

PROJECT MANUAL

**HICKORY PARK
WARMING HOUSE AND ICE RINKS**

CITY OF BELLE PLAINE

BELLE PLAINE, MINNESOTA

AUGUST 1, 2019

SECTION 00 01 05
CERTIFICATIONS PAGE

HICKORY PARK WARMING HOUSE AND ICE RINKS
AUGUST 1, 2019

ARCHITECT - OLESON + HOBBIE ARCHITECTS

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.



ERIC L. OLESON, AIA

REGISTRATION NO. 42143

CIVIL ENGINEER - BOLTON & MENK

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.

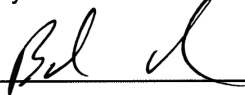


D. JOSEPH DUNCAN II, P.E.

REGISTRATION NO. 26100

STRUCTURAL ENGINEER - MIDWEST ENGINEERING

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.



BRANDON VILAND, P.E.

REGISTRATION NO. 53688

MECHANICAL ENGINEER - DOLEJS ASSOCIATES

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.




MIKE DOLEJS, P.E.

REGISTRATION NO. 24659

ELECTRICAL ENGINEER - DOLEJS ASSOCIATES

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.



MIKE DOLEJS, P.E.

REGISTRATION NO. 24659

END OF SECTION

SECTION 00 01 10
TABLE OF CONTENTS

PROCUREMENT AND CONTRACTING REQUIREMENTS

1.01 DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS

- A. 00 01 01 - Project Title Page
- B. 00 01 05 - Certifications Page
- C. 00 01 10 - Table of Contents
- D. 00 01 15 - List of Drawing Sheets
- E. 00 11 13 - Advertisement for Bids
- F. 00 21 13 - Instructions to Bidders
- G. 00 41 00 - Bid Form
- H. 00 72 00 - General Conditions
- I. 00 73 00 - Supplementary Conditions

SPECIFICATIONS

2.01 DIVISION 01 -- GENERAL REQUIREMENTS

- A. 01 10 00 - Summary
- B. 01 20 00 - Price and Payment Procedures
- C. 01 25 00 - Substitution Procedures
- D. 01 30 00 - Administrative Requirements
- E. 01 32 16 - Construction Progress Schedule
- F. 01 40 00 - Quality Requirements
- G. 01 45 33 - Code-Required Special Inspections
- H. 01 45 34 - Special Inspections Form
- I. 01 50 00 - Temporary Facilities and Controls
- J. 01 57 13 - Temporary Erosion and Sediment Control
- K. 01 60 00 - Product Requirements
- L. 01 70 00 - Execution and Closeout Requirements
- M. 01 74 19 - Construction Waste Management and Disposal
- N. 01 78 00 - Closeout Submittals
- O. 01 79 00 - Demonstration and Training

2.02 DIVISION 02 -- EXISTING CONDITIONS (NOT USED)

2.03 DIVISION 03 -- CONCRETE

- A. 03 10 00 - Concrete Forming and Accessories
- B. 03 30 00 - Cast-in-Place Concrete

2.04 DIVISION 04 -- MASONRY

- A. 04 20 00 - Unit Masonry
- B. 04 20 01 - Masonry Veneer
- C. 04 72 00 - Cast Stone Masonry

