUIREMENTS FOR LOAD CENTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton.
  - 2. General Electric Company; GE Energy Management - Electrical Distribution.
  - 3. SIEMENS Industry, Inc.
  - 4. Square D
- B. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 26 05 48.16 "Seismic Controls for Electrical Systems."
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Comply with NEMA PB 1.
- F. Comply with NFPA 70.
- G. Enclosures: Flush-mounted, dead-front cabinets.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
  - 2. Finishes:
    - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    - b. Back Boxes: Galvanized steel.
- H. Incoming Mains:
  - 1. Location: Convertible between top and bottom.

- I. Phase, Neutral, and Ground Buses:
  - 1. Material: Tin-plated aluminum.
    - a. Plating shall run entire length of bus.
    - b. Bus shall be fully rated the entire length.
  - 2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
  - 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
- J. NRTL Label: Load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices.
- K. Future Devices: Load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- L. Manufacturers: Same as the general requirements for panelboards

## 2.2 LOAD CENTERS

- A. Manufacturers: Same as the general requirements for Load Centers
- B. Load Centers: Comply with UL 67.
- C. Mains: Circuit breaker.
- D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges secured with flush latch with tumbler lock; keyed alike.
- F. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

## 2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Same as the general requirements for Load Centers
  - 1. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
  - 2. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
  - 3. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
  - 4. MCCB Features and Accessories:
    - a. Standard frame sizes, trip ratings, and number of poles.
    - b. Breaker handle indicates tripped status.
    - c. UL listed for reverse connection without restrictive line or load ratings.

## 2.4 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
  - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards according to NECA 407 and NEMA PB I.1.

- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with NECA I.
- C. Install panelboards and accessories according to NECA 407 and NEMA PB I.1.
  - I. Attach panelboard to the vertical finished or structural surface behind the panelboard.
- D. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- E. Mount panelboard cabinet plumb and rigid without distortion of box.
- F. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- G. Install overcurrent protective devices and controllers not already factory installed.
  - I. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- H. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- I. Install filler plates in unused spaces.
- J. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

### 3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
  - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.

END OF SECTION 26 24 16

## SECTION 26 27 13 - ELECTRICITY METERING

## PART 1 - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SUMMARY

- A. Section includes electricity metering, and work to accommodate utility company revenue meters.

## I.3 DEFINITIONS

- A. KY or KYZ Pulse: Term used by the metering industry to describe a method of measuring consumption of electricity (kWh) that is based on a relay opening and closing in response to the rotation of the disk in the meter. Electronic meters generate pulses electronically.

## I.4 ACTION SUBMITTALS

- A. Product Data:
  - 1. For each type of meter.

## I.5 WARRANTY

- 1. Warranty Period: Cost to repair or replace any parts for two years from date of Substantial Completion.
- 2. Extended Warranty Period: Cost of replacement parts (materials only, f.o.b. the nearest shipping point to Project site), for eight years, that failed in service due to transient voltage surges.

## I.6 COORDINATION

- A. Electrical Service Connections:
  - 1. Coordinate with utility companies and utility-furnished components.
    - a. Comply with requirements of utility providing electrical power services.
    - b. Coordinate installation and connection of utilities and services, including provision for electricity-metering components.

## PART 2 - PRODUCTS

## 2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 916.

## 2.2 UTILITY METERING INFRASTRUCTURE

- A. Install metering accessories furnished by the utility company, complying with its requirements.
- B. Utility-Furnished Meters: Connect data transmission facility of metering equipment installed by the Utility.
  - 1. Data Transmission: Transmit pulse data over control-circuit conductors, classified as Class I per NFPA 70, Article 725. Comply with Section 26 05 23 "Control-Voltage Electrical Power Cables."
- C. Current-Transformer Cabinets: Comply with requirements of electrical-power utility company.



- D. Meter Sockets:
  - 1. Comply with requirements of electrical-power utility company.
  - 2. Meter Sockets: Steady-state and short-circuit current ratings shall meet indicated circuit ratings.
  
- E. Modular Meter Center: Factory-coordinated assembly of a main service terminal box with lugs only, wireways, meter socket modules, and feeder circuit breakers arranged in adjacent vertical sections complete with interconnecting buses.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eaton.
    - b. General Electric Company.
    - c. SIEMENS Industry, Inc.; Energy Management Division.
    - d. Square D.
    - e. Or equal.
  - 2. Comply with requirements of utility company for meter center.
    - a. Comply with UL 67.
  - 3. Housing: NEMA 250, **Type 3R** enclosure.
  - 4. Meter Socket Rating: Coordinated with connected feeder circuit rating.
  - 5. Minimum Short-Circuit Rating: 22,000 A symmetrical at rated voltage.
  - 6. Steady-state and short-circuit current ratings shall have ratings that match connected circuit ratings.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Comply with equipment installation requirements in NECA I.
  
- B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written instructions. Provide empty conduits for metering leads and extend grounding connections as required by utility company.
  
- C. Install modular meter center according to switchboard installation requirements in NECA 400.
  
- D. Wiring Method:
  - 1. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

#### 3.2 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
  - 1. Equipment Identification Labels: Self-adhesive labels with clear protective overlay. For residential meters, provide an additional card holder suitable for [**printed, weather-resistant card**] [**typewritten card**] with occupant's name.

END OF SECTION 26 27 13

## SECTION 26 27 26 - WIRING DEVICES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Residential devices.
  - 2. Wall plates.
  - 3. DEFINITIONS
- B. Abbreviations of Manufacturers' Names:
  - 1. Cooper: Cooper Wiring Devices; Division of Cooper Industries, Inc.
  - 2. Hubbell: Hubbell Incorporated; Wiring Devices-Kellems.
  - 3. Leviton: Leviton Mfg. Company, Inc.
  - 4. Pass & Seymour: Pass& Seymour/Legrand.
- C. BAS: Building automation system.
- D. EMI: Electromagnetic interference.
- E. GFCI: Ground-fault circuit interrupter.
- F. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- G. RFI: Radio-frequency interference.
- H. SPD: Surge protective device.
- I. UTP: Unshielded twisted pair.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

## 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

## PART 2 - PRODUCTS

## 2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
  - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
  - 2. Devices shall comply with the requirements in this Section.

- D. Devices for Owner-Furnished Equipment:
    - 1. Receptacles: Match plug configurations.
    - 2. Cord and Plug Sets: Match equipment requirements.
  
  - E. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.
- 2.2 TOGGLE SWITCHES
- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
  
  - B. Switches, 120/277 V, 20 A:
    - 1. Single Pole:
      - a. Hubbell; HBL 1221.
      - b. Pass & Seymour; CSB20AC1.
      - c. Three Way:
      - d. Hubbell; HBL 1221.
      - e. Pass & Seymour; CSB20AC1.
      - f. RESIDENTIAL DEVICES
  
  - C. Residential-Grade, Tamper-Resistant Convenience Receptacles: 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - a. Eaton (Arrow Hart).
      - b. Hubbell Incorporated; Wiring Device-Kellems.
      - c. Leviton Manufacturing Co., Inc.
      - d. Or Equal
    - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
  
  - D. Weather-Resistant and Tamper-Resistant Convenience Receptacles: 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - a. Eaton (Arrow Hart).
      - b. Hubbell Incorporated; Wiring Device-Kellems.
      - c. Leviton Manufacturing Co., Inc.
      - d. Or equal.
    - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.
  
  - E. Fan-Speed Controls:
    - 1. Modular, 120-V, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters.
    - 2. Comply with UL 1917.
    - 3. The 5-A rating in first subparagraph below allows more than one fan to be controlled by the same device.
    - 4. Continuously adjustable toggle switch, A.
    - 5. Three-speed adjustable slider rotary knob, 1.5 A.
    - 6. Telephone Outlet:
    - 7. Manufacturers: Subject to compliance with requirements, provide products by the following:
      - a. Eaton (Arrow Hart).
      - b. Or Equal.
    - 8. Description: Single RJ-45 jack for terminating Category 5e, twisted pair cable. Description: Single RJ-45 jack for terminating Category 5e, twisted pair cable complying with Section 27-1513 "Communications Copper Horizontal Cabling."
    - 9. Comply with UL 1863.
  
  - F. Combination TV and Telephone Outlet:
    - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      - a. Eaton (Arrow Hart).
      - b. or equal.
    - 2. Description: Single RJ-45 jack for terminating Category 5e, twisted pair cable and a single BNC connector for terminating coaxial cable.

3. Description: Single RJ-45 jack for terminating Category 5e, twisted pair cable complying with Section 27-1513 "Communications Copper Horizontal Cabling" and a single BNC connector for terminating coaxial cable complying with Section 27-1533 "Communications Coaxial Horizontal Cabling."
4. Comply with UL 1863.

### 2.3 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
  1. Plate-Securing Screws: Metal with head color to match plate finish.
  2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
  3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
  4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

### 2.4 FINISHES

- A. Device Color:
  1. Wiring Devices shall be **As selected by Architect**.
  2. Wall Plate Color: For plastic covers, match device color.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with NECA I, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
  1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
  2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
  1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
  2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  4. Existing Conductors:
    - a. Cut back and pigtail, or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
  1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
  2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
  3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
  4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
  5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
  6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
  7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
  8. Tighten unused terminal screws on the device.

9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left.
  2. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- F. Dimmers:
1. Install dimmers within terms of their listing.
  2. Verify that dimmers used for fan-speed control are listed for that application.
  3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.
- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.
- 3.2 GFCI RECEPTACLES
- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.
- 3.3 IDENTIFICATION
- A. Comply with Section 26 05 53 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.
- 3.4 FIELD QUALITY CONTROL
1. Tests for Convenience Receptacles:
  2. Line Voltage: Acceptable range is 105 to 132 V.
  3. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
  4. Ground Impedance: Values of up to 2 ohms are acceptable.
  5. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
  6. Using the test plug, verify that the device and its outlet box are securely mounted.
  7. Wiring device will be considered defective if it does not pass tests and inspections.
- B. Prepare test and inspection reports.

END OF SECTION 26 27 26

## SECTION 26 51 00 - INTERIOR LIGHTING

## PART I - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SUMMARY

- A. Section Includes:
  - I. Interior lighting fixtures.

## I.3 DEFINITIONS

- A. BF: Ballast factor.
- B. CCT: Correlated color temperature.
- C. CRI: Color-rendering index.
- D. HID: High-intensity discharge.
- E. LER: Luminaire efficacy rating.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting fixture, including ballast housing if provided.
- H. LED: Light Emitting Diode

## I.4 ACTION SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and light source components. The light fixture submittal must be complete or the entire submittal will be rejected. A complete submittal includes the following:
  - 1. All light fixtures, ballasts, lamp, light emitting diode data, drivers, and power supplies as specified in the Luminaire Schedule.
  - 2. Physical description of lighting fixture including dimensions.
  - 3. Ballast, including BF.
  - 4. Energy-efficiency data.
  - 5. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
  - 6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
    - a. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.
    - b. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

## I.5 PRIOR APPROVALS AND SUBSTITUTIONS

- A. Requests for substitution of light fixtures, lamps, LED, must be submitted and approved prior to bid.

- B. All requests for substitution must be submitted for review at least 7 working days prior to the last scheduled addendum issued prior to bid opening. Substitution requests submitted fewer than 7 working days prior to the last scheduled addendum will not be reviewed.
- C. All substitution requests to be submitted in accordance with the requirements of Section 01 25 00.

#### 1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

#### 1.7 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

### PART 2 - PRODUCTS

#### 2.1 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Metal Parts: Free of burrs and sharp corners and edges.
- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
  - 1. Label shall include the following lamp and ballast characteristics:
    - a. "USE ONLY" and include specific lamp type.
    - b. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
    - c. CCT and CRI for all luminaires.

#### 2.2 LED LUMINAIRES

- A. LED Luminaires shall meet all DesignLights Consortium® (DesignLights.org) Product Qualification Criteria. This does not require that the luminaire be listed on the DesignLights Consortium's® Qualified Products List, but they must meet the Product Qualification Criteria. The technical requirements that the luminaire shall meet for each Application Category are:
  - 1. Minimum Light Output.
  - 2. Zonal Lumen Requirements.
  - 3. Minimum Luminaire Efficacy.
  - 4. Minimum CRI.
  - 5. L70 Lumen Maintenance.
  - 6. Minimum Luminaire Warranty of 5 years (not pro-rated) to include LED driver and all LED components.
  - 7. Additional requirements:
    - a. Color Temperature of 3000K-4100K for interior luminaires as listed in the Luminaire Schedule. The color temperature of exterior LED luminaires should not exceed 4100K (nominal).
    - b. Color Consistency: LED manufacturer shall use a maximum 3-step MacAdam Ellipse binning process to achieve consistent luminaire-to-luminaire color for interior luminaires. Exterior luminaires shall use a maximum 5-step MacAdam Ellipse binning process.
    - c. Glare Control: Exterior luminaires shall meet DesignLights Consortium's® criteria for Zonal Lumen Distribution requirements or Backlight-Uplight-Glare (BUG) standards for exterior luminaires.
    - d. Luminaire shall be mercury-free, lead-free, and RoHS compliant.
    - e. Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
    - f. Light output of the LED system shall be measured using the absolute photometry method following IES LM-79 and IES LM-80 requirements and guidelines.
    - g. Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.

- h. Driver shall have a rated life of 50,000 hours, minimum.
  - i. Lumen output shall not depreciate more than 20% after 10,000 hours of use.
  - j. Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.
  - k. Luminaire Color Rendering Index (CRI) shall be a minimum of 80 for interior luminaires, and a minimum of 70 for exterior luminaires.
8. LED luminaire shall be thermally designed as to not exceed the maximum junction temperature of the LED for the ambient temperature of the location the luminaire is to be installed. Rated case temperature shall be suitable for operation in the ambient temperatures typically found for the intended installation. Exterior luminaires to operate in ambient temperatures of -20°F to 122°F (-29°C to 50°C).
  9. LED driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at full input power and across specified voltage range.
  10. Luminaire shall operate normally for input voltage fluctuations of plus or minus 10 percent.
  11. Luminaire shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
  12. Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance.
  13. All connections to luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
  14. Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected as per Class 2 UL listing.
  15. All luminaires shall be provided with knockouts for conduit connections.
  16. The LED luminaire shall carry a limited 5-year warranty minimum for LED light engine(s)/board array, and driver(s).
  17. Provide all of the following data on submittals:
    - a. Delivered lumens.
    - b. Input watts.
    - c. Efficacy.
    - d. Color rendering index.

### 2.3 DIMMING

- A. LED driver indicated as line voltage dimming shall be compatible with dimming controls where dimming is indicated on the plans. Dimmable drivers shall use Dimming Constant Current (DCC) or Pulse Width Modulation (PWM) operation.

### 2.4 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Lighting fixtures:
  1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
  2. Install lamps in each luminaire.
- B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.
- C. Remote Mounting of Ballasts: Distance between the ballast and fixture shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturers, maximum distance between ballast and luminaire.
- D. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.
- E. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

### 3.2 IDENTIFICATION

- A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."



END OF SECTION 26 51 00

## SECTION 26 56 00 - EXTERIOR LIGHTING

## PART I - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016 version) of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SUMMARY

- A. Section Includes:
  - 1. Exterior luminaires.
  - 2. Poles and accessories.
- B. Related Sections:
  - 1. Section 26 51 00 "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.

## I.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color-rendering index.
- C. HID: High-intensity discharge.
- D. LER: Luminaire efficacy rating.
- E. Luminaire: Complete lighting fixture, including ballast housing if provided.
- F. Pole: Luminaire support structure, including tower used for large area illumination.
- G. Standard: Same definition as "Pole" above.

## I.4 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

- A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4-M.
- B. Live Load: Single load of 500 lbf, distributed as stated in AASHTO LTS-4-M.
- C. Ice Load: Load of 3 lbf/sq. ft., applied as stated in AASHTO LTS-4-M Ice Load Map.
- D. Wind Load: Pressure of wind on pole and luminaire and banners and banner arms, calculated and applied as stated in AASHTO LTS-4-M.
  - I. Basic wind speed for calculating wind load for poles 50 feet high or less is 100 mph.
    - a. Wind Importance Factor: 1.0.
    - b. Minimum Design Life: 25 years.
    - c. Velocity Conversion Factors: 1.0.

## I.5 ACTION SUBMITTALS

- A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and light source components. The light fixture submittal must be complete or the entire submittal will be rejected. A complete submittal includes and the following:
  - I. All light fixtures, ballasts, lamp, light emitting diode data, drivers, and power supplies as specified in the Luminaire Schedule.

2. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
  3. Details of attaching luminaires and accessories.
  4. Details of installation and construction.
  5. Luminaire materials.
  6. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.
    - a. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
    - b. Manufacturer Certified Data: Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
  7. Photoelectric relays.
  8. Ballasts, including energy-efficiency data.
  9. Lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.
  10. Materials, dimensions, and finishes of poles.
  11. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
  12. Anchor bolts for poles.
  13. Manufactured pole foundations.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  2. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
  3. Design calculations, certified by a qualified professional engineer, indicating strength of screw foundations and soil conditions on which they are based.
  4. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples: For products designated for sample submission in the Exterior Lighting Device Schedule. Each Sample shall include lamps and ballasts.
- 1.6 PRIOR APPROVALS AND SUBSTITUTIONS
- A. Requests for substitution of light fixtures, lamps, LED, ballasts, drivers and power supplies must be submitted and approved prior to bid.
- B. All requests for substitution must be submitted for review at least 7 working days prior to the last scheduled addendum issued prior to bid opening. Substitution requests submitted fewer than 7 working days prior to the last scheduled addendum will not be reviewed.
- C. All substitution requests to be submitted in accordance with the requirements of Section 10-2500.
- 1.7 INFORMATIONAL SUBMITTALS
- A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations by a professional engineer.
- B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.
- C. Field quality-control reports.
- D. Warranty: Sample of special warranty.
- 1.8 QUALITY ASSURANCE
- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with IEEE C2, "National Electrical Safety Code."
- C. Comply with NFPA 70.

## 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
  2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
  3. Warranty Period for Color Retention: Five years from date of Substantial Completion.
  4. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products indicated on Drawings.

## 2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
1. LER Tests Incandescent Fixtures: Where LER is specified, test according to NEMA LE 5A.
  2. LER Tests Fluorescent Fixtures: Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
  3. LER Tests HID Fixtures: Where LER is specified, test according to NEMA LE 5B.
- B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.
- J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
1. White Surfaces: 85 percent.
  2. Specular Surfaces: 83 percent.
  3. Diffusing Specular Surfaces: 75 percent.
- K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

## 2.3 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

- A. Structural Characteristics: Comply with AASHTO LTS-4-M.
  - 1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
  - 2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.
- B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.
- C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
  - 1. Materials: Shall not cause galvanic action at contact points.
  - 2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
  - 3. Anchor-Bolt Template: Plywood or steel.
- D. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Section 03 30 00 "Cast-in-Place Concrete."

## PART 3 - EXECUTION

### 3.1 LUMINAIRE INSTALLATION

- A. Install lamps in each luminaire.
- B. Fasten luminaire to indicated structural supports.
  - 1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Adjust luminaires that require field adjustment or aiming.

### 3.2 POLE INSTALLATION

- A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
- B. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 03-3000 "Cast-in-Place Concrete."

### 3.3 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
  - 1. Verify operation of photoelectric controls.

**END OF SECTION 26 56 00**

**SECTION 27 00 00 - COMMUNICATIONS CABLE AND EQUIPMENT****PART I - GENERAL****I.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

**I.2 SCOPE**

- A. This section describes the products and execution requirements relating to furnishing and installation of Telecommunications Cabling System.

**I.3 REGULATORY REFERENCES**

- A. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, State of Minnesota Electrical Code and present manufacturing standards.
  - 1. All materials shall be listed by UL and shall bear the UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.
- B. Other applicable standards are as follows:
  - 1. ANSI/IEEE C2 - National Electrical Safety Code.
  - 2. NFPA 70 - National Electrical Code.
  - 3. TIA/EIA - Standards 526-14A (OFSPT-14A), 526-7 (OFSPT-7), 568B.1, 568B.3, 569A, 606A, and 607 (with exception).
  - 4. IEEE/ANSI 142-1982 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
  - 5. ICEA publication S-80-576-2002.