2.05 DIVISION 05 -- METALS (NOT USED)

2.06 DIVISION 06 -- WOOD, PLASTICS, AND COMPOSITES

- A. 06 10 00 - Rough Carpentry
- B. 06 17 53 - Shop-Fabricated Wood Trusses

C. 06 20 00 - Finish Carpentry

2.07 DIVISION 07 -- THERMAL AND MOISTURE PROTECTION

A. 07 21 00 - Thermal Insulation

B. 07 21 19 - Foamed-In-Place Insulation

C. 07 22 00 - Non-Vented Nail Base Roof Insulation Panels

D. 07 25 00 - Weather Barriers

E. 07 41 13 - Metal Roof Panels

F. 07 46 23 - Pre-Finished Composition Siding

G. 07 72 00 - Roof Accessories

H. 07 92 00 - Joint Sealants

2.08 DIVISION 08 -- OPENINGS

A. 08 11 13 - Hollow Metal Doors and Frames

B. 08 36 13 - Sectional Doors

C. 08 43 13 - Aluminum-Framed Storefronts

D. 08 71 00 - Door Hardware

E. 08 80 00 - Glazing

2.09 DIVISION 09 -- FINISHES

A. 09 21 16 - Gypsum Board Assemblies

B. 09 65 00 - Resilient Flooring

C. 09 91 23 - Interior Painting

2.10 DIVISION 10 -- SPECIALTIES

A. 10 14 00 - Signage

B. 10 28 00 - Toilet, Bath, and Laundry Accessories

C. 10 44 00 - Fire Protection Specialties

2.11 DIVISION 11 -- EQUIPMENT (NOT USED)

2.12 DIVISION 12 -- FURNISHINGS (NOT USED)

2.13 DIVISION 13 -- SPECIAL CONSTRUCTION (NOT USED)

2.14 DIVISION 14 -- CONVEYING EQUIPMENT (NOT USED)

2.15 DIVISION 21 -- FIRE SUPPRESSION (NOT USED)

2.16 DIVISION 22 -- PLUMBING

A. 22 11 00 - Facility Water Distribution and Specialties

B. 22 11 23 - Facility Natural Gas Piping

C. 22 13 00 - Facility Sanitary Sewerage and Specialties

D. 22 33 00 - Electrical Water Heaters

E. 22 40 00 - Plumbing Fixtures

2.17 DIVISION 23 -- HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

A. 23 05 00 - Plumbing and HVAC Requirements

B. 23 05 29 - Hangers, Supports, Safety Rails and Firestopping for Plumbing, HVAC Piping and Equipment

C. 23 05 53 - Identification for HVAC, Plumbing Piping and Equipment

D. 23 05 93 - Testing, Adjusting, and Balancing for HVAC

E. 23 07 00 - HVAC and Plumbing Insulation

- F. 23 09 02 - Electric/Electronic Controls and Control Equipment Furnace
- G. 23 09 15 - Carbon Monoxide Sensing
- H. 23 23 00 - Refrigerant Piping and Insulation
- I. 23 31 00 - HVAC Ducts and Casings
- J. 23 33 00 - Air Duct Accessories
- K. 23 34 05 - HVAC Fans
- L. 23 37 00 - Air Outlets and Inlets
- M. 23 51 00 - Chimneys and Stacks
- N. 23 54 00 - Furnaces
- O. 23 55 00 - Gas Fuel-Fired Unit Heaters
- P. 23 63 13 - Air Cooled Refrigerant Condensers

2.18 DIVISION 26 -- ELECTRICAL

- A. 26 05 00 - Basic Electrical Requirements
- B. 26 05 01 - Temporary Light and Power
- C. 26 05 02 - Cutting and Patching
- D. 26 05 03 - Equipment Wiring Systems
- E. 26 05 04 - Firestopping
- F. 26 05 19 - Building Wire and Cable
- G. 26 05 26 - Grounding and Bonding
- H. 26 05 29 - Supporting Devices
- I. 26 05 32 - Conduit
- J. 26 05 34 - Boxes
- K. 26 05 35 - Mounting Heights
- L. 26 05 53 - Electrical Identification
- M. 26 09 42 - Time Clocks
- N. 26 24 16 - Panelboards
- O. 26 27 16 - Cabinets and Enclosures
- P. 26 27 26 - Wiring Devices
- Q. 26 28 13 - Fuses
- R. 26 28 19 - Enclosed Disconnect Switches
- S. 26 29 13 - Enclosed Motor Controllers
- T. 26 29 16 - Enclosed Contactors and Relays
- U. 26 51 00 - Interior Luminaires - L.E.D.
- V. 26 58 00 - Occupancy Sensors and Low-Voltage Lighting Controls

2.19 DIVISION 27 -- COMMUNICATIONS (NOT USED)

2.20 DIVISION 28 -- ELECTRONIC SAFETY AND SECURITY (NOT USED)

2.21 DIVISION 31 -- EARTHWORK - SEE CIVIL SPECIFICATIONS

2.22 DIVISION 32 -- EXTERIOR IMPROVEMENTS - SEE CIVIL SPECIFICATIONS

2.23 DIVISION 33 -- UTILITIES - SEE CIVIL SPECIFICATIONS

- A. 33 71 73 - Utility Service Entrance

2.24 CIVIL SPECIFICATIONS

- A. 02210 - Subsurface Investigation
- B. 02220 - Removing Pavement and Miscellaneous Structures
- C. 02310 - Excavation & Embankment - Site Grading
- D. 02315 - Application of Water
- E. 02335 - Subgrade Preparation
- F. 02370 - Erosion & Sediment Control (Less than one acre disturbance)
- G. 02510 - Domestic Water System
- H. 02720 - Aggregate Base
- I. 02751 - Concrete Pavement
- J. 02770 - Concrete Curbing and Driveway Pavement
- K. 02775 - Walks - Concrete
- L. 02920 - Turf Restoration

END OF SECTION

SECTION 00 01 15
LIST OF DRAWING SHEETS

DRAWINGS

All of the following drawings included herein are included in and made a part of the individual work of this project. The labeling of the drawing sheets does not restrict or expand the responsibility of the Work. These are 24" x 36" sheets bound separately from this Project Manual.

GENERAL

T1	Title Sheet
T2	Code Review Plan

CIVIL

G0.01	Title Sheet
G0.02	Legend
G0.03	General Notes
C0.01	Existing Conditions & Removals
C1.01	Details & Typical Sections
C3.01	Proposed Site Plan
C3.02	Proposed Grading Plan

STRUCTURAL

S1.00	Structural Notes
S1.10	Foundation and Slab Plan
S1.20	Foundation and Slab Details
S3.10	Roof Framing Plan
S3.11	Ceiling Framing Plan and Details
S3.20	Framing Details

ARCHITECTURAL

A1.1	First Level Floor Plan, Opening Schedule
A2.1	Details
A3.1	Exterior Elevations
A4.1	Building Sections
A5.1	Wall Sections
A7.1	Reflected Ceiling Plan, Roof Plan & Details
A8.1	Interior Elevations and Finish Plans

MECHANICAL

M1.0	Floor Plan HVAC
M2.0	HVAC Schedules
P1.0	Plumbing Floor Plans
P2.0	Plumbing Risers & Schedules

ELECTRICAL

- E1.0 Site Plan - Electrical
- E2.0 Floor Plan - Lighting
- E3.0 Floor Plan - Power & Special Systems
- E4.0 Schedules, Power Riser, Symbols & Abbreviations

END OF SECTION

ADVERTISEMENT FOR BIDS

Hickory Park Warming House and Ice Rinks
City of Belle Plaine
Belle Plaine, MN

RECEIPT AND OPENING OF PROPOSALS: Sealed proposals for the work described below will be received at the Office of the City Administrator, City of Belle Plaine, 218 North Meridian Street, Belle Plaine, MN 56011 until 11:00am on August 15, 2019 at which time the bids will be opened and publicly read.