**I.4 DESIGN INTENT**

- A. The Horizontal Data Cabling System is based on the installation of Voice/Data Category 6 and Coaxial.
- B. Outlets shall be mounted flush on a wall-mounted box. Information Outlet locations are to be identified on Project Drawings.
- C. All cables and related termination, support and grounding hardware, bonding, shall be furnished, installed, wired, tested, labeled, and documented by the Contractor.

**I.5 QUALITY ASSURANCE**

- A. The manufacturer shall be a company specializing in communication cable and/or accessories with a minimum of five years documented experience in producing cable and/or accessories similar to those specified below.
- B. The Contractor shall have been in this line of business for a minimum of five (5) years and completed four (4) jobs of the magnitude specified in the following sections.

**I.6 DELIVERY, STORAGE AND HANDLING**

- A. Cable shall be stored according to manufacturer's recommendations as minimum. In addition, cable must be stored in a location protected from vandalism and weather. If cable is stored outside, it must be covered with

opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If air temperature at cable storage location will be below 4 degrees C., the cable shall be moved to a heated (10 degrees C. minimum) location.

## 1.7 DRAWINGS

- A. It shall be understood that the electrical and telecommunication details and drawings provided with the specification package are diagrammatic. They are included to show the intent of the specifications and to aid the Contractor in bidding the job. The Contractor shall make allowance in the bid proposal to cover whatever work is required to comply with the intent of the plans and specifications.
- B. The Contractor shall verify all dimensions at the site and be responsible for their accuracy. Prior to submitting the bid, the Contractor shall call the attention of the Engineer to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted, within ten (10) days prior to the Bid Due Date.

## PART 2 - PRODUCTS

### 2.1 DATA CABLE STATIONS

- A. General:
  - 1. The jacket color for Cat 6 Data cables shall be Blue or as required by owner.
  - 2. Cable shall be packaged in a way that minimizes tangling and kinking of the cable during installation. Examples are open reels or packages that incorporate a rotating reel.
  - 3. Fasteners: Only Velcro™ –style hook and loop fasteners are acceptable.
  - 4. Labeling: Each cable in the terminal room shall be tagged with the current designation from the architectural drawings.
  - 5. Product:
    - a. Category 6: General Cable Category 6 Cable or equal.
- B. INFORMATION OUTLET
- C. Station cables shall each be terminated at their designated location in the connector types described in the subsections below.
- D. Data and Voice Jacks:
  - 1. Category 6:
    - a. Style: Jacks shall be mounted in a 106-type frame,
    - b. Cover plate: Thermoplastic.

### 2.2 COMMUNICATIONS COAXIAL CABLE

- A. Description: Coaxial cable with a 75-ohm characteristic impedance designed for broadband data transmission.
  - I. RG-6/U: UL Type CMP and CL2P.
    - a. No. 18 AWG, solid, copper-covered steel conductor.
    - b. Plenum rated.
    - c. Gas-injected, foam-PE insulation.
    - d. Shielded with 100 percent aluminum tape and 60 percent aluminum braid.
    - e. Double shielded with 100 percent aluminum foil shield, 60 percent aluminum braided inner shield, and 40 percent aluminum braided outer shield.
    - f. Jacketed with black PVC or PE.
    - g. Suitable for indoor installations.

## 2.3 COAXIAL CABLE HARDWARE

- A. Description: Hardware designed to connect, splice, and terminate coaxial cable with a 75-ohm characteristic impedance.
- B. Coaxial-Cable Connectors: Type BNC, 75 ohms.
- C. Jacks and Jack Assemblies: Modular, color-coded, with female Type BNC connectors.
- D. Patch Cords: Factory-made cables in 36-inch lengths; terminated with a male Type BNC connector at each end.
- E. Faceplates:
  - I. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices." And as described in the drawings.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Refer to Project Drawings which indicate the cable routes to follow and the termination location(s) within each building.
- B. It is the Contractor's responsibility to survey the site and include all necessary costs to perform the installation as specified. This includes any modifications required to route and conceal horizontal distribution wiring.
- C. Contractor shall furnish all required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment is to include, but not limited to, sheaves, winches, cable reels, cable reel jacks, duct entrance tunnels, pulling tension gauge and similar devices. All equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices, which may move or wear in a manner to pose a hazard to the cable, shall not be used.
- D. All cable shall be pulled by hand unless installation conditions require mechanical assistance. Where mechanical assistance is used, care shall be taken to ensure that the maximum tensile load for the cable as defined by the manufacturer is not exceeded. This may be in the form of continuous monitoring of pulling tension, use of a "break-away" or other approved method.
- E. Where unacceptable conditions are found, the Contractor shall bring this to the attention of the construction supervisor immediately. A written resolution will follow to determine the appropriate action to be taken.
- F. Qualified personnel utilizing state-of-the-art equipment and techniques shall complete all installation work. During pulling operation an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.
- G. Cable pulling shall be done in accordance with cable manufacturer's recommendations and ANSI/IEEE C2 standards. Manufacturer's recommendations shall be a part of the cable submittal. Recommended pulling tensions and pulling bending radius shall not be exceeded. Any cable bent or kinked to radius less than recommended dimension shall not be installed. If any installed cable is kinked to a radius less than recommended dimension it shall be replaced by the Contractor with no additional cost to the project.
- H. cable shall be free of tension at both ends.
- I. Avoid abrasion and other damage to cables during installation.
- J. Pulling Lubricant may be used to ease pulling tensions. Lubricant shall be of a type that is non-injurious to the cable jacket and other materials used. Lubricant shall not harden or become adhesive with age.



- K. The Cable system will be tested and documented upon completion of the installation as defined in the Section below.

### 3.2 TESTING AND ACCEPTANCE

- A. General:
  - I. The Contractor is responsible to perform acceptance tests as indicated below for each sub-system (e.g. backbone, station, etc.) as it is completed.

### 3.3 AS-BUILT CONSTRUCTION DRAWINGS

- A. Drawings included with the specifications set shall be modified by the Contractor to denote as-built information.
- B. The drawings are to include cable routes and outlet locations
- C. All documentation, including hard copy and electronic forms shall become the property of the Owner.

### 3.4 WARRANTY

- A. This Contractor shall guarantee all materials, etc., two (2) years from date of substantial completion of this work. In the case of data cabling the Contractor shall furnish complete Category 6 system warranty consisting of no less than fifteen (15) years. This guarantee shall include all labor, material and travel time.

**END OF SECTION 27 00 00**

## SECTION 28 46 21.13 - CONVENTIONAL FIRE-ALARM SYSTEMS

## PART 1 - GENERAL

## I.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Comply with the current (April 2016) version of the Minnesota Overlay and Guide to the 2015 Enterprise Green Communities Criteria.

## I.2 SUMMARY

- A. Section Includes:
  - 1. Nonsystem smoke detectors.

## I.3 DEFINITIONS

- A. NICET: National Institute for Certification in Engineering Technologies.

## I.4 ACTION SUBMITTALS

- A. General Submittal Requirements:
  - 1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
- B. Product Data: For each type of product, including furnished options and accessories.

## I.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Smoke and Fire Detectors: Quantity equal to 1 for each unit.
  - 2. Detector Bases: Quantity equal to 1 for each unit.

## I.6 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

## I.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 1 year from date of Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
  - 1. Smoke detectors.
  - 2. Carbon monoxide detectors.

## 2.2 CARBON MONOXIDE DETECTORS

- A. Description: Listed for connection to fire-alarm system.

1. Mounting: Adapter plate for outlet box mounting.
2. Detector shall provide a means to test by introducing test carbon monoxide into the sensing cell.
3. Detector shall provide alarm contacts and trouble contacts.
4. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
5. Detector shall be listed to comply with UL 2075.
6. Detectors shall be located, mounted, and wired according to manufacturer's written instructions.
7. Test button simulates an alarm condition.

### 2.3 NONSYSTEM SMOKE DETECTORS

- A. General Requirements for Nonsystem Smoke Detectors:
  1. Nonsystem smoke detectors shall meet the monitoring for integrity requirements in NFPA 72.
- B. Single-Station Smoke Detectors:
  1. Comply with UL 217; suitable for NFPA 101, residential occupancies; operating at 120-V ac with 9-V dc battery as the secondary power source. Provide with "low" or "missing" battery chirping-sound device.
  2. Auxiliary Relays: One Form C, rated at 0.5 A Form A and one Form C, both rated at 0.5 A.
  3. Audible Notification Appliance: Piezoelectric sounder rated at 90 dBA at 10 feet according to UL 464.
  4. Visible Notification Appliance: 177-cd strobe.
  5. Heat sensor, 135 deg F combination rate-of-rise and fixed temperature.
  6. Test Switch: Push to test; simulates smoke at rated obscuration.
  7. Tandem Connection: Allow tandem connection of number of indicated detectors; alarm on one detector shall actuate notification on all connected detectors.
  8. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
  9. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
  10. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
  1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.
- B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

### 3.2 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
- B. Smoke Detector Spacing:
  1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
  2. Luminaires: Locate detectors not closer than 12 inches from any part of a luminaire and not directly above pendant mounted or indirect lighting.
- C. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

### 3.3 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by authorities having jurisdiction.

END OF SECTION 28 46 21.13

## SECTION 31 10 00 - SITE CLEARING

### PART 1 - GENERAL

#### 1.1 CONDITIONS OF THE CONTRACT

- A. Conditions of the Contract, DIVISION 00 and General Requirements, DIVISION 01 govern work under this Section.
  - 1. Performance of the Work of this Section shall comply with DIVISION 00 for Prevailing Wage Rate Requirements that apply to this project.
  - 2. Performance of the Work of this Section shall comply with DIVISION 01 for Storm Water Plan "SWPPP" Requirements and SWPPP training requirements that apply to this project.

#### 1.2 SECTION INCLUDES

- A. Clearing and protection of vegetation.

#### 1.3 RELATED SECTIONS

- A. Section 023100 – Site Demolition
- B. Section 312200 – Grading
- C. Section 312323 – Fill
- D. Section 329113 – Soil Preparation
- E. Section 32915 – Soil Preparation – Performance Specification
- F. Section 329200 – Turf and Grasses
- G. Section 329219 – Native Prairie Grasses and Forbs
- H. Section 329300 - Plants

#### 1.4 REFERENCES

- A. Minnesota Department of Transportation Standard Specifications for Construction, 2016 Edition and Corresponding Supplements.
  - 1. Where reference is made to a number preceded by "MnDOT", the reference shall be understood to mean that numbered section of the Department of Transportation Standard Specifications, Latest edition.
  - 2. Provisions for measurement and payment shall not apply except as amended herein and all costs in connection therewith shall be included in the lump sum price bid for the work.

#### 1.5 SUBMITTALS

- A. See Section 024100 – Site Demolition for Construction Staging Plan submittal requirements.

- B. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.6 QUALITY ASSURANCE

- A. Clearing Firm: Company specializing in the type of work required.

1.7 PROJECT CONDITIONS

- A. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Fill Material: As specified in Section 312323 – Fill.

PART 3 - EXECUTION

3.1 EXISTING UTILITIES AND BUILT ELEMENTS

- A. Coordinate work with utility companies and Owner; notify before starting work and comply with their requirements; obtain required permits.
- B. Coordinate with the Owner before starting work that will connect to their existing private utility lines.
- C. Protect existing utilities to remain from damage.
- D. Do not disrupt public utilities without permit from authority having jurisdiction.
- E. Protect existing structures and other elements that are not to be removed.

3.2 VEGETATION

- A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, lawns, and planting beds or those which will be disturbed during utility construction.
- B. Do not begin clearing until vegetation to be relocated has been removed.
- C. Install substantial, chain link fences at least 6 feet high to prevent inadvertent damage to vegetation to remain:
  - 1. At vegetation removal limits.
  - 2. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
  - 3. Around other vegetation to remain within vegetation removal limits.
- D. Do not excavate within drip line of trees to remain.
- E. Do not allow material laydown or equipment storage within drip line or root zone of existing trees to remain.

- F. Do not allow vehicle parking within drip line of trees to remain.
- G. Where excavation for new construction is required within drip line of trees, 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 relocated and covered with soil.
  3. Coat cut faces of roots more than ½ inch in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
  4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.
- H. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
1. Chip vegetation for mulch for dog area.
  2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove and grind stumps and roots to depth of 18 inches.
  3. Existing Stumps and root zones: Treat as specified for other vegetation removed; remove and grind stumps and roots to depth of 36 inches.
  4. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
  5. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.
  6. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.
  7. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.
    1. Employ a qualified 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 the qualified arborist.
  8. Stockpile materials for reuse away from edge of excavations without intermixing of various fill types and topsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
    1. Limit height of topsoil stockpiles to 72 inches and do not stockpile topsoil within drip line of remaining trees.
    2. Dispose of excess topsoil as specified for waste material disposal and stockpile surplus topsoil and allow for respreading deeper topsoil.
    3. Apply temporary seed and mulch or erosion control mats on stockpiles that remain unused for more than three days.
- L. The Contractor shall be charged a penalty for removal or damage of an existing tree without prior authorization in the amount of \$1,000 per diameter inch as measured four feet from the ground.

3.3 DEBRIS

- A. Remove debris, junk, and trash from site on a daily basis.
- B. No debris shall be disposed of in Owner facilities, containers or on Owner property unless directed to do so otherwise in writing.
- C. Remove from site all materials not to be reused on site; comply with requirements of Division 01 for Final Cleaning.
- D. Leave site in clean condition, ready for subsequent work.
- E. Clean up spillage and wind-blown debris from public and private lands.

**END OF SECTION 31 10 00**



**SECTION 31 22 00 - GRADING**

**PART 1 - GENERAL**

**1.1 CONDITIONS OF THE CONTRACT**

- A. Conditions of the Contract, DIVISION 00 and General Requirements, DIVISION 01 govern work under this Section.
  - 1. Performance of the Work of this Section shall comply with DIVISION 00 for Prevailing Wage Rate Requirements that apply to this project.
  - 2. Performance of the Work of this Section shall comply with DIVISION 01 for Storm Water Plan "SWPPP" Requirements and SWPPP training requirements that apply to this project.

**1.2 SECTION INCLUDES**

- A. Site rough grading and fine grading.

**1.3 RELATED SECTIONS**

- A. Section 312317 - Trenching
- B. Section 312323 - Fill

**1.4 SUBMITTALS**

- A. Samples submitted and tested for gradation and material requirements for fill defined in Section 312323 - Fill.

**1.5 REFERENCES**

- A. Minnesota Department of Transportation Standard Specifications For Construction, 2016 Edition and Corresponding Supplements.
- B. Subsurface Geotechnical Investigation prepared by Braun Intertec DRAFT report Project B160592 dated December 30, 2016.
  - 1. Where reference is made to a number preceded by "MnDOT", the reference shall be understood to mean that numbered section of the Department of Transportation Standard Specifications, Latest edition.
  - 2. Provisions for measurement and payment shall not apply except as amended herein and all costs in connection therewith shall be included in the lump sum price bid for the work.

**1.6 REQUIRED TESTING AND INSPECTION SERVICES**

- A. The Owner will retain the services of an independent testing laboratory to perform on-site geotechnical observation during rough grading, stripping, excavation, filling and backfilling operations. Contractor shall not commence or perform any of this work without the presence of the testing laboratory.
- B. Notify the testing laboratory five working days in advance of commencing rough grading, stripping, excavating, filling and backfilling operations. Provide a minimum of three working days following the initial notification.
- C. Allow for Independent Testing Laboratory:

1. Bottom of all excavations.
2. Provide access to on-site borrow areas for sampling.
3. Provide samples of all imported soils for materials testing and gradations.
4. Provide areas for on-site materials testing.
5. Provide access for in-place density tests on compacted fill.
6. Communicate schedule to Geotechnical Engineer so testing and observation can be done on all aspects of work.

D. Coordinate schedule of work with Geotechnical Engineer for the following testing:

Description	Minimum Tests/Unit Area/Lift
Natural Sub-grade	1/200 square yard and at every column pad and every 50' under wall/strip footings and fraction thereof.
General Building Fill	1/50 square yard and fraction thereof.
Fill Under Building Foundations & Oversize	1 per every 20' under wall/strip footings and fraction thereof and every column pad
Exterior Building Backfill (Non-Structural Areas)	1/200 square yard and fraction thereof
Fill Under and Within 10' of Exterior Paved and Concrete Areas	1/100 square yard and fraction thereof
Landscape Fill Areas (Non-structural)	1/200 square yard and fraction thereof
Utility Trenches	1/50 square yard and fraction thereof

E. If in-place density tests indicate work does not meet specified requirements, remove work, replace and retest at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil: See Section 312323 - Fill.
- B. Other Fill Materials: See Section 312323 - Fill.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect utilities that remain, from damage.
- D. Notify utility company to remove and relocate utilities.

- E. Install erosion control measures to comply with NPDES permit and all city and state requirements.
- F. Record existing conditions on record set of drawings to be returned to the engineer at the end of the project to locate existing utilities or other unforeseen conditions accurately on the record drawings.
- G. See Section 024100 – Site Demolition and 311000 - Site Clearing.

### 3.3 ROUGH GRADING

- A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
- B. Do not remove topsoil when wet.
- C. Remove unsuitable soils, existing fill and soft soils with an N-value of 5 or less. See recommendations within geotechnical report for depths of subcut and removals of existing site soils. Bottom must be inspected by representative of the geotechnical engineer prior to backfilling.
- D. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
- E. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.
- F. When excavating through roots, perform work by hand and cut roots with sharp axe.
- G. See Section 312323 - Fill for filling procedures.
- H. Remove cobbles, crushed concrete and all debris found at bottom of excavation and utility trenches.
- I. Benching Slopes: Horizontally bench existing slopes greater than 1 vertical: 4 horizontal to key fill material to slope for firm bearing.
- J. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.
- K. Concrete walks adjacent to building and at entryways shall have backfill consisting of imported soils classified as sand or sand with silt (SP or SP-SM) should be taped upward at a slope of at least three units horizontal to one unit vertical (3:1) to meet the naturally-occurring soil.
- L. An extensive soils removal protocol has been outlined in the geotechnical report and the Contractor shall refer to the recommendations for removals.
- M. All on-site materials shall be evaluated for contamination and follow the Response Action Plan developed for the project.

### 3.4 SOIL REMOVAL

- A. Stockpile topsoil to be re-used on site; remove remainder from site.
- B. Stockpile subsoil to be re-used on site; remove remainder from site. On site soils containing organics shall not be used as backfill on site.
- C. Stockpiles: See Section 311000 - Site Clearing.

### 3.5 FINISH GRADING

- A. Before Finish Grading:

1. Verify building and trench backfilling have been inspected by the Geotechnical Engineer or a qualified representative of the Independent Testing Laboratory.
  2. Verify subgrade has been contoured, compacted, and necessary testing has shown proper compaction. All areas, at which compaction tests failed, have been corrected and retested to pass specified compaction.
  3. See Section 321123 Aggregate Base Courses for verification of subgrade prior to finish grading.
- B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size.
  - C. Where topsoil is to be placed, scarify surface to depth of 18 inches.
  - D. Place topsoil in areas indicated to nominal depth of 6 inches.
  - E. Place topsoil during dry weather.
  - F. Remove roots, weeds, rocks, and foreign material while spreading.
  - G. Near plants spread topsoil manually to prevent damage.
  - H. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
  - I. Lightly compact placed topsoil per 312323 – Fill.
  - J. Do not compact soils within infiltration areas per 312323 - Fill.
- 3.6 TOLERANCES
- A. Top Surface of Subgrade: Plus or minus 1/20 foot from required elevation.
  - B. Top Surface of Finish Grade: Plus or minus 1/4 inch.
- 3.7 FIELD QUALITY CONTROL
- A. See Section 312323 - Fill for compaction density testing.
- 3.8 CLEANING AND PROTECTION
- A. Remove unused stockpiled materials.
  - B. Leave site clean and raked, ready to receive landscaping.

**END OF SECTION 31 22 00**

**SECTION 31 23 16 - EXCAVATION**

**PART 1 - GENERAL**

**1.1 CONDITIONS OF THE CONTRACT**

- A. Conditions of the Contract, DIVISION 00 and General Requirements, DIVISION 01 govern work under this Section.
  - 1. Performance of the Work of this Section shall comply with DIVISION 00 for Prevailing Wage Rate Requirements that apply to this project.
  - 2. Performance of the Work of this Section shall comply with DIVISION 01 for Storm Water Plan "SWPPP" Requirements and SWPPP training requirements that apply to this project.

**1.2 SECTION INCLUDES**

- A. Excavating for building volume below grade, footings, foundations, retaining walls, slabs-on-grade, paving, site structures, and utilities.

**1.3 RELATED SECTIONS**

- A. Section 312200 – Grading
- B. Section 312317 - Trenching
- C. Section 312323 - Fill

**1.4 PROJECT CONDITIONS**

- A. Verify that survey benchmark and intended elevations for the Work are as indicated.
- B. Protect plants, lawns, rock outcroppings, pavement, structures, trees and other features to remain.
- C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- D. Existing utilities are shown on project plans per survey location of the surficial features and underground utility record drawings provided by the Owner. The utilities are shown for reference only and locations are approximate. Contractor shall field verify exact locations of all existing utilities and contact Gopher State One Call prior to mobilizing on site.

**1.5 REFERENCES**

- A. Minnesota Department of Transportation Standard Specifications For Construction, 2016 Edition and Corresponding Supplements.
- B. Subsurface Geotechnical Investigation prepared by Braun Intertec DRAFT report Project B1610592 dated December 30, 2016.
  - 1. Where reference is made to a number preceded by "MnDOT", the reference shall be understood to mean that numbered section of the Department of Transportation Standard Specifications, Latest edition.
  - 2. Provisions for measurement and payment shall not apply except as amended herein and all costs in connection therewith shall be included in the lump sum price bid for the work.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 PREPARATION

- A. See Section 312200 - Grading for additional requirements.

3.2 EXCAVATING

- A. Provide temporary support for adjacent structures which may be damaged by excavating work.
- B. Verify the location of all existing and new underground utilities and tanks prior to beginning excavation.
- C. Excavate to accommodate new structures and construction operations.
- D. Notify Civil Engineer of Record of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- E. Slope banks of excavations deeper than 4 feet to angle of repose or less unless shored. Follow OSHA standards. OSHA requires an engineer to evaluate slopes or excavations over 20 feet in depth.
- F. Building footings, grade beams, retaining wall footings or any below-grade structure support excavation: Remove the in-place soils as required for construction. Excavate to bearing elevation identified on plans. Minimum footing bearing elevation shall be a depth of five (5) feet below final adjacent finished grade elevation typical. Place footing on naturally occurring material or existing fill. Geotechnical engineer shall inspect the bottom of all footing excavation to determine adequate bearing capacity of in-situ soils. Should bottom of excavation soils not provide adequate soil bearing capacity remove, replace and recompact with suitable fill, see Section 312323 Fill. Oversize the excavations of these regions a minimum of 1:1 on all sides of footing or foundation structure dimensions.
- G. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 312323 Fill.
- H. All topsoil, fill, organic and/or other unsuitable bearing material shall be removed below the footings and/or within the building areas to the depths indicated in the geotechnical report. Coordinate work so the extent of the removal is verified by the Geotechnical Engineer.
- I. All excavations shall be observed by a qualified Geotechnical Engineer to verify the removal of all unsuitable material, and confirm the proper preparation of bearing conditions. Rock excavation for individual footings is not expected to exceed five foot depth, unless noted otherwise. No mass excavation is anticipated.
- J. Rock blasting is not permitted.
- K. Remove unsuitable soils, existing fill and soft soils. See recommendations within geotechnical report. Bottom must be inspected by representative of the geotechnical engineer prior to backfilling.
- L. Remove cobbles, crushed concrete and debris found at bottom of excavation and utility trenches.
- M. Sidewalk abutting the structure and exterior building backfill consisting of imported soils classified as sand or sand with silt (SP or SP-SM) should be tapered upward at a slope of at least three units horizontal to one unit vertical (3:1) to meet the naturally-occurring soil.

- N. Beneath exterior pavement, subcut excessively soft/wet or significantly organic soils to four (4) feet below the proposed subgrade elevation unless the soils are so unstable that they limit the ability to compact the fill placed above these soils. See Geotechnical recommendations and adhere to more stringent requirement.
- O. An extensive soils removal protocol has been outlined in the geotechnical report and the Contractor shall refer to the recommendations for removals.
- P. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- Q. Remove excavated material that is unsuitable for re-use from site.
- R. Stockpile excavated material to be re-used in area designated on site in accordance with Section 312200 Grading and 311000 Site Clearing.
- S. Remove excess excavated material from site.
- T. Excavation by blasting and use of explosives is not allowed.
- U. Scarify 12" of subgrade and compact to density equal to or greater than requirements for subsequent fill material.
- V. Backfill and compact per Section 312323 - Fill.

### 3.3 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 approved by the MPCA to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.
- C. Follow the requirements of the Storm Water Pollution Prevention Plan.

### 3.4 PROTECTION

- A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- C. Protect public from entering excavation area by using proper fencing and warning signage or other means as necessary.

### 3.5 CLEAN-UP

- A. Remove unused stockpiled materials, leave area in a clean and neat condition, see Section 311000 - Site Clearing.
- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.
- C. Stabilize exposed grading areas in required time limits per NPDES permit.

**END OF SECTION 31 23 16**



## SECTION 31 23 17 - TRENCHING

### PART 1 - GENERAL

#### 1.1 CONDITIONS OF THE CONTRACT

- A. Conditions of the Contract, DIVISION 00 and General Requirements, DIVISION 01 govern work under this Section.
  - 1. Performance of the Work of this Section shall comply with DIVISION 00 for Prevailing Wage Rate Requirements that apply to this project.
  - 2. Performance of the Work of this Section shall comply with DIVISION 01 for Storm Water Plan "SWPPP" Requirements and SWPPP training requirements that apply to this project.

#### 1.2 SECTION INCLUDES

- A. Trenching for utilities outside the building to utility main connections.

#### 1.3 RELATED SECTIONS

- A. Geotechnical report; boring locations and findings of subsurface materials.
- B. Section 312200 – Grading
- C. Section 312316 - Excavation
- D. Section 312323 - Fill

#### 1.4 REFERENCES

- A. Minnesota Department of Transportation Standard Specifications For Construction, 2016 Edition and Corresponding Supplements.
- B. Subsurface Geotechnical Investigation prepared by Braun Intertec report Project B1610592 dated December 30, 2016.
  - 1. Where reference is made to a number preceded by "MnDOT", the reference shall be understood to mean that numbered section of the Department of Transportation Standard Specifications, Latest edition.
  - 2. Provisions for measurement and payment shall not apply except as amended herein and all costs in connection therewith shall be included in the lump sum price bid for the work.

#### 1.5 SUBMITTALS

- A. See section 31 2323 - Fill for material submittal requirements.

#### 1.6 PROJECT CONDITIONS

- A. Verify that survey bench marks and intended elevations for the Work are as indicated.
- B. Protect plants, lawns, rock outcroppings, structures, pavements and other features to remain.
- C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- D. Existing utilities are shown on project plans per survey location of the surficial features and underground utility record drawings provided by Owner. The utilities are shown for reference

only and locations are approximate. Contractor shall field verify exact locations of all existing utilities and contact Gopher One Call prior to mobilizing on site.

## PART 2 - PRODUCTS – NOT USED

## PART 3 - EXECUTION

### 3.1 PREPARTION

- A. See Section 31 2200 - Grading for additional requirements.

### 3.2 TRENCHING

- A. Notify Civil Engineer of Record of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- B. Slope banks of excavations deeper than 4 feet to angle of repose or less unless shored. Follow OSHA standards. OSHA requires an engineer to evaluate slopes or excavations over 20 feet in depth.
- C. Do not interfere with 45 degree bearing splay of foundations.
- D. Cut trenches wide enough to allow inspection of installed utilities.
- E. Hand trim excavations. Remove loose matter.
- F. Remove large stones, cobbles, crushed concrete and other hard matter which could damage piping or impede consistent backfilling or compaction.
- G. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.
- H. Remove excavated material that is unsuitable for re-use from site.
- I. Stockpile excavated material to be re-used in area designated on site in accordance with Section 313100 - Site Clearing and 312200 - Grading.
- J. Remove excess material from site.
- K. Excavation by blasting and use of explosives is not allowed.
- L. Backfill and compact per Section 312323 - Fill.

### 3.3 PREPARATION FOR UTILITY PLACEMENT

- A. Bottom of trenches shall be inspected by the Geotechnical Engineer or a qualified representative of the Independent Testing Laboratory before placement of piping or pipe bedding. See 31 2200 – Grading for further testing and inspection requirements.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with fill as specified in Section 312323 - Fill.
- C. Scarify 12" of subgrade and compact to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to backfill, maintain excavations and prevent loose soil and stormwater runoff from falling into excavation.
- E. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

- F. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- G. Protect public from entering excavation area by using proper fencing and warning signage or other means as necessary.

### 3.4 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 approved by the MPCA to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.
- C. Follow the requirements of the Storm Water Pollution Prevention Plan.

### 3.5 FIELD QUALITY CONTROL

- A. Perform compaction density testing on compacted fill in accordance Sections 31 2200 – Grading and 312323 - Fill.

### 3.6 CLEAN-UP

- A. Remove unused stockpiled materials, leave area in a clean and neat condition, see Section 311000 - Site Clearing.

**END OF SECTION 31 23 17**

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**SECTION 31 23 23 - FILL**

**PART 1 - GENERAL**

**1.1 CONDITIONS OF THE CONTRACT**

- A. Conditions of the Contract, DIVISION 00 and General Requirements, DIVISION 01 govern work under this Section.
  - 1. Performance of the Work of this Section shall comply with DIVISION 00 for Prevailing Wage Rate Requirements that apply to this project.
  - 2. Performance of the Work of this Section shall comply with DIVISION 01 for Storm Water Plan "SWPPP" Requirements and SWPPP training requirements that apply to this project.

**1.2 SECTION INCLUDES**

- A. Filling, backfilling, and compacting for building volume below grade and paving.
- B. Backfilling and compacting for utilities outside the building to utility main connections.
- C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations and earth moving for grading operations.

**1.3 RELATED SECTIONS**

- A. Geotechnical Report prepared for this project.
- B. Section 312200 - Grading
- C. Section 312316 - Excavation
- D. Section 312317 - Trenching

**1.4 REFERENCES**

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18 in. Drop; American Association of State Highway and Transportation Officials; 2001.
- B. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2005.
- C. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>); 2000a.
- D. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2000.
- E. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>); 2002.
- F. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 1994(R 2001).
- G. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2000.

- H. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2004.
- I. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2004.
- J. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2000.
- K. Minnesota Department of Transportation Standard Specifications For Construction, 2016 Edition and Corresponding Supplements.
- L. Subsurface Geotechnical Investigation prepared by Braun Intertec report B1610592 dated December 30, 2016.
  - 1. Where reference is made to a number preceded by "MnDOT", the reference shall be understood to mean that numbered section of the Department of Transportation Standard Specifications, Latest edition.
  - 2. Provisions for measurement and payment shall not apply except as amended herein and all costs in connection therewith shall be included in the lump sum price bid for the work.

1.5 SUBMITTALS

- A. Samples: 10 lb sample of each type of fill; submit in air-tight containers to testing laboratory.
- B. Materials Sources: Submit name of imported materials source.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Compaction Density Test Reports.

1.6 PROJECT CONDITIONS

- A. Provide sufficient quantities of fill to meet project schedule and requirements. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where indicated.
  - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
  - 2. Prevent contamination.
  - 3. Protect stockpiles from erosion and deterioration of materials.
  - 4. See Section 311000 - Site Clearing.
- C. Verify that survey bench marks and intended elevations for the Work are as indicated.
- D. Protect plants, lawns, rock outcroppings, trees, pavement and other features to remain.
- E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving and curbs from excavating equipment and vehicular traffic.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

- A. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps over 2" in greatest dimension and with no more than 15% of the rocks or lumps larger than 1" in their greatest dimensions, predominately granular, non-expansive soil. Fill material is

subject to the analysis of the Geotechnical Engineer and the approval of the Civil Engineer and is that material removed from excavations or imported from off-site borrow areas.

1. Provide certified granular material meeting the specified gradation.
  2. Report the No. 200 sieve results to the nearest 0.1 percent and all other sieves to the nearest whole number.
  3. Provide certified granular material that has similar appearance, texture, moisture content, and performance characteristics.
  4. Provide virgin aggregate meeting the following requirements:
    - a. Consists of naturally occurring mineral materials;
    - b. Contains non topsoil, organics, or severely weathered rock, and
    - c. Insoluble residue test results for the portion of quarried/bedrock carbonate aggregates, passing the No. 200 sieve is no greater than 10 percent.
- B. Under building foundations and interior slabs on grade: Engineered fill imported soils, non-frost susceptible classified as sand, loamy sand or sandy loam (S, LS, SL) with 100% passing the 2" sieve and less than 2% organic content and capable of attaining the required compaction to achieve design bearing capacity for foundation support as indicated on the drawings. Depth of fill shall be minimum 6 inches and in conformance with the Geotechnical Report.
- C. Adjacent to and behind below-grade walls when needed for a drainage layer: Engineered fill imported soils classified as sand (S) with 100% passing the 1" sieve, less than 50% passing the #40 sieve, less than 5% passing the #200 and less than 2% organic content.
- D. Adjacent to below-grade walls beyond the drainage layer: Engineered fill imported or retained soils classified as sand (S, LS, SL) with 100% passing the 3" sieve, less than 20% passing the #200, less than 2% organic content and a plasticity index of less than 4%.
- E. Under all paved areas, exterior pavement, slabs and sidewalks:
  1. Engineered fill imported or retained soils classified as sand, loamy sand or sandy loam (S, LS, SL) with 100% passing the 3" sieve, less than 20% passing the #200, less than 2% organic content and a plasticity index of less than 15%.
  2. See section 32 1123 Aggregate Base Course.
- F. General Fill: See 2.01.D
- G. Rock Section around underground filtration system: Clean, double washed, poorly-graded natural or crushed stone; free from shale, limestone, clay, organic materials and debris, and recycled crushed concrete; 1 1/2" - 2" size with less than 5% of the particles by weight passing the 3/8" sieve
- H. Filter Aggregate around draitile behind retaining (foundation drains): Clean poorly-graded natural or crushed stone; free from shale, clay, organic materials and debris and recycled crushed concrete; to comply with gradation table per MnDOT specification section 3149.2H. Coarse Filter Aggregate modified with less than 20% of particles by weight passing the 3/8" sieve and less than 5% of the particles by weight pass the #200 sieve.

<b>Coarse Filter Aggregate Gradation Requirements</b>	
<b>Sieve size</b>	<b>Percent Passing</b>
1 inch	100
3/4 inch	85-100
3/8 inch	30-60
No. 4	0-10

- I. Topsoil in landscaped areas: Topsoil is defined as natural friable loam surface soil found in a depth of not less than 6", containing between 2%-15% organic matter. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones and other objects over 1" in diameter, and without weeds, roots, toxic substances and other extraneous or toxic matter harmful to plant growth. Irrigated areas shall comply with University Standards and shall be classified as sandy loam with the following properties:

<b>Sieve size or material</b>	<b>% passing or % of composition</b>
#4 sieve	100
#10 sieve	80-90
#200 sieve	15-25
Silt	10-20
Clay	5-10
Organic matter	3-10

- 1. The silt:clay shall be 2:1 or less.
- 2. pH shall be minimum 5.5 and maximum 7.5, with 6 to 6.5 preferred.
- 3. Maximum lead content shall not exceed 400 ppm for non-residential and non-childcare facilities. Maximum lead content for residential and childcare facilities shall not exceed 100 ppm.

- J. Pipe Bedding Sand: Non-frost susceptible sand having less than 5% of the particles by weight passing the #200 sieve and less than 50% by weight passing the #40 sieve.

- K. Other areas: Soils removed from excavations or imported from off-site as approved by the Geotechnical Engineer

2.2 ACCESSORIES

- A. Geotextile Fabric: Non-biodegradable, woven, Type V per Section 312500 Erosion Prevention and Sediment Control Part 2.1.D.

2.3 SOURCE QUALITY CONTROL

- A. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site. Provide a minimum of three weeks prior to use on site for testing and review of fill materials.
- B. If tests indicate materials do not meet specified requirements, change material and retest.
- C. Provide materials of each type from same source throughout the Work.



## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 312200 – Grading, 312316 - Excavation, and 312317 - Trenching for additional requirements.
- C. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.
- D. Verify structural ability of unsupported walls to support imposed loads by the fill.
- E. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.

### 3.2 PREPARATION

- A. Scarify subgrade surface to a depth of 12 inches to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill. Remove unsuitable soils, existing fill and soft soils with an N-value of 5 or less. See recommendations within geotechnical report. Bottom must be inspected by representative of the geotechnical engineer prior to backfilling.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to fill, maintain excavations and prevent loose soil and stormwater runoff from falling into excavation.
- E. Prior to placement of aggregate base within paved areas, perform proof roll with fully loaded tandem axle truck and observed by a Geotechnical Engineer. Soils which rut or deflect 1" or more under the test roll should be corrected by either subcutting and replacement; or by scarification, drying and re-compaction. Correct any soft or weak areas prior to placing aggregate. Geotechnical Engineer shall test corrected areas and a subsequent test roll may be needed to test corrected areas.

### 3.3 FILLING

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Fill up to subgrade elevations unless otherwise indicated.
- C. Employ a placement method that does not disturb or damage other work.
- D. For footings that do not bear on natural undisturbed soil, extend engineered fill laterally beyond bottom edge of footing per recommendations in the geotechnical report.
- E. Foundation and retaining walls shall be backfilled with free-draining fill reviewed by the Geotechnical Engineer and approved by the Structural Engineer.
- F. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- G. Maintain optimum moisture content of fill materials to attain required compaction density.
- H. Place and compact materials in equal continuous layers not exceeding 8 inches loose depth.
- I. Backfill equally on both sides of foundation walls to prevent overturning or lateral wall movement or brace as necessary.

- J. Slope subgrade to follow drainage patterns and drain toward draitile lines as shown.
- K. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- L. Correct areas that are over-excavated. Compact to requirements of subsequent fill.

3.4 COMPACTING

- A. Control soil compaction during construction to provide the minimum percentage of density specified for each area as determined according to ASTM D698 Standard Proctor.
- B. Provide not less than the following percentage of maximum dry density (ASTM D698 Standard Proctor) of soil material compacted at optimum moisture content for each layer in place and as approved by the Geotechnical Engineer.

- 1. Below all foundation, interior slabs, oversizing subgrade and landscaping walls elevations:
  - a. Each layer of fill and backfill material at (98%) of maximum dry density.
- 2. Below paving:
  - a. Each layer of fill and backfill material including base at (100%) of maximum dry density within three feet of subgrade elevations.
  - b. Each layer of fill and backfill material at (95%) of maximum dry density more than three feet below subgrade elevations.
- 3. Landscaped areas:
  - a. Each layer of fill and backfill material at (90%) of maximum density.
- 4. Utility trenches:
  - a. Follow compaction effort as shown above within utility trench areas.

- C. Field density tests and frequency to be performed as outlined in Section 31 2200 – Grading.

3.5 TOLERANCES

- A. Top Surface of General Filling: Plus or minus 1/8 inch from required elevations.
- B. Top Surface of Filling Under Paved Areas: Plus or minus 1/8 inch from required elevations.

3.6 FIELD QUALITY CONTROL

- A. See Section 312200 - Grading for earthwork testing and inspection requirements.