DESCRIPTION OF WORK:

- Work includes, but is not limited to, site and utility construction, construction of new building containing warming house, restrooms, vehicle garage, mechanical and electrical systems.
- The work includes the site construction of approximately:

6" Concrete Pavement	2,500	SY	6" Concrete Walk	6,100	SF
B412 C&G	300	LF	Select Granular	250	CY
Remove Conc. & Bituminous	300	SY	Fencing	600	LF

together with numerous related items of work, all in accordance with Plans and Specifications. This project is subject to Responsible Contractor Certification.

COMPLETION OF WORK: All work under the Contract must be complete by December 20, 2019.

PLAN HOLDERS LIST, ADDENDUMS AND BID TABULATION: The plan holders list, addendums and bid tabulations will be available for download on-line at www.bolton-menk.com or www.questcdn.com. Any addendums may also be distributed by mail, fax or email.

TO OBTAIN BID DOCUMENTS: Complete digital project bidding documents are available at www.bolton-menk.com or www.questcdn.com. You may view the digital plan documents for free by entering Quest project #6343649 on the website's Project Search page. Documents may be downloaded for \$40.00. Please contact QuestCDN.com at 952-233-1632 or info@questcdn.com for assistance in free membership registration, viewing, downloading, and working with this digital project information. An optional paper set of project documents is also available for a nonrefundable price of \$50.00 per set, which includes applicable sales tax and shipping. Please make your check payable to Bolton & Menk, Inc. and send it to 1960 Premier Drive, Mankato, MN 56001, (507) 625-4171, fax (507) 625-4177.

BID SUBMITTAL: A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid. For this project the City will be accepting both paper bids and online electronic bids through QuestCDN. To access the electronic bid form, download the project documents and click the online bidding button at the top of the advertisement. Prospective bidders must be on the plan holders list through QuestCDN for bids to be accepted.

BID SECURITY: A certified check or proposal bond in the amount of not less than 5 percent of the total amount bid, drawn in favor of City of Belle Plaine shall accompany each bid.

OWNER'S RIGHTS RESERVED: The Owner reserves the right to reject any or all bids and to waive any irregularities and informalities therein and to award the Contract to other than the lowest bidder if, in their discretion, the interest of the Owner would be best served thereby.

Dated: June 3, 2019 /s/ Dawn Meyer
City Administrator

Published:

QuestCDN: July 24, 2019

Belle Plaine Herald: July 24, 2019, July 31, 2019, and August 7, 2019

SECTION 00 21 13
INSTRUCTIONS TO BIDDERS

SUMMARY

1.01 DOCUMENT INCLUDES

- A. Invitation
 - 1. Bid Submission
 - 2. Intent
 - 3. Work Identified in the Contract Documents
 - 4. Contract Time
- B. Bid Documents and Contract Documents
 - 1. Definitions
 - 2. Contract Documents Identification
 - 3. Availability
 - 4. Examination
 - 5. Inquiries/Addenda
 - 6. Product/Assembly/System Substitutions
- C. Site Assessment
 - 1. Site Examination
 - 2. Prebid Conference
- D. Qualifications
 - 1. Subcontractors/Suppliers/Others
- E. Bid Submission
 - 1. Submission Procedure
 - 2. Bid Ineligibility
- F. Bid Enclosures/Requirements
 - 1. Security Deposit
 - 2. Performance Assurance
 - 3. Insurance
 - 4. Bid Form Requirements
 - 5. Bid Form Signature
 - 6. Selection and Award of Alternates
- G. Offer Acceptance/Rejection
 - 1. Duration of Offer
 - 2. Acceptance of Offer

1.02 RELATED DOCUMENTS

- A. Document 01 10 00 - Summary.
- B. Document 00 11 13 - Advertisement for Bids.
- C. Document 00 41 00 - Bid Form.
- D. Document 00 73 00 - Supplementary Conditions:

INVITATION

2.01 BID SUBMISSION

- A. Bids signed and under seal, executed, and dated will be received at the office of the Owner at 218 North Meridian Street, Belle Plaine, MN 56011 before 11:00 a.m. local standard time on the 15th day of August, 2019.
- B. Offers submitted after the above time shall be returned to the bidder unopened.
- C. Offers will be opened publicly immediately after the time for receipt of bids.

2.02 INTENT

- A. The intent of this Bid request is to obtain an offer to perform work to complete a site and utility construction project which will include a new warming house building with vehicle garage located at Hickory Park for a Stipulated Sum contract, in accordance with the Contract Documents.

2.03 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS

- A. Work of this proposed Contract comprises building construction and site development, including general construction, structural, mechanical, electrical, and civil Work.
- B. Location: Hickory Park located at East Orchard Street and Laredo Avenue.

2.04 CONTRACT TIME

- A. Perform the Work within the time stated in Section 01 10 00 - Summary.
- B. The bidder, in submitting an offer, accepts the Contract Time period stated for performing the Work. The completion date in the Agreement shall be the Contract Time added to the commencement date.

BID DOCUMENTS AND CONTRACT DOCUMENTS

3.01 DEFINITIONS

- A. Bid Documents: Contract Documents supplemented with Instructions to Bidders, Bid Form, and Bid securities identified.
- B. Contract Documents: Defined in AIA A201 Article 1 including issued Addenda.
- C. Bid, Offer, or Bidding: Act of submitting an offer under seal.
- D. Bid Amount: Monetary sum identified by the Bidder in the Bid Form.

3.02 CONTRACT DOCUMENTS IDENTIFICATION

- A. The Contract Documents are identified as Project Number 19-019BP, as prepared by Architect who is located at 330 Stadium Road, Suite 202, Mankato, MN 56001, and with contents as identified in the Table of Contents.

3.03 AVAILABILITY

- A. Bidding Documents can be downloaded for a non-refundable charge of \$40.00 at QuestCDN. Plan holders are parties that have downloaded the drawings and specifications. Plan holders will be notified via email as addenda are issued. Parties that download the drawings and specifications and need to have them printed elsewhere are solely responsible for those printing costs. The sales of paper copies for projects listed on this site are not available.
- B. Contact QuestCDN.com at 952-233-1632 or info@questcdn.com for assistance in viewing or downloading with this digital project information. The QuestCDN project number is eBidDoc #6343649.
- C. Bid Documents are made available only for the purpose of obtaining offers for this project. Their use does not grant a license for other purposes.

3.04 EXAMINATION

- A. Upon receipt of Bid Documents verify that documents are complete. Notify Architect should the documents be incomplete.
- B. Immediately notify Architect upon finding discrepancies or omissions in the Bid Documents.

3.05 INQUIRIES/ADDENDA

- A. Direct questions to Tim Auringer, email; tima@oharchitects.com.
- B. Addenda may be issued during the bidding period. All Addenda become part of the Contract Documents. Include resultant costs in the Bid Amount.
- C. Verbal answers are not binding on any party.

- D. Clarifications requested by bidders must be in writing not less than 7 days before date set for receipt of bids. The reply will be in the form of an Addendum, a copy of which will be forwarded to known recipients.

3.06 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS

- A. Where the Bid Documents stipulate a particular product, substitutions will be considered up to 10 days before receipt of bids.
- B. When a request to substitute a product is made, Architect may approve the substitution and will issue an Addendum to known bidders.
- C. The submission shall provide sufficient information to determine acceptability of such products.
- D. Provide complete information on required revisions to other work to accommodate each proposed substitution.
- E. Provide products as specified unless substitutions are submitted in this manner and accepted.

SITE ASSESSMENT

4.01 SITE EXAMINATION

- A. Examine the project site before submitting a bid.

QUALIFICATIONS

5.01 SUBCONTRACTORS/SUPPLIERS/OTHERS

- A. Owner reserves the right to reject a proposed subcontractor for reasonable cause.

BID SUBMISSION

6.01 SUBMISSION PROCEDURE

- A. Bidders shall be solely responsible for the delivery of their bids in the manner and time prescribed.
- B. Submit one copy of the executed offer on the Bid Forms provided, signed and sealed with the required security in a closed opaque envelope, clearly identified with bidder's name, project name and Owner's name on the outside.
- C. Improperly completed information, irregularities in security deposit, may be cause not to open the Bid Form envelope and declare the bid invalid or informal.
- D. An abstract summary of submitted bids will be made available to all bidders following bid opening.

6.02 BID INELIGIBILITY

- A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may at the discretion of the Owner, be declared unacceptable.

BID ENCLOSURES/REQUIREMENTS

7.01 SECURITY DEPOSIT

- A. Bids shall be accompanied by a security deposit as follows:
 - 1. Bid Bond of a sum no less than 5 percent of the Bid Amount on AIA A310 Bid Bond Form.
- B. Endorse the Bid Bond in the name of the Owner as obligee, signed and sealed by the principal (Contractor) and surety.
- C. The security deposit will be returned after delivery to the Owner of the required Performance and Payment Bond(s) by the accepted bidder.
- D. Include the cost of bid security in the Bid Amount.
- E. After a bid has been accepted, all securities will be returned to the respective bidders and other requested enclosures.
- F. If no contract is awarded, all security deposits will be returned.

7.02 PERFORMANCE ASSURANCE

- A. Accepted Bidder: Provide a Performance bond as described in 00 73 00 - Supplementary Conditions.
- B. Include the cost of performance assurance bonds in the Bid Amount.

7.03 INSURANCE

- A. Provide an executed "Undertaking of Insurance" on a standard form provided by the insurance company stating their intention to provide insurance to the bidder in accordance with the insurance requirements of the Contract Documents.

7.04 BID FORM REQUIREMENTS

- A. Complete all requested information in the Bid Form and Appendices.

7.05 BID FORM SIGNATURE

- A. The Bid Form shall be signed by the bidder, as follows:
 - 1. Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Insert the words "Sole Proprietor" under the signature. Affix seal.
 - 2. Partnership: Signature of all partners in the presence of a witness who will also sign. Insert the word "Partner" under each signature. Affix seal to each signature.
 - 3. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures. Insert the officer's capacity in which the signing officer acts, under each signature. Affix the corporate seal. If the bid is signed by officials other than the president and secretary of the company, or the president/secretary/treasurer of the company, a copy of the by-law resolution of their board of directors authorizing them to do so, must also be submitted with the Bid Form in the bid envelope.
 - 4. Joint Venture: Each party of the joint venture shall execute the Bid Form under their respective seals in a manner appropriate to such party as described above, similar to the requirements of a Partnership.

OFFER ACCEPTANCE/REJECTION

8.01 DURATION OF OFFER

- A. Bids shall remain open to acceptance and shall be irrevocable for a period of thirty (30) days after the bid closing date.

8.02 ACCEPTANCE OF OFFER

- A. Owner reserves the right to accept or reject any or all offers.
- B. After acceptance by Owner, Architect on behalf of Owner, will issue to the successful bidder, a written Bid Acceptance.