3.7 CLEAN-UP

- A. Remove unused stockpiled materials, leave area in a clean and neat condition.
- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

**END OF SECTION 31 23 23**

## **SECTION 31 25 00 - EROSION PREVENTION AND SEDIMENTATION CONTROL**

### **PART 1 - GENERAL**

#### **1.1 CONDITIONS OF THE CONTRACT**

- A. Conditions of the Contract, DIVISION 00 and General Requirements, DIVISION 01 govern work under this Section.
  - 1. Performance of the Work of this Section shall comply with DIVISION 00 for Prevailing Wage Rate Requirements that apply to this project.
  - 2. Performance of the Work of this Section shall comply with DIVISION 01 for Storm Water Plan "SWPPP" Requirements and SWPPP training requirements that apply to this project.

#### **1.2 SECTION INCLUDES**

- A. Prevention of erosion due to construction activities.
- B. Control of sedimentation of waterways, open drainage ways and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.
- E. MPCA Storm Water Pollution Prevention Plan requirements.

#### **1.3 RELATED SECTIONS**

- A. Section 311000 - Site Clearing
- B. Section 312200 – Grading
- C. Section 312316 – Excavating
- D. Section 312317 – Trenching

#### **1.4 REFERENCES**

- A. ASTM D 4355 - Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus); 1999.
- B. ASTM D 4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a.
- C. ASTM D 4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 1991 (Reapproved 1996).
- D. ASTM D 4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 1991 (Reapproved 1996).
- E. ASTM D 4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 1999a.

- F. ASTM D 4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2001.
- G. EPA 832-R-92-005 - Storm Water Management for Construction Activities; U.S. Environmental Protection Agency; 1992.
- H. MPCA NPDES Construction Site Requirements under General Permit MN R 100001
- I. Minnesota Department of Transportation Standard Specifications For Construction, 2016 Edition and Corresponding Supplements.
  - 1. Where reference is made to a number preceded by "MnDOT", the reference shall be understood to mean that numbered section of the Department of Transportation Standard Specifications, Latest edition.
  - 2. Provisions for measurement and payment shall not apply except as amended herein and all costs in connection therewith shall be included in the lump sum price bid for the work.

#### 1.5 PERFORMANCE REQUIREMENTS

- A. Follow standards for inspection and maintenance of Best Management Practices, as identified in the MPCA Erosion and Sedimentation Control Manual.
- B. Follow all permit requirements, the project-specific Storm Water Pollution Prevention Plan (SWPPP), and Owner policy for Stormwater Compliance (<http://policy.umn.edu/operations/environment-proc04>).
- C. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained. Obtain construction stormwater permit from the MPCA in accordance with Owner requirements.
- D. The MPCA NPDES General Permit for authorization to discharge stormwater associated with construction activities (permit MN R10001) recognizes the DNR "work in water restrictions: during specified fish migration and spawning timeframes for areas adjacent to water. During the restriction period, all exposed soil areas that are within 200 feet of the water's edge and drain to these waters, must have erosion prevention stabilization activities initiated immediately after soil disturbing activity has ceased (and be completed within 24 hours.) The restriction dates for streams in this area are March 15 through June 15.
- E. Install all temporary and permanent Best Management Practices (BMPs) at the project site as identified by the SWPPP, and as detailed by detail sheets. Maintain BMPs at the project site to control stormwater, prevent on-site and off-site soil erosion, to minimize on-site and off-site sedimentation, and to minimize soil compaction and devegetation. Additional BMPs may be necessary to achieve permit compliance or the provisions of this part, which shall be taken at no cost to the Owner.
  - a. Timing. Install BMPs identified in the SWPPP prior to disturbance of surface cover and before precipitation occurs. Follow project phasing indicated in SWPPP.
  - b. Maintenance. Maintain temporary preventive measures until permanent measures have been established to 90%. Permit termination may be requested after 70% vegetative cover across the entire project site has been established.
  - c. Install perimeter erosion control along all downstream edges of construction. Erosion control shall be placed along the downslope edge and placed to not disturb the existing pavement or drive lanes that are to remain. Many methods of erosion control will work and it is means and methods to install the measure most appropriate to the site conditions, project staging and that which meets the MPCA standards. Perimeter control is graphically shown on the plans for clarity but shall be placed in the most appropriate locations as needed for the work.

- d. Strawbales or haybales are not an acceptable perimeter control and are not allowed on site.
  - e. Install inlet protection at all catchbasin inlets within and downstream of the limits of construction and those that may receive runoff from the disturbed areas. Strawbales or filter fabric wrapping grates are not an effective or an acceptable form of inlet protection.
  - f. Locate soil or dirt stockpiles no less than 25 feet from any roadway or drainage channel. If remaining for more than seven days, stabilize the stockpiles by mulching, vegetative cover, tarps or other means. Control erosion from all stockpiles by placing silt barriers around the piles. Temporary stockpiles located on paved surfaces must be no less than two feet from the drainage/gutter line and shall be covered if left more than 24 hours.
  - g. Construction Site Vehicle Entry/Exit. Prior to beginning work, install temporary construction exit(s) at each point where vehicles exit the construction site. Use a rock construction exit (see plans for detail), or other Owner-approved site exit control.
  - h. Prior to beginning work, control drainage and erosion on the site, including haul roads, designated waste locations, concrete wash-out, top-soil stockpiling and other designated staking, marking and signing.
- F. Mark/stake and maintain sensitive areas delineated on the SWPPP to prevent disturbance, compaction, erosion and sedimentation of sensitive areas. Use measures such as hand clearing and grubbing, limiting bare soil exposure time, expediting construction activities, and immediately establishing final vegetation to minimize sediment loss potential in these areas. Inspect marked/staked areas at each inspection to ensure areas are being protected from sedimentation and sediment loss. Additional measures to prevent fouling of permanent stormwater BMPs may be necessary, and should be implemented to maintain design operability at project turnover.
- G. Maintain precipitation records onsite for use in determining applicable precipitation events. Use one of the following online sources (which maintains an electronic record of events) or install an onsite rain gauge and keep a daily weather log onsite. Indicate the source of the weather data in the SWPPP materials.
- a. May use NOAA weather station sites within 1 mile of the project site in lieu of maintaining an on-site meter and precipitation log.
- H. Complete periodic required stormwater inspections as identified by the permit (weekly routine inspections and precipitation events). Inspections shall continue periodically until termination of permit as described by Section 1.4(O). Maintain inspection records onsite and provide as requested by Owner or regulatory staff.
- I. Make corrective actions to findings of periodic inspections, as self-identified on periodic inspections, or as identified by Owner or other regulator inspections within 24 hours of discovery/notice. Maintain corrective action records onsite and provide as requested by Owner or regulatory staff.
- J. Update SWPPP as often as needed to reflect real-time site conditions and Best Management Practices (BMPs) currently in place. Update locations of solid waste containers, on-site fueling and concrete washing as conditions at the site change. The updated SWPPP shall be posted at the project site and be made available upon request to Owner or regulator staff.
- K. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
- a. Prevent runoff into project and adjacent storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.

- b. Any storm water discharge from disturbed areas must be visibly free of sediment and only contain stormwater or other permit-authorized discharges. Turbid or sediment-laden water must be treated prior to discharge (see Section 1.4(L) (5) for details).
  - c. Inlet protection removed in accordance with the permit for the purposes of public safety must be reinstalled as soon as feasible after conclusion of the event initiating removal.
  - d. Stormwater and other discharges from the site may not be discharged to the sanitary sewer.
- L. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
- a. Control movement of sediment and soil from temporary stockpiles of soil.
    - i. Stockpiles shall not be placed in natural buffers or surface waters unless there is a bypass in place. Stockpiles shall be stabilized with temporary BMPs by the end of the work day or shift during which it was created.
    - ii. Unless infeasible or otherwise project-specified, topsoil shall be preserved for site restoration and revegetation purposes, and shall be protected from wind or water erosion as described above.
    - iii. Stockpiles transported off-site shall be covered to prevent wind erosion and off-site deposition.
  - b. Control and minimize traffic and traffic paths throughout project site to minimize tracking, disturbance and compaction. Prevent development of ruts due to equipment and vehicular traffic.
  - c. Immediately stabilize areas when construction activity in an area has temporarily ceased or ended and will not resume for at least 14 calendar days.
  - d. If erosion, compaction or de-vegetation occurs due to non-compliance with these requirements, restore impacted areas at no cost to Owner. Maintain all temporary erosion and sediment control devices in place until the contributing drainage areas are stabilized. Inspect temporary erosion and sediment control on a daily basis and replace deteriorated, damaged, or rotted devices immediately.
- M. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water or soils leaving the project site due to construction activities for this project.
- a. Prevent windblown soil from leaving the project site. Soils transported off-site shall be covered to prevent wind erosion and off-site deposition.
  - b. Prevent tracking of mud onto public roads outside site. If installation and maintenance of SWPPP-identified BMPs is not sufficient to prevent tracking, additional preventive measures shall be implemented at no cost to the Owner.
  - c. Street sweeping. Sweep or otherwise remove all soil and sediment tracked or otherwise deposited on public or private paved areas on a daily basis when tracking occurs and shall be maintained throughout the duration of the project. Sweeping shall be done in a manner to prevent dust being blown to adjacent properties and roadways. Use mechanical methods to remove solids first, followed by wet methods, only as needed.
  - d. Prevent mud and sediment from flowing onto sidewalks and pavements.
  - e. Discharges within or from the project site shall meet the following requirements.

- i. Water discharged from the project site must be comprised solely of stormwater, and be visibly free of sediment and floating solids. Other discharges require separate permitting authority.
      - ii. Unless infeasible due to lack of pervious or vegetated area, discharges shall be made to vegetated areas, and with energy dissipation in place to prevent erosion. Discharges from the project site to the sanitary sewer require prior approval by Owner and the sewer authority.
      - iii. Water discharged must not cause nuisance conditions, erosion in receiving channels or downslope properties, or inundation of wetlands.
      - iv. For turbid or sediment-laden water, provide a treatment plan for Owner pre-approval before pumping water (see Section 1.5x).
    - f. If off-site impacts occur due to non-compliance with these requirements, restore impacted areas at no cost to Owner.
- N. Sedimentation of Waterways: Prevent migration of sediment from project site to waterways on-site or off-site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
  - a. Project areas adjacent to or flowing directly to waters of the state have additional management requirements, which include setbacks and enhanced BMPs, including rapid stabilization methods. Consult the SWPPP for specific provisions to be followed at the project site. If installation and maintenance of SWPPP-identified BMPs is not sufficient to prevent sedimentation, additional preventive or protective measures shall be implemented at no cost to the Owner.
  - b. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner. Corrective measures include removal of deposited sediments from waters of the state. Prior to removal of sediment from waterways, obtain OWNER approval, and any necessary permit; comply with requirements of authorities having jurisdiction.
  - c. If sediment basins or devices are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
  - d. Discharges within or from the project site shall meet the following requirements.
    - i. Water discharged from the project site must be comprised solely of stormwater, and be visibly free of sediment and floating solids. Other discharges require separate permitting authority.
    - ii. Unless infeasible due to lack of pervious or vegetated area, discharges shall be made to vegetated areas, and with energy dissipation in place to prevent erosion. Discharges from the project site to the sanitary sewer require prior approval by Owner and the sewer authority.
    - iii. Water discharged must not cause nuisance conditions, erosion in receiving channels or downslope properties, or inundation of wetlands.
    - iv. For turbid or sediment-laden water, provide a treatment plan for Owner pre-approval before pumping water (see Section 1.5x).
  - e. If on-site or off-site impacts occur due to non-compliance with these requirements, restore impacted areas at no cost to Owner.
- O. Open Water: Prevent standing water that could become stagnant.

- P. Pollution Prevention Measures: Prevent contamination of stormwater from on-site materials and wastes. Activities occurring at a separate area (staging) in conjunction with the project are subject to the provisions in this section.
- a. Any product or waste with the potential to contaminate stormwater must be stored inside or under cover in SWPPP designated areas only. Items must be stored in a closed, labeled container and in a manner to prevent releases through vandalism, theft, accident or otherwise. Items included in this provision include, but is not limited to: building materials, pesticides, treatment chemicals and by-products, landscape materials, fuels, oils and lubes, paints, paint waste and other hazardous wastes. Storage locations shall be indicated on the SWPPP, and be updated as necessary to reflect site conditions.
  - b. Litter and solid waste at the site must be controlled to prevent release from the project site and be covered, except when adding or removing waste. Litter and wastes may not be buried or otherwise disposed at the project site. Solid waste must be collected and disposed off-site in a manner consistent with local and state solid waste rules. Solid waste locations shall be indicated on the SWPPP, and be updated as necessary to reflect site conditions.
  - c. On-site fueling shall be conducted in SWPPP designated areas only, and shall have secondary containment in place to prevent fuel releases. In situations where permanent containment is not feasible, rubberized containers suitable for use under equipment during fueling operations is acceptable. Fueling locations shall be indicated on the SWPPP, and be updated as necessary to reflect site conditions.
  - d. A spill kit containing materials appropriate to project-specific pollutants and quantities shall be located on the project site, and shall be indicated on the SWPPP.
  - e. Portable toilets must be positioned so that they are secure, and will not be tipped or knocked over. Sanitary waste must be disposed in a manner consistent with local and state rules.
  - f. Vehicle and equipment washing is prohibited at the project site, including but not limited to the staging area.
  - g. Concrete wash-out waste shall either be collected and managed off-site, or managed on-site in a SWPPP-designated concrete washout area. Materials in or destined for the washout area shall not contact the ground, nor shall water or other liquid discharge from the containment structure. Wastes collected must be disposed of off-site in a manner consistent with local and state solid waste rules. Washout areas shall be indicated on the SWPPP, and be updated as necessary to reflect site conditions; washout areas shall be signed at the project site. Under no circumstances may washout water drain into the storm sewer or drainage way. Washout area must comply with MPCA requirements.
  - h. Spill response and notification. In the event of a release to the environment, or an unexpected field observation (such as a tank, buried waste, or discolored soil), complete the Owner Spill Notification Form and submit to the Owner in accordance with the specified procedure below (see section 1.5(H)).
  - i. If on-site or off-site impacts occur due to non-compliance with these requirements, restore impacted areas at no cost to Owner.
- Q. Establish final stabilization: Restore the project site to permit-required vegetative conditions and initiate permit termination process.
- a. Complete soil disturbing activities and restore site to a uniform perennial vegetative cover with a density of 70% to prevent soil failure under erosive conditions.



- b. Temporary BMPs shall be removed, unless specifically approved by the Owner.
- c. Permanent BMPs shall be fully installed and verified to be operating as designed. Any basins or other permanent BMPs also used as temporary BMPs during the construction phase, must be cleaned of accumulated sediment.
- d. Notify Owner project staff for post-construction inspection.
- e. Initiate termination (or transfer) of construction stormwater permit in accordance with Owner specified procedure below. DO NOT submit a Permit Termination form; Owner staff will terminate permit in accordance with Owner specified procedure below (see Section 1.5(G)).
- f. Note that compliance inspections, in accordance with the provisions of the permit, must continue to be completed until the permit is terminated.
- g. Growing season: Commencement of work in relationship to growing seasons and final stabilization efforts may impact the Contractor's selection of BMPs for final stabilization. That is, seeding or hydro-seeding of sites in the Fall do not constitute final stabilization and will delay the ability to cease inspections and/or terminate the permit.

## 1.6 SUBMITTALS

- A. See 013200 Attachment J Contractor Qualification Form Erosion and Stormwater Management
- B. See 013200 – Construction Progress Documentation – Contractor shall submit weekly inspection log recording the necessary SWPPP information and utilizing Document 013201 Storm water Pollution Prevention Plan (SWPP) Inspection Log.
- C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- D. Stormwater Permit Application Procedure.
  - a. Contractor completes a hard-copy version of the MPCA Construction Stormwater Permit Application Form and submits to Owner project contact for review and “Owner’s Signature”.
  - b. Owner project contact reviews document, and returns the revised/signed hard-copy for electronic submittal by Contractor to the MPCA. Owner signature on the hard-copy of the draft permit application constitutes Owner agreement that the project documents comply with applicable Owner policy and permits.
  - c. Contractor to obtain MPCA permit from e-Submittal site after Owner approval: [https://rsp.pca.state.mn.us/TEMPO\\_RSP/Orchestrate.do?initiate=true](https://rsp.pca.state.mn.us/TEMPO_RSP/Orchestrate.do?initiate=true). Contractor SHOULD NOT apply for a permit for Owner construction until the draft permit application has been reviewed and signed by Owner.
- E. Owner Inspections/Notifications. Notify Owner project contact at each of the following project milestones:
  - a. Pre-construction inspection: After BMPs have been installed in accordance with the SWPPP, prior to soil disturbing work is initiated.
  - b. Post-construction inspection: When the provisions of Section 1.4(P) for final site stabilization have been met.

- F. Inspection Reports. As indicated in Section 1.4(G), inspections shall be completed and shall be maintained onsite, to be provided to Owner or regulatory staff as outlined in 013200 – Construction Progress Documentation.
- G. Stormwater Permit Termination Procedure. When the provisions of Section 1.4(P) for final stabilization have been met and a post construction inspection has been completed:
  - a. Contractor completes a hard-copy version of the MPCA Notice of Termination form (<http://www.pca.state.mn.us/index.php/view-document.html?gid=7388>) and submits to Owner project contact for review and “Owner’s Signature”.
  - b. Owner project contact reviews document and submits to the MPCA. The contractor will be copied on correspondence to the MPCA.
- H. Spill Response and Notification. As indicated in Section 1.4(O), submit the Owner Spill Notification Form to the Owner in the event of a release to the environment, or an unexpected field observation (such as a tank, buried waste, or discolored soil). If more than 5 gallons of petroleum product, or any volume of other substance causing pollution of water are released, as described on the Spill Notification Form, the contractor shall directly contact the Owner and the State Duty Officer at 651.649.5451.
- I. Materials and product shop drawings.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Mulch: MnDOT Specification Section 3733, Type 3:
  - a. Clean agricultural grain straw, (wheat, oats, rye, barley) or clean straw harvested from native grass production fields, certified by the Minnesota Crop Improvement Association (MCIA) to be free of noxious weeds;
  - b. Free of cattail (*Typha* sp), reed canary grass \**Phalaris arundinacea*), birds-foot trefoil (*Lotus corniculatus*), Crown vetch (*Coronilla varia*); and Queen anne’s lace (*Daucus carota*);
  - c. Bales area in an air-dried condition at the time of delivery; and
  - d. Attached to each bale is the MCIA inspection tag.
  - e. Provide mulch from a supplier outside of the Emerald Ash Borer quarantine areas. Mulch shall not be transported in or through a quarantine area.
- B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons. MnDOT Seed Mix #100 or #110.
- C. Silt Fence Fabric:
  - a. Provide silt fence along down gradient slope edge of all disturbed areas to retain sediment.
  - b. MnDOT Specification Section 3886 for Standard Machine Sliced or Heavy Duty type.
  - c. Provide machine sliced (MS) silt fence consisting of woven geotextile fabric installed by machine and supported by steel posts.

- d. Provide geotextiles for silt fence from the MnDOT Approved/Qualified Products List.
- e. Provide fabric meeting the following requirements and characteristics:
  - i. Uniform in texture
  - ii. Uniform in appearance
  - iii. Contains no defects, flaws or tears affecting the physical properties
  - iv. Contains UV inhibitors and stabilizers providing a minimum service life of at least two years during outdoor exposure
  - v. Table 3886-1 in MnDOT Specification Section 3886.

<b>Table 3886-1 Silt Fence Requirements</b>							
<b>Silt Fence Type</b>	<b>Width, in [mm]</b>	<b>Grab Tensile (machine direction), lb [kg]*</b>	<b>Apparent Opening Size †</b>	<b>Puncture Strength †</b>	<b>UV Stability, 500 h, % ‡</b>	<b>MAX Permittivity #</b>	<b>Flow Rates, gpm/sq. ft [L/min/sq. m]</b>
MS, HI woven geotextile §	36 [915]	130 [59]	No. 30 sieve [0.60 mm]	—	70	1.0 s <sup>-1</sup>	100 [4,073]
PA woven geotextile	36 [915]	100 [45]	No. 30 sieve [0.60 mm]	—	70	0.1 s <sup>-1</sup>	5 [170]
SD woven or non-woven geotextile **	36 [915]	100 [45]	No. 30 sieve [0.60 mm]	—	70	—	—
TB polyester or polyvinyl Fabric	60 [1524]	200 [91]	—	90 lb [41 kg]	70	impervious	—

Values in table are Minimum Average Roll Values (MARV)

\* ASTM D 4632  
 † ASTM D 4751 Maximum average roll value.  
 ‡ ASTM D 4833  
 # ASTM D 4355  
 § ASTM D 4491  
 § Provide MS, HI woven geotextile with monofilament in both directions. Do not make substitutions.  
 \*\* The Contractor may use poly/poly-reinforced sheeting with a thickness of at least 6 mil [0.152 mm] or an equivalent.