END OF SECTION

**SECTION 00 41 00
BID FORM**

THE PROJECT AND THE PARTIES

TO:

City of Belle Plaine (Owner)
218 North Meridian Street
Belle Plaine, MN 56011

FOR:

Project: Hickory Park Warming House and Ice Rinks

FROM: (BIDDER TO ENTER NAME AND ADDRESS)

Bidder's Full Name _____

Address _____

City, State, Zip _____

OFFER

The undersigned, having become thoroughly familiar with terms and conditions of the proposed Contract documents and with local conditions affecting the work, proposes and agrees to fully perform the work within the stated time and in strict accordance with the Contract Documents, including all labor, materials, equipment, supplies, supervision and bonds, for the sum of money stated in this Bid Form.

In submitting this bid, the undersigned acknowledges agreement with the following: The undersigned is a lawfully authorized agent of the Bidder

Upon written Notice of Award, bidder will provide evidence of insurance coverage, and the signed, executed Agreement within the prescribed period of time.

Upon execution of the Agreement, bidder will commence work promptly (within 10 days) upon Notice to Proceed.

Upon execution of the Agreement, bidder will assure that specified work will be Substantially Completed within the time and according to the provisions of these documents.

If written notice of the acceptance of this bid is mailed or delivered to the undersigned within thirty (30) days after the date of bid opening, or at any other time thereafter before it is withdrawn, the Bidder will execute all required documents in a timely manner according to these instruments.

Notice of Award or requests for additional information may be addressed to the undersigned at the address set forth below.

Bidder agrees and attests that no unlawful discriminatory practices or segregated facilities will be permitted in the performance of the work. Under no circumstances within the bidder's control will segregation on the basis of race, color, religion, sex, or national origin be permitted.

If bidder is a corporation, indicate in the blank space to the right of the signature the legal name of the corporation, state of incorporation, and names of president and secretary; if a partnership, give name of firm and names of all individual co-partners comprising the firm, if bidder is an individual, give first and last names in full.

The bidder, having examined the place of the work, and being thoroughly familiar with these documents and conditions surrounding the proposed work and affecting the cost of the work, and being familiar with the Bid Documents, Contract Form, all Conditions of the Contract, Drawings, Project Manual, and Addenda, hereby propose to furnish all labor, materials, supplies, coordination, and equipment, to construct the above named project within the time set forth, in accordance with the Contract Documents prepared by Oleson + Hobbie Architects, LLC for the above mentioned project for the Sum of:

dollars (\$ _____), in lawful money of the United States of America.

We have included the required security deposit as required by the Instruction to Bidders.

We have included the required performance assurance bonds in the Bid Amount as required by the Instructions to Bidders.

All applicable federal taxes are included and State of Minnesota taxes are included in the Bid Sum.

ACCEPTANCE

This offer shall be open to acceptance and is irrevocable for thirty days from the bid closing date.

If this bid is accepted by Owner within the time period stated above, we will:

Execute the Agreement within seven days of receipt of Notice of Award.

Furnish the required bonds within seven days of receipt of Notice of Award.

Commence work within seven days after written Notice to Proceed of this bid.

If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Owner by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

CONTRACT TIME

If this Bid is accepted, we will:

Complete Civil site work by November 15, 2019.

Complete all Work by December 20, 2019.

UNIT PRICES

The following are Unit Prices for specific portions of the Work as listed. The following is the list of Unit Prices:

ITEM NO.	ITEM	APPROX. QUANT.	UNIT	UNIT PRICE	AMOUNT
	WARMING HOUSE BUILDING				
1	CONSTRUCTION	1	LUMP SUM		
2	MOBILIZATION	1	LUMP SUM		
3	REMOVE BITUMINOUS	250	SQ YD		
4	REMOVE CONCRETE	18.6	SQ YD		
5	SALVAGE AND REINSTALL SIGN	1	EACH		
6	SITE GRADING	1	LUMP SUM		
7	TOPSOIL STRIP & RE-SPREAD	250	CU YD		
8	SELECT GRANULAR BORROW (CV)	250	CU YD		
9	6" CONCRETE WALK CONCRETE CURB & GUTTER	6100	SQ FT		
10	DESIGN B412	300	LIN FT		
	6" REINFORCED CONCRETE				
11	PAVEMENT	2450	SQ YD		
12	STOP LOG & FRAME	1	EACH		
	SALVAGE AND REINSTALL				
13	FENCING, POSTS & GATES	590	LIN FT		
14	REMOVE SEWER PIPE (SANITARY)	16	LIN FT		
15	8"x4" PVC REDUCER (SDR26) CONNECT TO EXISTING	1	EACH		
16	WATERMAIN	1	EACH		
17	REMOVE WATERMAIN	16	LIN FT		
18	HYDRANT (WITH STORZ NOZZLE)	1	EACH		
19	6" GATE VALVE & BOX	1	EACH		
20	1.5" CORPORATION STOP	1	EACH		
21	1.5' WATER SERVICE	55	LIN FT		
22	6" WATERMAIN	33	LIN FT		
23	WATERMAIN FITTINGS CONNECT TO EXISTING STORM	72	LBS		
24	CATCH BASIN	1	EACH		
25	8" PIPE SEWER (STORM)	250	LIN FT		
	8" PVC PIPE DRAIN CLEANOUT				
26	(STORM)	1	EACH		
27	ROOF DRAIN CONNECTION	2	EACH		
28	PERIMETER EROSION CONTROL	85	LIN FT		
29	HYDRO SEED & HYDROMULCH	1	LUMP SUM		

TOTAL AMOUNT BID: _____

CHANGES TO THE WORK

When Architect establishes that the method of valuation for Changes in the Work will be net cost plus a percentage fee in accordance with General Conditions, our percentage fee will be:

- _____ percent overhead and profit on the net cost of our own Work;
- _____ percent on the cost of work done by any Subcontractor.

On work deleted from the Contract, our credit to Owner shall be Architect-approved net cost plus _____ of the overhead and profit percentage noted above.

ADDENDA

The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.

- Addendum # _____ Dated _____.
- Addendum # _____ Dated _____.
- Addendum # _____ Dated _____.

BID FORM SIGNATURE(S)

The Corporate Seal of

(Bidder - print the full name of your firm)
was hereunto affixed in the presence of:

(Authorized signing officer, Title)

(Authorized signing officer, Title)

DATE

BID DATED THIS _____ DAY OF _____, 2019

END OF SECTION

**SECTION 00 72 00
GENERAL CONDITIONS**

PART 1 - GENERAL

1.01 FORM OF GENERAL CONDITIONS

- A. General Conditions of the Contract for Construction, AIA Document A201, Latest Edition, complete, is hereby made part of this Specification (except as altered herein) to the same extent as if bound herein.
- B. A copy is on file in the office of the Architect/Engineer and may be obtained or examined there

1.02 RELATED REQUIREMENTS

- A. Section 00 73 00 - Supplementary Conditions.

1.03 SUPPLEMENTARY CONDITIONS

- A. Refer to document 00 73 00 - Supplementary Conditions for amendments to these general conditions.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

**SECTION 00 73 00
SUPPLEMENTARY CONDITIONS**

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. General Conditions.
- B. Supplements to the General Conditions.

1.02 GENERAL CONDITIONS

- A. AIA Documents A201, "General Conditions of the Contract for Construction," Latest Edition, Articles 1 through 15 inclusive, is part of the Contract.

1.03 SUPPLEMENTS TO GENERAL CONDITIONS

- A. Where articles, paragraphs, subparagraphs are supplemented by the following paragraphs, supplemental provisions are added to the original provisions which remain in effect.
- B. Articles, paragraphs, subparagraphs not amended, voided, or superseded by the following paragraphs remain in effect.

ARTICLE 1 - GENERAL PROVISIONS

1.1.3 THE WORK

Add the following sub-paragraph:

1.1.3.1 The term "Provided" shall mean furnished and installed in place.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following subparagraph:

1.2.4 If there is an inconsistency in quality or quantity of Work required by the Contract Documents, provide quality or quantity consistent with Architect's interpretation. No change shall result in Contract sum based upon that interpretation providing that Work so required was within range of quality or quantity described in the Documents.

1.4 INTERPRETATION

Add the following four subparagraphs:

1.4.1 The general character and scope of the Work is shown by the Drawings. Where a portion of the Work is fully drawn and the remainder is merely indicated, the portion fully drawn shall apply to all similar parts of the Work.

1.4.2 Figured dimensions on the Drawings shall be followed in preference to scaled measurements on the Drawings.

1.4.3 Where Specifications are abbreviated type, they indicate complete sentences in the same manner as when a note occurs in the Drawings. Omissions of a word such as "the Contractor shall" and "as shown on the Drawings" is intentional. The words "shall" or "shall be" are to be supplied by inference.

1.4.4 Where a number is listed in the Specifications (as for gauges, weights, temperatures, amounts of time, etc.), the number shall be interpreted as that or better.

ARTICLE 3 - CONTRACTOR

3.4 LABOR AND MATERIALS

Add the following four subparagraphs:

3.4.4 Manufacturer's printed instructions covering details of installation shall be followed where not in conflict with these Specifications. If there is a conflict, notify the Architect and obtain approval before proceeding.

3.4.5 Completed Work shall be left plumb, level, true to line or plane, anchored securely in place, free from damage.

3.4.6 Unless otherwise called for, all pieces of material shall be as large a stock size as is in conformity with standard good practice of the trade.

3.4.7. *Except where in conflict with the Specifications, current manufacturer's printed Specifications of herein-specified proprietary products are made part of the specifications.*

3.7 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS

Add the following sub-subparagraph:

3.7.1.1 *The Contractor will purchase and pay for the building permit.*

Add the following to subparagraph 3.7.2:

When the Contract Documents require Work better than that required by Statute, the Contract Documents shall govern.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

Add the following to subparagraph 3.10.1:

The General Contractor with the overall Project Construction Schedule shall coordinate the schedule.

3.13 USE OF SITE

Add the following subparagraph:

3.13.2 *Owner may perform certain other work on site during the course of construction with own personnel or by separate Contract. Permit full access to entire site by Owner or other Contractors, coordinate Work with theirs, and cooperate in any way possible.*

3.18 INDEMNIFICATION

Add the following sub-subparagraph:

3.18.2.1 *In addition to any indemnification required under paragraph 3.18, purchase insurance as provided in the State Statutes, as most recently amended, and as required in Article 11. Provide copies of insurance to Owner, Architect, and include these items as additional insured.*

ADD TO ARTICLE 3:

3.19 VERIFICATION OF FIELD CONDITIONS:

Add the following subparagraphs:

3.19.1 *Take field measurements and verify field conditions. Thoroughly compare such measurements and conditions with Contract Documents and Shop Drawings or product information before commencing Work. Report any error, inconsistency, or omission to Architect immediately.*

3.19.2 *No change in Contract Sum will be allowed because of minor differences between actual field conditions and conditions described in Contract Documents.*

ARTICLE 4 - ARCHITECT

4.2 ADMINISTRATION OF THE CONTRACT

Add the following to subparagraph 4.2.3:

The Architect shall not be responsible for the acts or omissions of the Owner.