- f. Provide fasteners with a tensile strength of at least 50 pound. Use plastic zip ties to fasten geotextile to posts.
- g. Provide steel posts for silt fence types MnDOT Specification Section 3403 Hot rolled Steel Fence Posts and Table 3886-2 in MnDOT Specification section 3886.

<b>Steel Silt Fence Post Requirements</b>	
<b>Characteristic</b>	<b>Requirement</b>
Type	T-post
Weight	0.95 lb/ft
Length	≥ 5.0 ft

Embedment	≥ 24 in
Post Spacing	≤ 6.0 ft

- h. Preassembled silt fence is not allowed.
  - i. Follow MnDOT standards.
- D. Geotextiles: Per MnDOT Specification Section 3733, Type V.
- a. Provide geotextiles consisting of woven or nonwoven fabric of polymeric filaments or yards, such as polypropylene, polyethylene or polyamide, that form a stable network. Provide geotextile resistant to biological and chemical environments normally found in soils, and that is free of chemical treatment or coating that may significantly reduce porosity or permeability.
  - b. Provide geotextile that is uniform in texture, thickness and appearance and is free of defects, flaws or tears that may alter the strength or filtering properties.
  - c. Deliver rolls of geotextile with an opaque plastic covering to protect the material from ultraviolet rays or contamination with mud, dirt, dust or debris. Provide rolled geotextile labeled on the outside wrap and inside the core in accordance with ASTM D-4873 and that lists manufacturer, product name and roll number.
  - d. Ensure unprotected geotextile is not exposed to sun for more than seven days. Replace contaminated geotextile or geotextile exposed to the sun for more than seven days.
  - e. Geotextile shall meet the properties identified in Table 3733-1 in MnDOT Specification Section 3733 for Type 5.
    - i. Seams shall meet the requirements of Table 3733-1, row B3 "Seam Breaking Strength Minimum"

Table 3733-1 Geotextile Properties								
Geotextile Property	Test Method (ASTM)	Type (a)						
	Units	1		3	4	5	6	7 (c)
		Fabric	Knit sock (b)					
B1 Grab Tensile Strength minimum, each principal direction	D4632 lb [kN]	100 [0.45]	—	100 [0.45]	200 [0.90]	200 [0.90]	(d)	300 [1.3]
B2 Elongation minimum, each principal direction	D4632 percent	—	—	50	50	—	(d)	50
B3 Seam Breaking Strength minimum (e)	D4632 lb [kN]	90 [0.40]	—	90 [0.40]	180 [0.80]	180 [0.80]	(d)	270 [1.2]
B4 Apparent Opening Size (AOS) maximum (f)	D4751 U.S. Std. sieve size [mm]	40 [0.425]	40 [0.425] as applied	50 [0.30]	50 [0.30]	30 [0.60]	20 [0.85]	50 [0.30]
B5 Permittivity minimum (g)	D4491 falling head sec <sup>-1</sup>	0.7	2.75 relaxed	0.5	0.5	0.05	0.05	0.5
B6 Puncture strength minimum	D6241 lb [N]	—	180 [800]	—	—	—	—	—
B7 Wide Width Strip Tensile Strength minimum each principal direction	D4595 lb/ft [kN/m]	—	—	—	—	—	(d)	—

(a) Minimum Average Roll Values (MARV) based on average of at least three tests per swatch.  
 (b) Provide socks made of knit polymeric materials and meeting the requirements of ASTM D6707-06, for Type H: fabric. Ensure the sock exhibits minimum snag or run potential, is factory-applied to maintain uniform installed mass, and conforms to the outside diameter of the tubing with a snug fit.  
 (c) Needle-punched nonwoven. Do not use thermally bonded (heat-set) fabric.  
 (d) Requirements are site-specific and will be as specified in the contract. The property values for B1 and B3 may not be less than shown for Type 5. If the contract does not specify either B1 or B7, use a default value of 300 lb [1.3 kN] for B1. If the contract does not specify seam strength, use a default value of 270 lb [1.2 kN] for B3.  
 (e) Adhere to this requirement if the contract requires or allows seams. Strength specifications apply to factory and field seams. Use thread for sewing that has strength of at least 25 lb [110 N]. Sew seams with a Federal Type 401 stitch using a two-spool sewing machine, and install seams facing upward. For seaming with adhesives, see the Approved/Qualified Products List available at the Department's website.  
 (f) For U.S. sieve sizes, the AOS Number must be equal to or greater than the number specified.  
 (g) Permittivity:  $P = K/L$ , where  $K$  = fabric permeability and  $L$  = fabric thickness.

E. Erosion Control Blankets:

- a. Provide temporary rolled out products to control erosion, aid the establishment of vegetation, and reinforce vegetation on slopes, ditch bottoms and shorelines.
- b. MnDOT Specification Section 3885 Blankets Type:
  - i. Category 4N Straw/Coconut 2S shall be utilized for all slopes less than 3:1 and greater than 4:1.
  - ii. Category 3N Straw 2S for all slopes less than 4:1 and greater than 8:1.
  - iii. Erosion Control shall meet criteria on Table 3885-3 in MnDOT Specification Section 3885.
  - iv. Natural netting (indicated by the "N") shall be on both sides of the mat, as indicated by the "2S".

<b>Table 3885-3 Erosion Control Blanket Criteria</b>						
<b>Criteria</b>		<b>*Category 3P, Category 3N</b>		<b>*Category 4P, Category 4N</b>		
		<b>Straw 2S</b>	<b>Wood Fiber 2S</b>	<b>Straw-Coconut 2S</b>	<b>Wood Fiber 2S</b>	
mass per yd <sup>2</sup> [m <sup>2</sup> ] (min) ASTM D 6475		6.0 oz [0.17 kg]	6.0 oz [0.17 kg]	6.0 oz [0.17 kg]	8.0 oz [0.23 kg]	
Permissible Shear stress, (min) (non-vegetated) ASTM D 6460		1.7 lb/sq.ft [84 Pa]	1.7 lb/sq.ft [84 Pa]	2.25 lb/sq.ft. [108 Pa]	2.25 lb/sq.ft. [108 Pa]	
Fill	Fiber length, 80% greater than	3 in [75 mm]	6 in [150 mm]	3 in [75 mm]	6 in [150 mm]	
	Material	100% Straw	100% Excelsior	70% Straw, 30% Coconut	100% Excelsior	
	Service Life	-	-	-	-	
Netting	Material	**Degradable Synthetic or Natural	**Degradable Synthetic or Natural	**Degradable Synthetic or Natural	**Degradable Synthetic or Natural	
	Netting Opening, (min) (MD x TD)	Synthetic	0.5in x 0.5in [13mm x 13 mm]	0.75in x 0.75in [19mm x 19mm]	0.5in x 0.5 in [13mm x13 mm]	0.75in x 0.75 in [19mm x 19 mm]
		Natural	0.5 x 0.5 in [13mm x 13 mm]	0.75 x 0.75 in [19mm x 19mm]		
	Tensile Strength Synthetic(max)AS TM D 4355	MD	-	-	-	-
		TD	-	-	-	-
Service Life (max)	9 months	9 months	12 months	12 months		
Stitching	Material	**Degradable Synthetic or Natural	**Degradable Synthetic or Natural	**Degradable Synthetic or Natural	**Degradable Synthetic or Natural	
	Tensile Strength(max) ASTM D 4355	-	-	-	-	
	Service life (max)	6 months	6 months	6 months	6 months	
	Max spacing	2 in [50 mm]	4 in [100 mm]	2 in [50 mm]	4 in [100 mm]	

\* 3P &4P = Synthetic netting, 3N & 4N = Natural netting and natural stitching  
 \*\* Not Photo Degradable

- c. Provide fill material with a uniform web of interlocking fibers, with uniform thickness, and with the material fibers evenly distributed over the entire area of the blanket.
- d. Provide anchors consisting of 11 gauge steel wire a minimum 6 inches long.

F. Turf Reinforcement Mats:

- a. MnDOT Specification Section 3885, TRM 3 for Slope greater than 3:1 and at pipe outlets.
- b. Provide Turf Reinforcement Mats (TRM) made of a three-dimensional matrix of synthetic materials, continuously bonded at filament intersections meeting the requirements of Table 3885-6 in MnDOT Specification Section 3885.

<b>Table 3885-6 Turf Reinforcement Mat Criteria</b>			
<b>TRM Category</b>	<b>Minimum Permissible Shear Stress <sup>  </sup>, lb/sq ft [Pa]</b>	<b>Minimum Tensile Strength <sup>†</sup>, lb/ft [kN/m] ASTM-D 6818</b>	<b>Matrix Composition <sup>*</sup></b>
1	2.1 [100]	125 [1.82]	Nylon, Polypropylene, Polyolefin, or Polyester
*2	6 [288]	150 [2.19]	Nylon, Polypropylene, Polyolefin, or Polyester
*3	8 [384]	175 [2.55]	Nylon, Polypropylene, Polyolefin, or Polyester
*4	10 [480]	1370 [20]	Nylon Polypropylene, Polyolefin, or Polyester
<p>* Provide mats with cells at least 3/8 - 3/4 in [10-19 mm) in depth to allow soil filling and retention.                         ASTM D 6460-07 vegetated.                      † Minimum Average Roll Value of either direction.                      ‡ Minimum thickness of 1/4 in [6.4 mm), UV stability ASTM D4355 at 500 hours of 80 percent.</p>			

- c. Fill all Turf Reinforcement Mats with soil.
  - d. Provide anchors consisting of 11 gauge steel wire a minimum 10 inches long. Anchor shall be adjusted in the field to assure TRM is held securely in place.
  - e. Approved products for this specification are on file on the MnDOT web page in the Materials Engineering Section.
- G. Storm Drain Inlet Protection: Filter Bag insert or approved equivalent. Silt fence wrapped on casting or silt fence or strawbales surrounding catchbasin or manhole will not be allowed.
- H. Filter Log:
- a. Provide sediment control logs for slowing water velocities, filtering sediment and diverting stormwater runoff.
  - b. MnDOT specification Section 3897 Type Straw, Wood or Compost Log.
    - i. Straw: Provide straw logs meeting the following requirements and characteristics:
      1. Type 3 mulch per 2.1.A.
      2. Encased in photodegradable natural netting with a service life from 6 months to 9 months with openings 1/2 inch x 1/2 inch.
      3. Diameter from 8 inch to 9 inch.
      4. Consisting of at least 80 percent of the fiber material at least 3 inches long.
      5. Dry weight of 2 - 4 pounds per cubic foot.
    - ii. Wood Fiber: Provide wood fiber logs with the following requirements and characteristics:
      1. Excelsior wood fibers.
      2. Encased in photodegradable natural netting with a service life from 6 months to 9 months with openings 1/2 inch x 1/2 inch.

3. Diameter from 6 inch to 9 inch.
  4. Consisting of at least 80 percent of the fiber material at least 6 inches long.
  5. Dry weight of 1.4 - 5.7 pounds per cubic foot.
- iii. Wood Chip: Provide wood chip logs meeting the following requirements and characteristics:
1. Type 6 mulch MnDOT Specification Section 3882.
    - a. Raw wood material from hard or soft timber that is the product of a mechanical chipper, hammermill or tub grinder.
    - b. Material is free of mold, dirt, sawdust and deleterious material.
    - c. Do not use wood material in an advanced state of decomposition, chipped-up manufactured boards or chemically treated wood; including wafer board, particle board, Chromated Copper Arsenate (CCA), or penta treated wood.
    - d. Material is air dried.
    - e. Do not allow unattached bark, green-leaf composition to exceed 20 percent by mass.
    - f. Maximum length of individual pieces shall not exceed 12 inches.
    - g. Maximum width of individual pieces shall not exceed two inches.
  2. Encased in photodegradable natural netting with a service life from 12 months to 24 months with openings 1/8 inch x 3/8 inch.
  3. Diameter from 8 inch to 10 inch.
- iv. Compost: Provide compost logs meeting the following characteristics and requirements:
1. Consisting of the following blend of compost and partially decomposed wood chips:
    - a. From 30 percent to 40 percent, Grade 2 compost in accordance with MnDOT Specification 3890 with at least 70 percent retained on the 3/8 inch sieve.
      - i. Grade 2 Compost:
        1. Provide Grade 2 compost that is humus-rich, derived from natural decomposition of leaves and yard wastes and has a texture similar to a shredded peat.
        2. Do not use manure at any stage of decomposition.
        3. Shall meet requirements as indicated in Table 3890-2 in MnDOT Specification Section 3890.



<b>Table 3890-2 Grade 2 Compost Requirements</b>	
<b>Requirement</b>	<b>Range</b>
Organic matter content	≥ 30 %
C/N ratio	6:1 – 20:1
pH	5.5 – 8.5
Moisture content	35% – 55%
Bulk density	700 lb per cu. yd – 1,600 lb per cu. yd [415 kg per cu. m – 890 kg per cu. m]
Inert material *	< 3% at 0.15 in [4 mm]
Soluble salts	≤ 10 mmho per cm
Germination test	80% – 100%
Screened particle size	≤ ¾ in [19 mm]
* Includes plastic bag shreds.	
Germination test must list the species of Cress or lettuce seed used.	

4. Provide compost material from vendors listed on the MnDOT Approved/Qualified Products List.
  5. Submit certified test reports and a manufacturer’s Certificates of Compliance.
- b. From 60 percent to 70 percent partially decomposed Type 6 mulch per MnDOT Specification 3882.
- i. Type 6 Mulch:
    1. Raw wood material from hard or soft timber and that is the product of a mechanical chipper, hammermill, or tub grinder
    2. Material is free of mold, dirt, sawdust and deleterious material
    3. Do not use wood material in an advanced state of decomposition, chipped-up manufactured boards or chemically treated wood.
    4. Material is air-dried
    5. Do not allow unattached bark, green-leaf composition to exceed 20 percent by mass
    6. Maximum length of individual pieces shall not to exceed 12 inches.
    7. Maximum width of individual pieces shall not to exceed 2 inches.
  2. Encased in photodegradable natural netting with a service life from 12 months to 24 months with openings 1/8 inch x 3/8 inch.
  3. Diameter from 7 inch to 9 inch.

- c. For anchoring provide wood stakes 1 inch by 2 inch and 22-24 inches long with a pointed end.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

#### 3.2 PREPARATION

- A. Examine Schedule work so that soil surfaces are left exposed for the minimum amount of time.

#### 3.3 CONSTRUCTION ACTIVITY REQUIREMENTS

- A. **STORM WATER POLLUTION PREVENTION PLAN** The Contractor must implement the SWPPP and the requirements of this part. The Best Management Practices (BMPs) identified in the SWPPP and in this permit must be installed in an appropriate and functional manner.

- B. **EROSION PREVENTION PRACTICES**

- a. The Contractor must plan for and implement appropriate construction phasing, vegetative buffer strips, horizontal slope grading, and other construction practices that minimize erosion, so that the inspection and maintenance requirements are complied with. The location of areas not to be disturbed must be delineated (e.g. with flags, stakes, signs, silt fence etc.) on the development site before work begins. Phasing and special site areas to be marked/staked are indicated on the SWPPP.
- b. All exposed soil areas with a continuous positive slope must have temporary erosion protection or permanent cover for the exposed soil areas year round, according to the following table of slopes and time frames (Maximum time an area can remain open when the area is not actively being worked):

<u>Type of Slope</u>	<u>Time</u>
Steeper than 3:1	7 days
10:1 to 3:1	14 days
Flatter than 10:1	21 days

- i. These areas include constructed bioswale side slopes, and any exposed soil areas with a positive slope to a storm water conveyance system, such as a curb and gutter system, storm sewer inlet, temporary or permanent drainage ditch or other natural or man made systems that discharge to a surface water.
  - ii. See Section 1.4.D for limitations during fish migration and spawning.
- C. The normal wetted perimeter of any temporary or permanent drainage ditch that drains water from a construction site, or diverts water around a site, must be stabilized within 200 lineal feet from the property edge, or from the point of discharge to any surface water. Stabilization must be completed within 24 hours of connecting to a surface water.
    - a. Pipe outlets must be provided with temporary or permanent energy dissipation within 24 hours of connection to a stormwater conveyance system.
  - D. **SEDIMENT CONTROL PRACTICES**
    - a. Sediment control practices must minimize sediment from entering surface waters, including curb and gutter systems and storm sewer inlets.

- b. Temporary or permanent drainage ditches and sediment basins that are designed as part of a treatment system require sediment control practices only as appropriate for site conditions.
- c. If the down gradient treatment system is overloaded, additional upgradient sediment control practices must be installed to eliminate the overloading, and the SWPPP must be amended to identify these additional practices.
- d. In order to maintain sheet flow and minimize rills and/or gullies, there shall be no unbroken slope length of greater than 75 feet for slopes with a grade of 3:1 or steeper.
- e. Sediment control practices must be established on all down gradient perimeters before any upgradient land disturbing activities begin. These practices shall remain in place until final stabilization has been established.
- f. The timing of the installation of sediment control practices may be adjusted to accommodate short-term activities such as clearing or grubbing, or passage of vehicles. Any short-term activity must be completed as quickly as possible and the sediment control practices must be installed immediately after the activity is completed. However, sediment control practices must be installed before the next precipitation event even if the activity is not complete.
- g. All storm drain inlets must be protected by appropriate BMPs during construction until all sources with potential for discharging to the inlet have been stabilized.
- h. Temporary soil stockpiles must have silt fence or other effective sediment controls, and cannot be placed in surface waters, including storm water conveyances such as curb and gutter systems, or conduits and ditches.
- i. Vehicle tracking of sediment from the construction site must be minimized by BMPs such as stone pads, concrete or steel wash racks, or equivalent systems. Streets must be swept daily.
- j. Install of erosion stabilization mats:
  - i. Before installation apply topsoil, fertilizer and seed to surface. Begin at the top of the channel, install mats by anchoring in a 6" deep by 6" wide trench with approximately 12" of mat extended beyond the upslope portion of the trench. Anchor with a row of staples approximately 12" apart in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to compacted soil and fold remaining 12" portion of mat back over seed and soil. Secure mats with a row of staples spaced approximately 12" apart across the width of the mats.
  - ii. Roll center mats in direction of water flow in bottom of channel.
  - iii. Place consecutive and adjacent mats end over end (shingle-style) with a minimum 6" overlap. Use a double row of staples staggered 4" apart and 4" on center to secure overlapped mats.
  - iv. Full length edge of mats at top of side slopes must be anchored with a row of staples approximately 12" apart in a 6" deep by 6" wide trench.
  - v. The terminal end of mats must be anchored with a row of staples approximately 12" apart in a 6" deep by 6" wide trench.
  - vi. Backfill and seed after stapling.
  - vii. Follow manufacturer's recommendations for proper installation.

#### E. DEWATERING AND BASIN DRAINING

- a. Dewatering or basin draining (e.g., pumped discharges, trench/ditch cuts for drainage) related to the construction activity that may have turbid or sediment laden discharge water must be discharged to a temporary or permanent sedimentation basin on the project site whenever possible. If the water cannot be discharged to a sedimentation basin prior to entering the surface water, it must be treated with the appropriate BMPs, such that the discharge does not adversely affect the receiving water or downstream landowners. The Contractor must ensure that discharge points are adequately protected from erosion and scour. The discharge must be dispersed over natural rock riprap, sand bags, plastic sheeting or other accepted energy dissipation measures. Adequate sedimentation control measures are required for discharge water that contains suspended solids.
- b. All water from dewatering or basin draining activities must be discharged in a manner that does not cause nuisance conditions, erosion in receiving channels or on downslope properties, or inundation in wetlands causing significant adversely impact to the wetland.
- c. Obtain all permits for dewatering prior to initiation any dewatering practice. Prior to permit application, the Contractor shall seek pre-approval from Owner project contact.
- d. See Section 023100 Demolition Part 1.6.D for water appropriations permits

#### F. INSPECTIONS AND MAINTENANCE

- a. The Contractor must routinely inspect the construction site once every seven days during active construction and within 24 hours after a rainfall event greater than 0.5 inches in 24 hours.
- b. All inspections and maintenance conducted during construction must be recorded on an Owner-provided inspection forms and these records must be retained with the SWPPP. Use of the Owner inspection form (Section 1.4(G)) and weather log (Section 1.4(F)) accounts for permit-required elements.
- c. Where parts of the construction site have undergone final stabilization, but work remains on other parts of the site, inspections of the stabilized areas may be reduced to once per month. Where work has been suspended due to frozen ground conditions, inspections may also be suspended until thaw at the site occurs, but only upon pre-approval of Owner contact.
- d. All erosion prevention and sediment control BMPs must be inspected to ensure integrity and effectiveness. All nonfunctional BMPs must be repaired, replaced, or supplemented with functional BMPs. The Contractor must investigate and comply with the following inspection and maintenance requirements:
  - i. All silt fences must be repaired, replaced, or supplemented when they become nonfunctional or the sediment reaches 1/3 of the height of the fence. These repairs must be made within 24 hours of discovery, or as soon as field conditions allow access.
  - ii. Temporary and permanent sedimentation basins must be drained and the sediment removed when the depth of sediment collected in the basin reaches 1/2 the storage volume. Drainage and removal must be completed within 72 hours of discovery, or as soon as field conditions allow access.
  - iii. Surface waters, including drainage ditches and conveyance systems, must be inspected for evidence of sediment being deposited by erosion. The Contractor must remove all deltas and sediment deposited in surface waters, including

drainage ways, catch basins, and other drainage systems, and restabilize the areas where sediment removal results in exposed soil. The removal and stabilization must take place within seven days of discovery unless precluded by legal, regulatory, or physical access constraints. The Contractor shall use all reasonable efforts to obtain access. If precluded, removal and stabilization must take place within seven calendar days of obtaining access. The Contractor is responsible for contacting all local, regional, state and federal authorities and receiving any applicable permits, prior to conducting any work.

- iv. Construction site vehicle exit locations must be inspected for evidence of off-site sediment tracking onto paved surfaces. Tracked sediment must be removed from all off-site paved surfaces, within 24 hours of discovery, or if applicable, within a shorter time if requested by the Owner. The Contractor is responsible for the operation and maintenance of temporary and permanent water quality management BMPs, as well as all erosion prevention and sediment control BMPs, for the duration of the construction work at the site. The Contractor is responsible until another owner/operator has assumed control according to over all areas of the site that have not been finally stabilized or the site has undergone final stabilization, and a NOT has been submitted to the MPCA in accordance with the procedure identified in Section 1.5(G).
- v. If sediment escapes the construction site, off-site accumulations of sediment must be removed in a manner and at a frequency sufficient to minimize off-site impacts (e.g., fugitive sediment in streets could be washed into storm sewers by the next rain and/or pose a safety hazard to users of public streets.)
- vi. All infiltration areas must be inspected to ensure that no sediment from ongoing construction activities is reaching the bioswale area and these areas are protected from compaction due to construction equipment driving across the infiltration area.

#### G. POLLUTION PREVENTION MANAGEMENT MEASURES

The Contractor shall implement the following pollution prevention management measures on the site:

- a. Storage, Handling, and Disposal of Construction Products, Materials, and Wastes: The contractor shall comply with the following standards to minimize the exposure to stormwater of any of the products, materials, or wastes at Owner project sites. Products or wastes which are either not a source of contamination to stormwater or are designed to be exposed to stormwater are not held to this requirement:
- b. Building products that have the potential to leach pollutants must be under cover (e.g., plastic sheeting or temporary roofs) to prevent the discharge of pollutants or protected by a similarly effective means designed to minimize contact with stormwater.
- c. Pesticides, herbicides, insecticides, fertilizers, treatment chemicals, and landscape materials must be under cover (e.g., plastic sheeting or temporary roofs) to prevent the discharge of pollutants or protected by similarly effective means designed to minimize contact with stormwater.
- d. Hazardous materials, toxic waste, (including oil, diesel fuel, gasoline, hydraulic fluids, paint solvents, petroleum-based products, wood preservatives, additives, curing compounds, and acids) must be properly stored in sealed containers to prevent spills, leaks or other discharge. Restricted access storage areas must be provided to prevent vandalism. Storage and disposal of hazardous waste or hazardous materials must be in compliance with Minn. R. ch. 7045 including secondary containment as applicable.

- e. Solid waste must be stored, collected and disposed of properly in compliance with Minn. R. ch. 7035.
- f. Portable toilets must be positioned so that they are secure and will not be tipped or knocked over. Sanitary waste must be disposed of properly in accordance with Minn. R. ch. 7041.
- g. Fueling and Maintenance of Equipment or Vehicles; Spill Prevention and Response: The Permittee(s) shall take reasonable steps to prevent the discharge of spilled or leaked chemicals, including fuel, from any area where chemicals or fuel will be loaded or unloaded including the use of drip pans or absorbents unless infeasible. In situations where permanent containment is not feasible, rubberized containers suitable for use under equipment during fueling operations is acceptable. The Permittee(s) must conduct fueling in a contained area unless infeasible. The Permittee(s) must ensure adequate supplies are available at all times to clean up discharged materials and that an appropriate disposal method is available for recovered spilled materials. The Permittee(s) must report and clean up spills immediately as required by Minn. Stat. § 115.061, using dry clean up measures where possible.
- h. Vehicle and equipment washing: No vehicle or equipment washing is allowed at Owner project sites, including but not limited to staging areas.
- i. Concrete and other washouts waste: The Permittee(s) must provide effective containment for all liquid and solid wastes generated by washout operations (concrete, stucco, paint, form release oils, curing compounds and other construction materials) related to the construction activity. The liquid and solid washout wastes must not contact the ground, and the containment must be designed so that it does not result in runoff from the washout operations or areas. Liquid and solid wastes must be disposed of properly and in compliance with MPCA rules. A sign must be installed adjacent to each washout facility that requires site personnel to utilize the proper facilities for disposal of concrete and other washout wastes.

#### H. FINAL STABILIZATION

The Contractor must ensure final stabilization of the site. The Contractor shall follow the procedure described by Section 1.5(G) within 30 days after final stabilization is complete. Final stabilization can be achieved in one of the following ways:

- a. All soil disturbing activities at the site have been completed and all soils must be stabilized by a uniform perennial vegetative cover with a density of 70 percent over the entire pervious surface area to prevent soil failure under erosive conditions and;
  - i. All drainage ditches, constructed to drain water from the site after construction is complete, must be stabilized to preclude erosion;
  - ii. All temporary synthetic, and structural erosion prevention and sediment control BMPs must be removed as part of the site final stabilization; and
  - iii. The Contractor must clean out all sediment from conveyances and from temporary sedimentation basins. Sediment must be stabilized to prevent it from being washed back into the basin, conveyances or drainage ways discharging off-site or to surface waters.

#### 3.5 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.

- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

**END OF SECTION 31 25 00**

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**SECTION 32 11 23 - AGGREGATE BASE COURSE**

**PART 1 - GENERAL**

**1.1 CONDITIONS OF THE CONTRACT**

- A. Conditions of the Contract, DIVISION 00 and General Requirements, DIVISION 01 govern work under this Section.
  - 1. Performance of the Work of this Section shall comply with DIVISION 00 for Prevailing Wage Rate Requirements that apply to this project.
  - 2. Performance of the Work of this Section shall comply with DIVISION 01 for Storm Water Plan "SWPPP" Requirements and SWPPP training requirements that apply to this project.

**1.2 SECTION INCLUDES**

- A. Aggregate base course

**1.3 RELATED SECTIONS**

- A. Section 312200 – Grading
- B. Section 312323 - Fill
- C. Section 312317 - Trenching
- D. Section 321314 – Vehicular Concrete Paving

**1.4 REFERENCES**

- A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; American Association of State Highway and Transportation Officials; 1965 (2000).
- B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18 in Drop; American Association of State Highway and Transportation Officials; 2001.
- C. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2005.
- D. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>); 2000a.
- E. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (12,400 ft-lbf/ft<sup>3</sup>); 2002.
- F. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2000.
- G. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>); 2002.
- H. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2000.
- I. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2004.

- J. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2004.
- K. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2000.
- L. Minnesota Department of Transportation Standard Specifications For Construction, 2016 Edition and Corresponding Supplements.
  - 1. Where reference is made to a number preceded by "MnDOT", the reference shall be understood to mean that numbered section of the Department of Transportation Standard Specifications, Latest edition.
  - 2. Provisions for measurement and payment shall not apply except as amended herein and all costs in connection therewith shall be included in the lump sum price bid for the work.

1.5 SUBMITTALS

- A. Samples: 10 lb sample of each type of aggregate; submit in air-tight containers to testing laboratory.
- B. Materials Sources: Submit name of imported materials source. Include certification of aggregate per specifications and provide production gradations.
- C. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Compaction Density Test Reports.

1.6 PROJECT CONDITIONS

- A. Provide sufficient quantities of aggregate to meet project schedule and requirements. When necessary, store materials on site in advance of need.
- B. When aggregate materials need to be stored on site, locate stockpiles where indicated.
  - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
  - 2. Prevent contamination.
  - 3. Protect stockpiles from erosion and deterioration of materials.
- C. Verify that survey bench marks and intended elevations for the Work are as indicated.
- D. Refer to 311000 - Site Clearing for additional information.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Coarse Aggregate Class V MNDOT Standard Specification Section 3138 Aggregate for Surface and Base Courses:
  - 1. Provide certified aggregate materials that have uniform: appearance, texture, moisture content and performance characteristics.
  - 2. Provide virgin aggregates meeting the following requirements:
    - a. Comprised of naturally occurring mineral materials, and contains no topsoil, organics or disintegrating rock.
    - b. Conforms to quality requirements

<b>Quality Requirements for Virgin Materials</b>	
<b>Requirement</b>	<b>Class 5</b>
Max Shale, if No. 200 ≤ 7% by mass	10%
Max Shale, if No. 200 > 7% by mass	7%
Minimum Crushing Requirements (Material crushed from quarries is considered crushed material.)	10%
Maximum Los Angeles Rattler (LAR) loss from carbonate quarry rock	40%
Maximum Insoluble residue for the portion of quarried carbonate aggregates passing the No. 200 sieve	10%

c. Product shall contain less than 25% recycled materials and conform to:

<b>Base Aggregate (Total Percent Passing)</b>	
<b>Sieve Size</b>	<b>Class 5 Base</b>
1 inch	100
3/4 inch	90-100
3/8 inch	50-90
No. 4	35-80
No. 10	20-65
No. 40	10-35
No. 200	3.0-10.0

- B. Sand subbase layer shall follow MnDOT Specification 3149.2B2 for Select Granular Borrow modified such that the material has less than 5% passing the #200 sieve and less than 40% passing the #40 sieve.
1. Provide certified granular material meeting the specified gradation.
  2. Report the No. 200 sieve results to the nearest 0.1 percent and all other sieves to the nearest whole number.
  3. Provide certified granular material that has similar appearance, texture, moisture content, and performance characteristics.
  4. Provide virgin aggregate meeting the following requirements:
    - a. Consists of naturally occurring mineral materials;
    - b. Contains non topsoil, organics, or severely weathered rock, and
    - c. Insoluble residue test results for the portion of quarried/bedrock carbonate aggregates, passing the No. 200 sieve is no greater than 10 percent.
  5. Provide granular materials meeting the requirements for MnDOT Select Granular Material 3149 modified to have less than 10% passing the No. 200 sieve.

## 2.2 SOURCE QUALITY CONTROL

- A. Where aggregate materials are specified using ASTM D 2487 classification, test and analyze samples for compliance before delivery to site.
- B. If tests indicate materials do not meet specified requirements, change material and retest.
- C. Provide materials of each type from same source throughout the Work.
- D. Salvage crushed concrete is not allowed in areas where perforated drainage pipes are placed.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify substrate has been inspected by a Geotechnical Engineer or qualified representative of the Independent Laboratory, gradients and elevations are correct, and is dry.

### 3.2 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place aggregate on soft, muddy, or frozen surfaces.
- C. Strip unsuitable soils consisting of topsoil, organic soils, peat, vegetation, existing structures, debris-laden fill and pavements from the area within five feet of the surface of the proposed pavement grade if not already corrected from building excavations or utility trenches.
- D. Areas of lower permeability soils shall be graded at a 10:1 taper to areas of sand so that water does not accumulate on the subgrade. See geotechnical engineer for direction during field observations.
- E. Surface compact with at least five passes of a large roller with a minimum drum diameter of 3 feet.
- F. Place a minimum of 12" of granular fill and compact as defined in 312323 – Fill.
- G. Prior to placement of aggregate base, perform proof roll with fully loaded tandem axle truck and observed by a Geotechnical Engineer. Correct any soft or weak areas prior to placing aggregate.

### 3.3 INSTALLATION

- A. Spread sand subbase layer as recommended in the geotechnical report and per geotechnical engineer.
- B. Spread aggregate over prepared substrate to a total compacted thickness as indicated on drawings.
- C. Place aggregate in maximum 3 inch layers and compact to specified density per Section 312323 - Fill.
- D. Level and contour surfaces to elevations and gradients indicated.
- E. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- F. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

- 1. Ensure the aggregate material has a uniform consistency before compaction.
- G. Place and compact lifts per Table 2211-2 in MnDOT Specification 2211 based on lift thickness and bitumen content.

<b>Table 2211-2 Rollers Required for Compaction</b>	
<b>Base Lift Thickness / Bitumen Content</b>	<b>Required Rollers</b>
≤ 3 in [75 mm] / Any Bitumen Content	Use Pneumatic Rollers only
> 3 in [75 mm] to ≤ 6 in [150 mm] / Bitumen Content ≤ 2.5%	Use both Vibratory and Pneumatic Rollers
> 3 in [75 mm] to ≤ 6 in [150 mm] / Bitumen Content > 2.5%	Use both Vibratory Pad Foot roller weighing at least 25,000 lb. [11,300 kg] and 25 ton [22.7 tonne] Pneumatic Roller

- H. Place and compact the base to support traffic, while allowing no greater than ½ inch of surface displacement when measured using a straightedge. Construct to tolerances lifts in 3.5.
- I. Maintain the compaction, quality, integrity and properties of the aggregate material in each lift until the next lift or layer is placed.
- J. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

**3.4 TOLERANCES**

- A. Flatness: Maximum variation of 1/8 inch measured with 10 foot straight edge.
- B. Scheduled Compacted Thickness: Within 1/8 inch.
- C. Variation From Design Elevation: Within 1/8 inch.

**3.5 FIELD QUALITY CONTROL**

- A. See Sections 312200 – Grading and 312323 – Fill for testing and compaction requirements.
- B. Correct, blend and recompact aggregate material represented by failing tests.

**3.6 CLEAN-UP**

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

**END OF SECTION 32 11 23**

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## SECTION 32 12 16 - ASPHALT PAVING

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Bituminous concrete paving.
- B. Surface sealer.

#### 1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 31 23 23 - Fill
- C. Section 32 11 23 - Aggregate Base Courses

#### 1.3 REFERENCES

- A. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types; The Asphalt Institute; 1994, Sixth Edition.
- B. AI MS-19 - A Basic Asphalt Emulsion Manual; The Asphalt Institute; Third Edition.
- C. ASTM D 946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 1982 (Reapproved 1999).
- D. Minnesota Department of Transportation Standard Specifications for Construction, 2016 Edition and Corresponding Supplements.

#### 1.4 SUBMITTALS

- A. See Divisions 0 and 1 for submittal procedures.
- B. Product data: Within 10 calendar days after Contractor has received the Owner's Notice to Proceed, submit for review and approval:
  - 1. Asphalt Cement Concrete mix design. The proposed mixture shall be an established mix formulated within the past year. If a current mix is not available, a new mix should be designed and tested at Contractor's expense.
  - 2. Certificates, signed by the aggregate materials producer and Contractor stating that materials meet or exceed the specified requirements. Cost of necessary testing to be paid for by Contractor.

#### 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Minnesota Department of Transportation Standards.
- B. Mixing Plant: Conform to State of Minnesota Department of Transportation Standards.
- C. Obtain materials from same source throughout.
- D. Submit shop drawings of aggregate base and bituminous mix designs prior to construction.
- E. Mix plant and mix designs to be MnDOT certified.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F (4 degrees C), or surface is wet or frozen. If course is 1" or less in thickness, temperature must be 50 degrees F or above.
- B. Place bitumen mixture when temperature is not more than 15 F degrees (8 C degrees) below bitumen supplier's bill of loading and not more than maximum specified temperature.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Asphalt Cement: ASTM D 946.
- B. Aggregate for Base Course: See Section 32 11 23 - Aggregate Base Course.
- C. Tack Coat: Homogeneous, medium curing, liquid asphalt. In accordance with State of Minnesota Department of Transportation Standards Specification Section 2357.

2.2 ASPHALT PAVING MIXES AND MIX DESIGN

- A. Use dry material to avoid foaming. Mix uniformly.
- B. Binder Course: Per MnDOT Specification Section 2360 – See details on drawing for mix design.
- C. Wearing Course: Per MnDOT Specification Section 2360 – See details on drawing for mix design.
- D. Submit proposed mix design of each class of mix for review prior to beginning of work.
- E. Contractor shall provide one sample of in-place mixture for each days construction for laboratory testing to ensure conformance with MnDOT specifications.

2.3 SOURCE QUALITY CONTROL

- A. Test mix design and samples in accordance with AI MS-2.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify gradients and elevations of base are correct.
- B. Verify testing of base course has been performed and has met specifications.

3.2 BASE COURSE

- A. See Section 32 11 23 - Aggregate Base Course.

3.3 PREPARATION - TACK COAT

- A. Apply tack coat in accordance with manufacturer's instructions and MnDOT Specification Section 2357.



- B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate per MnDOT standards.
- C. Coat surfaces of manhole frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.4 PLACING ASPHALT PAVEMENT

- A. Place binder course to compacted thickness as shown on plans.
- B. Place asphalt wearing course within 24 hours of applying tack coat.
- C. Place wearing course to compacted thickness as shown on plans.
- D. Install gutter drainage grilles and frames in correct position and elevation.
- E. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- F. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.5 TOLERANCES

- A. Flatness: Maximum variation of 1/8 inch measured with 10 foot straight edge.
- B. Compacted Thickness: Within 1/8 inch of specified or indicated thickness.
- C. Variation from True Elevation: Within 1/8 inch.

3.6 FIELD QUALITY CONTROL

- A. See Divisions 0 and 1 for quality control.
- B. Owner shall secure and pay for the services of an Independent Testing Laboratory to conduct the pavement testing program.
- C. A qualified representative of the testing laboratory shall be present at the site during the performance of the work required under this Section. Contractor shall notify testing laboratory a minimum of two days in advance of required testing and shall coordinate with Engineer.
- D. The following tests shall be performed:
  - 1. Nuclear field density tests.
  - 2. Marshall density tests.
  - 3. Bituminous extraction and mechanical analysis of aggregate.
- E. Any surface depressions will be water tested by testing the depression one hour after wetting by placing one nickel coin flatwise in ponded area. Where water covers coins, the area will be outlined and shall be removed and redone at contractor's expense.
- F. Quality of pavement shall be such that there is no raveling, uneven roller marks, depressions as noted in 3.6.E or unsmooth abutments to adjacent gutters, curbs, concrete pavement and manhole/catch basin castings. Any pavement that does not meet the quality standards as determined by the Owner and Architect shall be removed and replaced at the contractor's sole expense.

- G. Clean and sweep excess bituminous rock and spray from any concrete surfaces or landscaping immediately after placement.
- H. Excess oil spray shall be scrubbed clean of any adjoining structure or adjacent concrete surface.