ARTICLE 5 - SUBCONTRACTORS

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

Add the following to subparagraph 5.2.1:

Contractor's responsibility to furnish materials, products, and equipment in conformance with requirements of the Contract Documents shall not be modified or limited by Owner's or Architect's lack of reasonable objection to any selected Subcontractor or Supplier.

ARTICLE 7 - CHANGES IN THE WORK

7.2 CHANGE ORDERS

Add the following subparagraphs:

7.2.2 *Change Orders are understood to include cost plus amount for overhead and profit agreed upon under 7.3.3.3 supplemented herein and required adjustments to Contract Time. No further consideration for additional impact upon Contract Sum or*

Contract Time will be made as result of any or all change orders as may be agreed to by Owner and Contractor.

7.2.3 Neither the Owner nor the Architect is responsible to give Notice of Change Orders to the Contractor's Surety.

7.3 CONSTRUCTIVE CHANGE DIRECTIVES

Change sub-subparagraph 7.3.3.3 as follows:

Delete the final "or" and add: "a reasonable allowance for overhead and profit shall not be more than: ten (10 %) percent of the net cost of the changed Work accomplished by Contractor's own forces; ten (10 %) percent of the net cost of the materials used in the changed Work; and five (5 %) of the net cost if the changed Work accomplished by the subcontractors. Subcontractors may add an allowance of not more than (10 %) percent of the net cost of the changed Work including materials performed or used by their own forces to cover their overhead and profit;

ARTICLE 8 - TIME

8.3 DELAYS AND EXTENSION OF TIME

Add the following subparagraph:

8.3.4 Contractor shall be responsible for damages incurred by Owner, Architect, Engineer and any other separate Contractors for delay resulting from Contractor's failure to complete work within Contract Time.

ARTICLE 9 - PAYMENTS AND COMPLETION

9.3 APPLICATIONS FOR PAYMENT

Add the following to subparagraph 9.3.1:

Substantiating documents shall include waivers of liens from subcontractors and suppliers.

Add the following subparagraph:

9.3.4 Progress payments shall be made monthly upon application, in the amount of ninety-five (95 %) of the Work completed and materials stored on site. The retained five (5 %) percent shall be held until such time as all the Contractor's Work has been completed in full. Said retainage of five (5 %), does not preclude the Owner and Architect to withhold additional sums for Contractor's failure to perform, or make payments to its subcontractors and suppliers.

9.8 SUBSTANTIAL COMPLETION

Add the following to subparagraph 9.8.1:

Minor corrective Work and the replacement of defective work or materials, and the adjustment of control apparatus will not delay the determination of substantial completion. See paragraph 12.2.2.2.

9.9 PARTIAL OCCUPANCY OR USE

Add the following to subparagraph 9.9.1:

The insurance company or companies providing property insurance required by Paragraph 11.3 shall consent to use or occupancy by endorsement prior to such use or occupancy.

Add the following to subparagraph 9.9.2:

After occupancy, the Owner will allow the Contractor reasonable access to occupied areas to complete and correct the work.

Add the following to subparagraph 9.9.3:

Use or occupancy by the Owner shall not be deemed to constitute waiver of existing claims on behalf of Owner or Contractor against each other.

Add the following subparagraph:

9.9.4 Owner shall have the right to install furnishings and equipment within project prior to substantial completion of the Work. Such installation shall not constitute occupancy or use by Owner.

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

Add the following four subparagraphs:

10.1.2 *The Contractor shall have on site at all times a copy of its Safety Program, Hazardous Communications Program and Material Safety Data Sheets (MSDS) for products to be used in connection with the Work; a copy of each Program and MSDS shall be provided to the Architect prior to commencing Work on site.*

10.1.3 *The Contractor shall immediately notify the Architect of all accidents which happen in connection with the Work, and within 24 hours have a written report as to what happened and what if any remedies or cautions are being implemented to prevent further injuries or damages. The contractor shall also give the Architect a copy of OSHA Form 200, each time it is updated.*

10.1.4 *If reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material, substance or condition encountered on the site by the Contractor, the Contractor shall upon recognizing the condition, immediately stop the work in the affected area and report the condition to the Owner and Architect in writing. The Owner, Contractor, and Architect shall then proceed in the same manner as outlined in Subparagraph 10.3.1.*

10.1.5 *The Owner shall be responsible for obtaining services of a licensed laboratory to verify a presence or absence of the material or substance reported by the Contractor and, in the event such material, substance or condition is found to be present, to verify that it has been rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material, substance or condition and who are to perform the task or removal or safe containment of such material, substance, or condition. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either have reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall proposed another to whom the Contractor and the Architect have no reasonable objection.*

ARTICLE 11 - INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

Delete paragraphs 11.1.1 through 11.1.4 and substitute the following:

11.1.1 *Purchase from and maintain in a company or companies lawfully authorized to do business in jurisdictions in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractors operations under the Contract, and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone whose acts any of them may be liable.*

11.1.2 *Worker's Compensation and Employer's Liability Insurance coverage as per State Statute.*

11.1.3 *Commercial General Liability*

.1 *\$2,000,000 General Aggregate.*

.2 *\$2,000,000 Products-Completed Operations Aggregate.*

.3 *\$2,000,000 Each Occurrence.*

.4 *\$2,000,000 Personal Injury.*

The Commercial General Liability shall provide at a minimum the following coverages:

.5 *Operations of Contractor;*

.6 *Operations of Contractor (Contingent Liability);*

.7 *Products/Completed Operations (To be carried for one year after completion of contract);*