3.7 PROTECTION

- A. Immediately after placement, protect pavement from mechanical injury for five days or until surface temperature is less than 140 degrees F (60 degrees C).

**END OF SECTION 32 12 16**

**SECTION 32 13 14 – CONCRETE PAVING**

## PART 1 - GENERAL

## 1.1 SECTION INCLUDES

- A. Vehicular concrete curbs, gutters, parking areas and drive aisles.

## 1.2 RELATED SECTIONS

- A. Section 312200 – Grading
- B. Section 312323 - Fill
- C. Section 321123 - Aggregate Base Courses
- D. See Cast-in-Place Concrete Specifications on Structural Documents

## 1.4 REFERENCES

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).
- B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 1999.
- C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.
- D. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 1999.
- E. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 1988.
- F. ASTM A 185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2002.
- G. ASTM A 497/A 497M - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete; 2002.
- H. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2004b.
- I. ASTM C 33 - Standard Specification for Concrete Aggregates; 2003.
- J. ASTM C 39/C 39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2004a.
- K. ASTM C 94/C 94M - Standard Specification for Ready-Mixed Concrete; 2004a.
- L. ASTM C 150 - Standard Specification for Portland Cement; 2004a.
- M. ASTM C 173/C 173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2001.
- N. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2001.
- O. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2003.

- P. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete; 2004.
- Q. ASTM C 618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2003.
- R. ASTM C 685/C 685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2001.
- S. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (nonextruding and Resilient Bituminous Types); 2004.
- T. Minnesota Department of Transportation Standard Specifications for Construction, 2016 Edition and Corresponding Supplements.

#### 1.5 SUBMITTALS

- A. Product Data: Provide data on joint filler, admixtures, and curing compound.
- B. Provide shop drawings on concrete mix design.
- C. Provide concrete joint layout plan for review and approval prior to starting work on concrete.
  - 1. Joint layout shall follow joint layout of existing truck parking lot. Align new pavement joints to match existing pavement to prevent irregular cracking.
  - 2. Submittal shall be reviewed and approved by Owner and Engineer of Record. Layout plan shall include joint dimensions, joint types, joint panels that require reinforcement, and joint panels that will have a thickened edge.

#### 1.6 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Obtain cementitious materials from same source throughout.
- C. Follow recommendations of ACI 305R when concreting during hot weather.
- D. Follow recommendations of ACI 306R when concreting during cold weather.

#### 1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when base surface temperature is less than 40 degrees F (4 degrees C), or surface is wet or frozen.

### PART 2 - PRODUCTS

#### 2.1 FORM MATERIALS

- A. Form Materials: Conform to ACI 301.
- B. Wood form material, profiled to suit conditions.
- C. Joint Filler: Preformed; non-extruding bituminous type (ASTM D 1751).
  - 1. Thickness: 1/2 inch.

#### 2.2 REINFORCEMENT

- A. Not used.

## 2.3 CONCRETE MATERIALS

- A. Concrete Materials: As specified in Structural Documents for Cast-in-place Concrete.
- B. Concrete Materials: Provide in accordance with State of Minnesota Department of Transportation standards.
- C. Cement: ASTM C 150 Normal - Type I Portland type, grey color, low alkali.
- D. Aggregate, general:
  - 1. ASTM C30, uniformly graded and clean.
  - 2. Do not use aggregate known to cause excessive shrinkage.
- E. Aggregate, coarse: Crushed rock or washed gravel with maximum size between  $\frac{3}{4}$ " and  $1\frac{1}{2}$ ", and with minimum size number 4.
- F. Aggregate, fine: Natural washed sand of hard and durable particles varying from fine to particles passing a  $\frac{3}{8}$ " screen, of which at least 12% shall pass a 50-mesh screen.
- G. Water: Clean, and not detrimental to concrete.
- H. Air Entrainment Admixture: ASTM C 260.

## 2.4 ACCESSORIES

- A. Curing Compound: ASTM C 309, Type 1, Class A.
- B. Joint Sealer: In accordance with MnDOT standards.

## 2.5 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
- C. Concrete Properties:
  - 1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: see Section 3.12.
  - 2. Total Air Content: 5-7 percent, determined in accordance with ASTM C 173/C 173M.
  - 3. Maximum Slump: 3-4 inches.

## 2.6 MIXING

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C 685. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
- B. Transit Mixers: Comply with ASTM C 94/C 94M.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.
- C. Refer to 31 1000 - Site Clearing for additional information.

### 3.2 SUBBASE

- A. See Section 321123 - Aggregate Base Courses for construction of base course for work of this Section.
- B. Prepare subbase in accordance with Section 312323 - Fill.

### 3.3 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Coat surfaces of manhole frames with oil to prevent bond with concrete pavement.
- C. Notify Engineer minimum 24 hours prior to commencement of concreting operations.

### 3.4 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

### 3.5 REINFORCEMENT

- A. Not used.

### 3.6 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete in accordance with MnDOT standards.
- C. Place concrete using the slip form technique.
- D. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.
- E. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- F. Apply surface retarder to all exposed surfaces in accordance with manufacturer's instructions.

### 3.7 JOINTS

- A. Align curb, gutter, and sidewalk joints. Sidewalk joints are designed by the Landscape Architect, see plans.
- B. As much as feasible, joint layout of new pavement shall align with existing pavement and follow similar dimensions and style. This will reduce the potential for irregular cracking.
- C. Thickened edge expansion joints shall be placed along the edge of all concrete pavement at the perimeter of all structures, concrete curb and gutter or adjacent existing pavement.
- D. All odd shaped concrete slab panels or slabs having the longer dimension exceeding the shorter dimension by more than 25% shall be reinforced.
- E. Contraction joints shall be placed within the new pavement slabs, outside areas identified in 3.7.C and 3.7.D.

- F. Joints shall be aligned radially to all curved surfaces a minimum of two feet from the edge. Irregular triangular panels shall be avoided as they are more susceptible to fracturing.
- G. Place 3/8 inch wide expansion joints at 20 foot intervals and to separate paving from vertical surfaces and other components and in pattern indicated.
  - 1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface. Secure to resist movement by wet concrete.
- H. Provide scored joints as shown on the Landscape Plans or in areas not defined as follows:
  - 1. At 5 feet maximum intervals for concrete sidewalk and at 10 feet maximum intervals for concrete pavement. Between sidewalks and curbs. Between curbs and pavement.
- I. Provide keyed joints as needed.
- J. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.

### 3.8 FINISHING

- A. Area Paving: Light broom, texture perpendicular to pavement direction.
- B. Sidewalk Paving: See Landscape Architectural.
- C. Curbs and Gutters: Light broom, texture parallel to pavement direction.
- D. Inclined Vehicular Ramps: per MnDOT standards and ADA requirements, see detail on drawing.
- E. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

### 3.9 TOLERANCES

- A. Maximum Variation of Surface Flatness: 1/8 inch in 10 ft. Maximum Variation From True Position: 1/8 inch.

### 3.10 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Quality Control. Owner will secure and pay for testing agency services.
  - 1. Provide free access to concrete operations at project site and cooperate with appointed firm.
  - 2. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
  - 3. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
  - 4. Inspection of reinforcement placement.
- B. Compressive Strength Tests: ASTM C 39/C 39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 50 cu yd or less of each class of concrete placed.
  - 1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
  - 2. Perform one slump test and one air test for each set of test cylinders taken.

- C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.11 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury. Do not permit pedestrian traffic over pavement for 7 days minimum after finishing.

3.12 SCHEDULES

- A. Concrete Curb and Gutter: 3,000 psi 28 day concrete.
- B. Driveway Pavement: 4,000 psi 28 day concrete.

**END OF SECTION 32 13 14**



**SECTION 32 17 23 - PAVEMENT MARKINGS**

**PART 1 - GENERAL**

**1.1 CONDITIONS OF THE CONTRACT**

- A. Conditions of the Contract, DIVISION 00 and General Requirements, DIVISION 01 govern work under this Section.
  - 1. Performance of the Work of this Section shall comply with DIVISION 00 for Prevailing Wage Rate Requirements that apply to this project.
  - 2. Performance of the Work of this Section shall comply with DIVISION 01 for Storm Water Plan "SWPPP" Requirements and SWPPP training requirements that apply to this project.

**1.2 SECTION INCLUDES**

- A. Painting stalls, crosswalks, ADA accessible aisles and ADA symbols on pavement surface.

**1.3 RELATED SECTIONS**

- A. Section 321214 – Vehicular Concrete Paving

**1.4 SUBMITTALS**

- A. Certification by manufacturer that shows paint meets specifications.

**1.5 REFERENCES**

- A. Minnesota Department of Transportation Standard Specifications For Construction, 2016 Edition and Corresponding Supplements.
  - 1. Where reference is made to a number preceded by "MnDOT", the reference shall be understood to mean that numbered section of the Department of Transportation Standard Specifications, Latest edition.
  - 2. Provisions for measurement and payment shall not apply except as amended herein and all costs in connection therewith shall be included in the lump sum price bid for the work.

**1.6 SITE CONDITIONS**

- A. Weather Limitations: Do not apply when asphalt is wet or contains an excess of moisture.

**1.7 PRODUCT HANDLING**

- A. All materials shall be delivered and stored in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, and directions, all of which shall be plainly legible at time of use.

**1.8 EQUIPMENT**

- A. All machines, tools, and equipment used in performance of the work shall be approved and maintained in satisfactory operating condition.
  - a. Hand-operated push-type machines of a type commonly used for application of paint to pavement surfaces shall be acceptable for marking small streets and parking areas.

- i. Applicator machine shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified.
- b. Sandblasting equipment shall be provided as required for cleaning surfaces to be painted or removal of existing stripping patterns.
- c. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.

## PART 2 – PRODUCTS

### 2.1 PAINT

- A. The paint shall be homogeneous, easily stirred to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of 6 months. Paint for parking areas and drives shall conform to AASHTO M 248, color as indicated. Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.
- B. Paint shall conform to MnDOT Specification Section 2582.
  - 1. Per MnDOT Section 2582: Initial pavement marking retroreflectivity is defined as the pavement marking retroreflectivity as measured between 14 days and 44 days after pavement marking installation. Provide pavement markings meeting the minimum initial pavement marking retroreflectivity when tested using 30 m geometry to meet 275 mcd/sq for white paint.
- C. Painted lines shall be 4-inches wide. Paint color shall be as follows:
  - 1. Standard parking stall striping: White
  - 2. Loading zone and no parking zone hatching: White
  - 3. ADA parking stalls and symbols: White

## PART 3 - EXECUTION

### 3.1 PAVEMENT MARKINGS

- A. Cleaning: Surfaces to be marked shall be thoroughly cleaned before application of the pavement marking material.
  - 1. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water or a combination of these methods as required.
  - 2. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed with scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion as directed.
  - 3. Areas of old pavement affected with oil or grease shall be scrubbed with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinsed thoroughly after each application.
    - a. After cleaning, oil-soaked areas shall be sealed with cut shellac to prevent bleeding through the new paint.
  - 4. Pavement surfaces shall be allowed to dry, when water is used for cleaning, prior to striping or marking.
  - 5. Surfaces shall be re-cleaned, when work has been stopped due to rain.

- B. Do not apply traffic and lane marking paint until layout and placement has been verified with Owner and Engineer.
- C. Apply paint with mechanical equipment to produce uniform straight edges. Apply in 1 coat at manufacturer's recommended rates.

3.2 APPLICATION

- A. All pavement markings and patterns shall be placed as shown on the plans.
- B. Apply the pavement marking as recommended by the material manufacturer in regards to pavement type, environmental conditions and other relevant factors in order to meet the requirements.
- C. Paint shall be applied to clean, dry surfaces, and only when air and pavement temperatures are above 5 degrees C (40 degrees F) and less than 35 degrees C (95 degrees F). Paint temperature shall be maintained within these same limits.
- D. New asphalt pavement surfaces and new Portland concrete cement shall be allowed to cure for a period of not less than 30 days before applications of paint.
- E. Before applying paint markings, sandblast new Portland concrete cement surfaces to remove surface treatments or laitance.
- F. Paint shall be applied pneumatically with approved equipment at rate of coverage specified by manufacturer.
- G. The Contractor shall provide guide lines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols. Edges of markings shall be sharply outlined.
- H. Apply paint with mechanical equipment to produce uniform straight edges. Apply in 1 coat at manufacturer's recommended rates.
- I. Drying: The maximum drying time requirements of the paint specifications will be strictly enforced to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. If there is a delay in drying of the markings, painting operations shall be discontinued until cause of the slow drying is determined and corrected.
- J. Alignment: Minimum linear pavement marking shall not be less than the specified width and shall not vary by more than 1/4". The width will not vary by a rate more than 1/4" per 10 feet. Alignment deviations from the design shall not vary by more than 1".
- K. Pavement marking material shall not be applied over a longitudinal joint.

**END OF SECTION 32 17 23**



## SECTION 32 31 19 - DECORATIVE METAL FENCES AND GATES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Decorative steel fences.

## 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each fence material and for each color specified.
- D. Maintenance Data: For gate operators to include in maintenance manuals.

## PART 2 - PRODUCTS

## 2.1 STEEL AND IRON

- A. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Bars (Pickets): Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.
- C. Tubing: ASTM A 500, cold formed steel tubing.
- D. Bar Grating: NAAMM MBG 53 I.
  - 1. Bars: Hot-rolled steel strip, ASTM A 101 I/A 101 IM, Commercial Steel, Type B.
  - 2. Wire Rods: ASTM A 510.
- E. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 50, with G90 coating.

## 2.2 COATING MATERIALS

- A. Epoxy Zinc-Rich Primer for Steel: Complying with MPI #20 and compatible with coating specified to be applied over it.
- B. Epoxy Primer for Galvanized Steel: Complying with MPI #101 and compatible with coating specified to be applied over it.
- C. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.
- D. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.

## 2.3 MISCELLANEOUS MATERIALS

- A. Concrete: Normal-weight concrete complying with requirements in Division 03 Section "Cast-in-Place Concrete" with a minimum 28-day compressive strength of 3000 psi, 3-inch slump, and 1-inch maximum aggregate size.

- B. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 and specifically recommended by manufacturer for exterior applications.

#### 2.4 DECORATIVE METALLIC-COATED STEEL TUBULAR PICKET FENCES

- A. Decorative Metallic-Coated Steel Tubular Picket Fences: Comply with ASTM F 2408, for residential application (class) unless otherwise indicated.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Remington Residential Fence by Master Halco or comparable product by one of the following available manufacturers offering products that may be incorporated into the Work, but are not limited to, the following:
    - a. Fortress Iron; a division of Woodmark International, LP.
    - b. Iron Eagle Industries, Inc.
    - c. Merchants Metals; a division of MMI Products, Inc.
    - d. Payne Fence Products; a division of Payne Metal Works, Inc.
    - e. Xcel Fence.
- B. Metallic-Coated Steel Sheet: Galvanized-steel sheet or aluminum-zinc alloy-coated steel sheet.
- C. Post Caps: Flat top cap.
- D. Pickets: Square tubes.
  - 1. Style: Master Halco's Universal Style, terminate tops of pickets at underside of top rail and top side of bottom rail for flush appearance.
  - 2. Picket Spacing: 4 inches max clear, maximum.
- E. Height: top rail to be 4'-0" AFF.
- F. Finish: Organic coating complying with requirements in ASTM F 2408.

#### 2.5 STEEL FINISHES

- A. Surface Preparation: Clean surfaces according to SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning"
  - 1. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
- B. Primer Application: Apply zinc-rich epoxy primer immediately after cleaning, to provide a minimum dry film thickness of 2 mils.
- C. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Apply at spreading rates recommended by coating manufacturer.
  - 1. Match approved Samples for color, texture, and coverage.

### PART 3 - EXECUTION

#### 3.1 DECORATIVE FENCE INSTALLATION

- A. Install fences according to manufacturer's written instructions.
- B. Post Excavation: Excavate holes to a diameter of not less than 4 times post size and a depth of not less than 36 inches plus 3 inches for each foot or fraction of a foot that fence height exceeds 4 feet.
- C. Post Setting: Set posts in concrete into firm, undisturbed soil.
  - 1. Hold posts in position during setting with concrete or mechanical devices.
  - 2. Concrete Fill: Place concrete around posts and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

3. Posts Set in Concrete: Extend post to within 6 inches of specified excavation depth, but not closer than 3 inches to bottom of concrete.
4. Space posts uniformly at 8 feet o.c nominal.

END OF SECTION 32 31 19

## **SECTION 33 11 16 - SITE WATER UTILITY DISTRIBUTION PIPING**

### **PART 1 - GENERAL**

#### **1.1 CONDITIONS OF THE CONTRACT**

- A. Conditions of the Contract, DIVISION 00 and General Requirements, DIVISION 01 govern work under this Section.
  - 1. Performance of the Work of this Section shall comply with DIVISION 00 for Prevailing Wage Rate Requirements that apply to this project.
  - 2. Performance of the Work of this Section shall comply with DIVISION 01 for Storm Water Plan "SWPPP" Requirements and SWPPP training requirements that apply to this project.

#### **1.2 SECTION INCLUDES**

- A. Pipe, fittings and valves for site water lines including domestic water lines and fire water lines.

#### **1.3 RELATED SECTIONS**

- A. Section 312316 - Excavation
- B. Section 312317 - Trenching
- C. Section 312323 - Fill
- D. Section 331300 - Disinfecting of Water Utility Distribution
- E. Section 033000 - Cast-in-Place Concrete

#### **1.4 REFERENCES**

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001(R 2002) (ANSI B16.18).
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001.
- C. ASTM B 88 - Standard Specification for Seamless Copper Water Tube; 2003.
- D. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; 1992 (Reaffirmed 2003).
- E. AWWA C606 - Grooved and Shouldered Joints; American Water Works Association; 2004.
- F. Recommended Standards for Water Works by the Great Lakes Upper Mississippi River Board of State Public Health and Environmental Managers (Ten-State Standards).
- G. Minnesota Plumbing Code, 2015 Edition and revisions

#### **1.5 SUBMITTALS**

- A. Product Data: Provide data on pipe materials, pipe fittings and accessories.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- C. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.



- D. Minnesota Department of Health permit: Submit plan set and secure required permits as needed.

#### 1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Minnesota requirements.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store pipes and all accessories in shipping containers with labeling in place.

### PART 2 - PRODUCTS

#### 2.1 WATER PIPE

- A. Copper Tubing: ASTM B 88, Type K, annealed:
  - 1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
  - 2. Joints: Compression connection or AWS A5.8, BCuP silver braze.

#### 2.2 BEDDING AND COVER MATERIALS

- A. Bedding: As specified in Section 312323 - Fill.
- B. Cover: Minimum 8 feet.

#### 2.3 ACCESSORIES

- A. Thrust Restraints:
  - 1. Provide metal tie rods and clamps or lugs, on plugs, caps, tees, and bends deflecting 22-1/2 degrees or more either vertically or horizontally.
- B. Installation:
  - 1. Locate thrust blocking between solid ground and the fitting to be anchored.
  - 2. Unless otherwise shown or directed by the Engineer, place the base and thrust bearing sides of thrust blocking directly against undisturbed earth.
  - 3. Sides of thrust blocking not subject to thrust may be paced against forms.
  - 4. Place thrust blocking so the fitting joints will be accessible for repair.
  - 5. Protect steel rods and clamps by galvanizing or by coating with bituminous paint.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

#### 3.2 PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare pipe connections to equipment with flanges or unions.

#### 3.3 TRENCHING

- A. See Section 312317 - Trenching for additional requirements.
- B. Hand trim excavation for accurate placement of pipe to elevations indicated.

- C. Form and place concrete for pipe thrust restraints at each change of pipe direction. Place concrete to permit full access to pipe and pipe accessories.
- D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

#### 3.4 INSTALLATION - PIPE

- A. Maintain separation of water main from sewer piping in accordance with Minnesota code.
- B. Group piping with other site piping work whenever practical.
- C. Establish elevations of buried piping to ensure not less than 8 ft of cover.
- D. Install pipe to indicated elevation to within tolerance of 5/8 inches.
- E. Route pipe in straight line.
- F. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- G. Install access fittings to permit disinfection of water system performed under Section 331300 – Disinfecting of Water Utility Distribution.
- H. Install trace wire 6 inches above top of pipe; coordinate with Section 312317 - Trenching.
- I. Handle pipe accessories so as to ensure delivery to the trench in sound, undamaged condition:
  - 1. Carry pipe into position; do not drag.
  - 2. Use pinch bars or tongs for aligning or turning the pipe only on the bare end of the pipe.
  - 3. Thoroughly clean interior of pipe and accessories before lowering pipe into trench. Keep clean during laying operations by plugging or other method approved by the Engineer.
  - 4. Before installation, inspect each piece of pipe and each fitting for defects. Material found to be defective before or after laying shall be replaced with sound material meeting the specified requirements, and without additional cost to the Owner.
- L. Pipe Cutting: Cut pipe neatly and without damage to the pipe.
  - 1. Unless otherwise recommended by the pipe manufacturer, and authorized by the Engineer, cut pipe with mechanical cutter only.
    - a. Use wheel cutters when practicable.
- M. Locating: Locate water pipe at least ten feet away, horizontally, from sewer pipes.
  - 1. Where bottom of the water pipe will be at least 12" above top of the sewer pipe, locate water pipe at least ten feet away, horizontally, from the sewer pipe.
  - 2. Where water lines cross under gravity-flow sewer lines, fully encase the sewer pipe in concrete for a distance of at least ten feet each side of the crossing, or provide pressure pipe with no joint located within 36" of the crossing.
  - 3. Cross water lines in cases above sewage force mains or inverted siphons at least 24" above the sewer line.
  - 4. Encase in concrete those joints in the sewer main closer, horizontally, than 36" to the crossing.

5. Do not place water lines in the same trench with sewer lines or electric wiring.

N. Placing and Laying General:

1. Lower pipe and accessories into trench by means of derrick, ropes, belt slings, or other equipment approved by the Engineer.
2. Do not dump or drop any of the materials of this Section into the trench.
3. Except where necessary in making connections to other lines, lay pipe with the bells facing in the direction of laying.
4. Rest the full length of each section of pipe solidly on the pipe bed, with recesses excavated to accommodate bells, couplings, and joints.
5. Take up and relay pipe that has the grade or joint disturbed after laying.
6. Do not lay pipe in water, or when trench conditions are unsuitable for the work; keep water out of the trench until jointing is completed.
7. Securely close open ends of pipe, fittings, and valves when work is not in progress.
8. Where any part of coating or lining is damaged, repair to the approval of the Engineer and at no additional cost to the Owner.
9. Connections: Use specials and fittings to suit the actual conditions where connections are made between new work and existing mains. Use only those specials and fittings approved by the utility having jurisdiction.
10. Sleeves:
  - a. Where pipe passes through walls of valve pits or structures, provide cast iron wall sleeves.
  - b. Fill annular space between walls and sleeves with rich cement mortar.
  - c. Fill annular space between pipe and sleeves with mastic.

3.5 SERVICE CONNECTIONS

- A. Provide sleeve in wall for service main. Support with reinforced concrete bridge. Calk enlarged sleeve watertight.
- B. Anchor service main to interior surface of foundation wall.

3.6 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with 014000 - Quality Requirements.
- B. Pressure test water piping to 200 psi.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

**END OF SECTION 33 11 16**

**SECTION 33 13 00 - DISINFECTING OF WATER UTILITY DISTRIBUTION**

**PART 1 - GENERAL**

**1.1 CONDITIONS OF THE CONTRACT**

- A. Conditions of the Contract, DIVISION 00 and General Requirements, DIVISION 01 govern work under this Section.
  - 1. Performance of the Work of this Section shall comply with DIVISION 00 for Prevailing Wage Rate Requirements that apply to this project.
  - 2. Performance of the Work of this Section shall comply with DIVISION 01 for Storm Water Plan "SWPPP" Requirements and SWPPP training requirements that apply to this project.

**1.2 SECTION INCLUDES**

- A. Disinfection of site domestic water lines and site fire water lines specified in Section 331116 - Site Water Utility Distribution Piping.
- B. Testing and reporting results.

**1.3 RELATED SECTIONS**

- A. Section 331116 - Site Water Utility Distribution Piping

**1.4 REFERENCES**

- A. AWWA B300 - Hypochlorites; American Water Works Association; 2004 (ANSI/AWWA B300).
- B. AWWA B301 - Liquid Chlorine; American Water Works Association; 2004 (ANSI/AWWA B301).
- C. AWWA B302 - Ammonium Sulfate; American Water Works Association; 2000.
- D. AWWA B303 - Sodium Chlorite; American Water Works Association; 2000.
- E. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 1999 (ANSI/AWWA C651).

**1.5 SUBMITTALS**

- A. Test Reports: Indicate results comparative to specified requirements.
- B. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.
- C. Disinfection report:
  - 1. Type and form of disinfectant used.
  - 2. Date and time of disinfectant injection start and time of completion.
  - 3. Test locations.
  - 4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
  - 5. Date and time of flushing start and completion.
  - 6. Disinfectant residual after flushing in ppm for each outlet tested.

D. Bacteriological report:

1. Date issued, project name, and testing laboratory name, address, and telephone number.
2. Time and date of water sample collection.
3. Name of person collecting samples.
4. Test locations.
5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for each outlet tested.
7. Certification that water conforms, or fails to conform, to bacterial standards of MPCA.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with AWWA C651.
- B. Testing Firm: Company specializing in testing potable water systems, certified by governing authorities of the State of Minnesota.
- C. Submit bacteriologist's signature and authority associated with testing.

1.7 REGULATORY REQUIREMENTS

- A. Conform to applicable code or regulation for performing the work of this Section.
- B. Provide certificate of compliance from authority having jurisdiction indicating approval of water system.

PART 2 - PRODUCTS

2.1 DISINFECTION CHEMICALS

- A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that piping system has been cleaned, inspected, and pressure tested.
- B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.2 EXECUTION

- A. Provide and attach required equipment to perform the work of this Section.
- B. Inject treatment disinfectant into piping system following proper AWWA C651 procedures.
- C. Maintain disinfectant in system for 24 hours.
- D. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.
- E. Replace permanent system devices removed for disinfection.
- F. Pressure test system to 200 psi. Repair leaks and re-test.

3.3 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with 014000 Quality Requirements.
- B. Test samples in accordance with AWWA C651.

**END OF SECTION 33 13 00**

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## SECTION 33 31 11 - SITE SANITARY UTILITY SEWERAGE PIPING

### PART 1 - GENERAL

#### 1.1 CONDITIONS OF THE CONTRACT

- A. Conditions of the Contract, DIVISION 00 and General Requirements, DIVISION 01 govern work under this Section.
  - 1. Performance of the Work of this Section shall comply with DIVISION 00 for Prevailing Wage Rate Requirements that apply to this project.
  - 2. Performance of the Work of this Section shall comply with DIVISION 01 for Storm Water Plan "SWPPP" Requirements and SWPPP training requirements that apply to this project.

#### 1.2 SECTION INCLUDES

- A. Sanitary sewerage drainage piping, fittings, and accessories.
- B. Connection of building sanitary drainage system to existing on-site sewers.

#### 1.3 RELATED SECTIONS

- A. Section 312316 - Excavation
- B. Section 312317 - Trenching
- C. Section 312323 - Fill
- D. Section 033000 - Cast-in-Place Concrete

#### 1.4 REFERENCES

- A. ASTM A 746 - Standard Specification for Ductile Iron Gravity Sewer Pipe; 2003.
- B. ASTM D 1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2004a.
- C. ASTM D 2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2003.
- D. AWWA C111/A21.11 - American National Standard for Rubber Gasket Joints For Cast Iron and Ductile Iron Pressure Pipe and Fittings; 2000. (ANSI/AWWA C111/A21.11)

#### 1.5 DEFINITIONS

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

#### 1.6 SUBMITTALS

- A. Product Data: Provide data indicating pipe, pipe accessories and necessary appurtenances for a complete system.
- B. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.



- D. Project Record Documents:
  - 1. Record location of pipe runs, sizes, materials, connections, manholes, cleanouts, rim and invert elevations.
  - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
- E. Minnesota Pollution Control Agency: Submit plans and secure sanitary sewer extension permit as needed.

1.7 REGULATORY REQUIREMENTS

- A. Conform to applicable code for materials and installation of the Work of this section.

1.8 PROJECT CONDITIONS

- A. Coordinate the Work with termination of sanitary sewer connection outside building, connection to existing sanitary sewer manhole, and trenching.
- B. Contractor to field verify the exact locations and elevation of the existing sanitary sewer prior to starting construction.
  - 1. Report discrepancies from the existing conditions survey to the Engineer prior to starting construction.

PART 2 - PRODUCTS

2.1 PIPE ACCESSORIES

- A. Trace Wire: Magnetic detectable conductor, HDPE coated copper wire, imprinted with "Sanitary Sewer Service" in large letters or color coded.

2.2 SEWER PIPE MATERIALS

- A. General Material Requirements:
  - 1. Pipe, fittings, cleanouts and appurtenances shall be new materials and shall be of the type, size, strength, and quality as shown on the Drawings and as specified in this Section.
  - 2. Contractor may be requested to secure and deliver to Civil Engineer a written statement from the manufacturer assuring the quality and compliance to the applicable specifications of all materials furnished and installed under this Contract. This shall not relieve the Contractor of responsibilities regarding quality of materials furnished and installed.
- B. Polyvinyl chloride pipe and fittings (PVC):
  - 1. Use extra strength, Schedule 40 PVC.
  - 2. Comply with ASTM D3034.
  - 3. Solvent cement watertight joints.
- C. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, and other configurations required.

2.3 SANITARY CLEANOUT

- A. Shall be same materials as sewer materials.
- B. Lid Design: Stamped Sanitary Sewer.

## 2.4 BEDDING AND COVER MATERIALS

- A. Pipe Bedding and Cover Material: As specified in Section 312317 - Trenching.

## PART 3 - EXECUTION

### 3.1 TRENCHING

- A. See Section 312317 - Trenching for additional requirements.
- B. Hand trim excavation for accurate placement of pipe to elevations indicated.
- C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

### 3.2 INSTALLATION - PIPE

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
  - 1. Plastic Pipe: Also comply with ASTM D 2321.
- C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- D. Connect to building sanitary sewer outlet, through installed sleeves.
- E. Install cleanouts every 100 lineal feet of pipe in straight runs and at all changes in direction.
- F. Install trace wire 6 inches above top of pipe; coordinate with Section 312317-Trenching.

### 3.3 CLEANOUT CONSTRUCTION

- A. Dual cleanouts shall be constructed per plan details.
- B. Cleanouts shall be installed every 100 lineal feet of pipe in straight runs and at all changes in direction.
- C. Cleanout shall be installed so that it opens to allow cleaning in the direction of waste flow.
- D. Cleanouts shall be extended to the surface flush with pavement.
- E. When installed within landscaping or asphalt paving, a concrete collar shall be installed around the cleanout for protection per the drawings.

### 3.4 FIELD QUALITY CONTROL

- A. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
- B. Pressure, Infiltration and Deflection Tests: Test in accordance with the Regulatory Agency.

### 3.5 PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

**END OF SECTION 33 31 11**

**SECTION 33 41 11 - SITE STORM UTILITY DRAINAGE PIPING**

PART 1 - GENERAL

1.1 CONDITIONS OF THE CONTRACT

- A. Conditions of the Contract, DIVISION 00 and General Requirements, DIVISION 01 govern work under this Section.
  - 1. Performance of the Work of this Section shall comply with DIVISION 00 for Prevailing Wage Rate Requirements that apply to this project.
  - 2. Performance of the Work of this Section shall comply with DIVISION 01 for Storm Water Plan "SWPPP" Requirements and SWPPP training requirements that apply to this project.

1.2 SECTION INCLUDES

- A. Storm drainage piping, fittings and accessories.

1.3 RELATED SECTIONS

- A. Section 312316 - Excavation
- B. Section 312323 - Fill
- C. Section 312317 – Trenching
- D. Section 312500 – Erosion Prevention and Sediment Control
- E. Section 330513 - Manholes and Structures
- F. Section 033000 - Cast-in-Place Concrete

1.4 REFERENCES

- A. AASHTO M 36M - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains; American Association of State Highway and Transportation Officials; 2003.
- B. ASTM C 14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe; 2003.
- C. ASTM C 76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2004a.
- D. ASTM C 443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2005.
- E. ASTM C 564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2003a.
- F. ASTM D 1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2004a.
- G. ASTM D 2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2003.
- H. Minnesota Department of Transportation Standard Specifications for Construction, 2016 Edition and Corresponding Supplements.

1. Where reference is made to a number preceded by "MnDOT", the reference shall be understood to mean that numbered section of the Department of Transportation Standard Specifications, Latest edition.
2. Provisions for measurement and payment shall not apply except as amended herein and all costs in connection therewith shall be included in the lump sum price bid for the work.

#### 1.5 DEFINITIONS

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.
- B. See Section 31 2323 - Fill.

#### 1.6 SUBMITTALS

- A. Product Data: Provide data indicating pipe, pipe accessories, and appurtenances to provide a complete working system.
- B. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Project Record Documents:
  1. Record location of pipe runs, connections, catch basins, cleanouts, and invert elevations.
  2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

#### 1.7 REGULATORY REQUIREMENTS

- A. Conform to applicable code for materials and installation of the Work of this section.

#### 1.8 PROJECT CONDITIONS

- A. Coordinate the Work with termination of storm sewer connection outside building, trenching, connection to storm sewer system.
- B. Contractor to field verify the exact locations and elevation of the existing storm sewer prior to starting construction.
  1. Report discrepancies from the existing conditions survey to the Engineer prior to starting construction.

### PART 2 - PRODUCTS

#### 2.1 SEWER PIPE MATERIALS

- A. Concrete Pipe: Reinforced, ASTM C 76, Class V as specified on drawings; mesh reinforcement, bell and spigot end joints. Concrete materials from a certified plant. Concrete Pipe: Reinforced, ASTM C 76, Class V or as specified on drawings; mesh reinforcement, bell and spigot end joints. If not specified on drawings, pipe shall be Class V.
- B. Reinforced Concrete Pipe Joint Device: ASTM C 443 rubber compression gasket joint.
- C. Polyvinyl chloride pipe and fittings (PVC):
  1. Use extra strength SDR 26 unless noted otherwise.

2. Comply with ASTM D3034.
3. Either solvent cement or flexible watertight joints.
4. Gasket joints must be approved by the Civil Engineer on the basis of data furnished by the manufacturer.

D. Ductile Iron Pipe: AWWA C151:

1. Fittings: Ductile iron, standard thickness.
2. Joints: AWWA C111, rubber gasket with rods.
3. Jackets: AWWA C105 polyethylene jacket.

E. Aluminized Corrugated Steel Pipe Type 2 shall comply with ASTM standard A760 or A796 and AASHTO Pipe M36 specifications with Class 1 perforations.

F. Aluminized Corrugated Steel Pipe Type 2 shall comply with ASTM standard A760 or A796 and AASHTO Pipe M36 specifications without perforations.

2.2 PIPE ACCESSORIES

- A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.
- B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.
- C. Filter Fabric: Non-biodegradable, woven, Type V per Section 312500 – Erosion Prevention and Sediment Control Part 2.1.D.
- D. Trace Wire: Magnetic detectable conductor, HPDE coated copper wire, imprinted with "Storm Sewer Service" in large letters or color coded.

2.3 BEDDING AND COVER MATERIALS

- A. Bedding and cover: As specified in Section 312323 - Fill.
- B. Cover: Minimum two feet.

PART 3 - EXECUTION

3.1 TRENCHING

- A. See Section 312317 - Trenching for additional requirements.
- B. Hand trim excavation for accurate placement of pipe to elevations indicated.
- C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.2 INSTALLATION - PIPE

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
- C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- D. Connect to building storm sewer through installed sleeves.

- E. Install continuous trace wire 6 inches above top of pipe; coordinate with Section 312317 - Trenching.

### 3.3 FIELD QUALITY CONTROL

- A. Contractor shall review that drintile and storm sewer is placed in cross-section and elevation per design documents. Contractor shall also test with water flow to check that storm lines are free flowing prior to backfilling.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
- C. Infiltration Test: Test in accordance with the Owner requirements.
- D. Deflection Test: Test in accordance with the Owner requirements.

### 3.5 PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

**END OF SECTION 33 41 11**

## SECTION 33 46 00 - SUBDRAINAGE

### PART 1 - GENERAL

#### 1.1 CONDITIONS OF THE CONTRACT

- A. Conditions of the Contract, DIVISION 00 and General Requirements, DIVISION 01 govern work under this Section.
  - 1. Performance of the Work of this Section shall comply with DIVISION 00 for Prevailing Wage Rate Requirements that apply to this project.
  - 2. Performance of the Work of this Section shall comply with DIVISION 01 for Storm Water Plan "SWPPP" Requirements and SWPPP training requirements that apply to this project.

#### 1.2 SECTION INCLUDES

- A. Retaining wall draitile system
- B. Filter Aggregate and bedding for retaining wall draitile

#### 1.3 RELATED SECTIONS

- A. Section 312316 – Excavation
- B. Section 312323 – Fill
- C. Section 312317 - Trenching

#### 1.4 SUBMITTALS

- A. Shop drawings: Indicate dimensions, layout of piping, high and low points of pipe inverts, gradient of slope between corners and intersections, and connections to structures.
- B. Product data: Provide data on pipe drainage products, pipe accessories, and appurtenances.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Project Record Documents: Record location of pipe runs, connections, cleanouts and principal invert elevations.

#### 1.5 REFERENCES

- A. Minnesota Department of Transportation Standard Specifications For Construction, 2016 Edition and Corresponding Supplements.
  - 1. Where reference is made to a number preceded by "MnDOT", the reference shall be understood to mean that numbered section of the Department of Transportation Standard Specifications, Latest edition.
  - 2. Provisions for measurement and payment shall not apply except as amended herein and all costs in connection therewith shall be included in the lump sum price bid for the work.



## PART 2 - PRODUCTS

### 2.1 PIPE MATERIALS

- A. High Density Polyethylene Pipe: ASTM D 3350 and AASHTO M252; plain end, 6 inch inside diameter with 1/4" minimum and 3/8" maximum diameter AASHTO Class 2 perforations.
- B. Use perforated pipe at Subdrainage system; unperforated through sleeved walls and connections to manholes.

### 2.2 AGGREGATE AND BEDDING

- A. Filter Aggregate and Bedding Material: Granular fill as specified in Section 31 2323 – Fill.

### 2.3 ACCESSORIES

- A. Pipe Couplings: Solid plastic.
- B. Joint Covers: No. 15 asphalt saturated roofing felt.
- C. Geotextile Fabric: Non-biodegradable, woven, Type V per Section 312500 Erosion Prevention and Sediment Control Part 2.1.D.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout Drawings.

### 3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over-excavation with fill as specified in Section 312323 – Fill.
- B. Remove large stones or other hard matter which could damage drainage piping or impede consistent backfilling or compaction.

### 3.3 INSTALLATION

- A. Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions.
- B. Place drainage pipe on clean cut subsoil.
- C. Lay pipe to slope gradients noted on Drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- D. Loosely butt pipe ends. Place Joint cover strip 12 inches wide, around pipe diameter centered over joint.
- E. Place pipe with perforations facing down. Mechanically join pipe ends.
- F. Install pipe couplings
- G. Install filter aggregate at sides, over joint covers and top of pipe. Provide top cover per drawings.
- H. Place filter fabric over leveled top surface of aggregate cover prior to subsequent backfilling operations.

- I. Place aggregate in maximum 4 inch lifts.
- J. Refer to Section 312323 – Fill.
- K. Place fill over drainage pipe aggregate cover.
- L. Connect to storm sewer system with unperforated pipe, through installed sleeves.
- M. Coordinate the Work with connection to municipal sewer utility service, and trenching.

3.4 FIELD QUALITY CONTROL

- A. Request inspection prior to and immediately after placing aggregate cover over pipe.
- B. Fabric sock is not allowed on this project.

3.5 PROTECTION

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operations begin.

**END OF SECTION 33 46 00**

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