.8 *Personal injury including employee related claims;*

- .9 *Employees as additional insured;*
- .10 *Broad Form Property Damage including but not limited to hazards of Explosion, Collapse and Underground; and*
- .11 *Contractual Liability.*
- 11.1.4 *Comprehensive Automobile Liability*
 - .1 *\$2,000,000 Combined single limit bodily injury and property damage;*
 - .2 *All owned vehicles;*
 - .3 *All non-owned vehicles;*
 - .4 *All hired vehicles.*
- 11.1.5 *Umbrella Liability*
 - .1 *\$2,000,000 Each Claim;*
 - .2 *\$2,000,000 Annual Aggregate; and,*
 - .3 *Umbrella Liability shall provide excess limits over and above Commercial General Liability, Employers Liability, and Comprehensive Automobile liability limits stated in this Article.*
- 11.1.6 *Insurance required by 11.1.1 shall be written for limits specified or required by law, whichever is greater. Coverages, whether written on an occurrence or claims made basis, shall be maintained without interruption from date of final payment and termination of any coverage required to be maintained after final payment.*
- 11.1.7 *Certificates of Insurance. File Certificates of Insurance with Architect prior to commencement of work, indicating that all insurance required by this Article is in force; such certificates to be prepared on ACORD or CICC forms. Such coverage shall contain provision that coverages afforded shall not be canceled or non-renewed without 30 days prior written notice to Owner.*

11.3 PROPERTY INSURANCE

Add the following:

- 11.3.1.6 *Owner, Architect, and Engineer shall be listed as additional insured on the Contractor Insurance Certificate.*

ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK

12.2 CORRECTION OF WORK

Add the following to sub-subparagraph 12.2.2.1:

- 12.2.2.1.1 *Warrant Work for one year from date of Substantial Completion Certification. Any specific warranties required by Contract Documents to remain in effect beyond a one year period shall not be considered modified by this one year warranty. Warranty period on Work not completed on date of Substantial Completion will begin on the date of Final Completion Certification or actual completion of the Work, whichever is later.*
- 12.2.2.1.2 *Neither the final Certificate of Payment nor any provision in the Contract Documents shall relieve the Contractor of responsibility for negligence or for faulty materials or work within extent and period provided by law. Upon written notice, remedy, any defect due thereto, and pay all expenses to any other work resulting therefrom.*

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOT USED.

END OF SECTION

SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Hickory Park Warming House and Ice Rinks
- B. Owner's Name: City of Belle Plaine.
- C. Architect's Name: Oleson + Hobbie Architects, LLC.
- D. The Project consists of the construction of site and utility construction, construction of new building containing warming house, restrooms, vehicle garage, mechanical and electrical systems.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 52 00 - Agreement Form.

1.03 WORK BY OWNER

- A. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Substantial Completion.

1.04 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
- B. Arrange use of site and premises to allow:
 - 1. Owner occupancy.
 - 2. Work by Others.
 - 3. Work by Owner.
 - 4. Use of site by the public.
- C. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
- D. Time Restrictions:
 - 1. Limit conduct of especially noisy exterior work to the hours of 8:00 a.m to 5:00 p.m..
- E. Utility Outages and Shutdown:
 - 1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
 - 2. Prevent accidental disruption of utility services to other facilities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

- A. Section 00 72 00 - General Conditions: Additional requirements for progress payments, final payment, changes in the Work.
- B. Section 00 73 00 - Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.
- C. Section 01 78 00 - Closeout Submittals: Project record documents.

1.03 SCHEDULE OF VALUES

- A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- E. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.
 - 10. Retainage.
- F. Execute certification by signature of authorized officer.
- G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- I. Submit one electronic and two hard-copies of each Application for Payment.
- J. Include the following with the application:

1. Transmittal letter as specified for submittals in Section 01 30 00.
 2. Partial release of liens from major subcontractors and vendors.
 3. Affidavits attesting to off-site stored products.
- K. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.05 MODIFICATION PROCEDURES

- A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
- B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 2. Promptly execute the change.
- C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within five days.
- D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 60 00.
- E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
 1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
 2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
 3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
 4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.
- F. Substantiation of Costs: Provide full information required for evaluation.
 1. On request, provide the following data:
 - a. Quantities of products, labor, and equipment.
 - b. Taxes, insurance, and bonds.
 - c. Overhead and profit.
 - d. Justification for any change in Contract Time.
 - e. Credit for deletions from Contract, similarly documented.
 2. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

1.06 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
 1. All closeout procedures specified in Section 01 70 00.

PART 2 PRODUCTS - NOT USED
PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- A. Section 00 21 13 - Instructions to Bidders: Restrictions on timing of substitution requests.
- B. Section 01 30 00 - Administrative Requirements: Submittal procedures, coordination.
- C. Section 01 60 00 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. No specific form is required. Contractor's Substitution Request documentation must include the following:
 - a. Project Information:
 - 1) Official project name and number, and any additional required identifiers established in Contract Documents.
 - 2) Owner's, Architect's, and Contractor's names.
 - b. Substitution Request Information:
 - 1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
 - 2) Indication of whether the substitution is for cause or convenience.
 - 3) Issue date.
 - 4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).

- 5) Description of Substitution.
- 6) Reason why the specified item cannot be provided.
- 7) Differences between proposed substitution and specified item.
- 8) Description of how proposed substitution affects other parts of work.
- c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
 - 1) Physical characteristics.
 - 2) In-service performance.
 - 3) Expected durability.
 - 4) Visual effect.
 - 5) Sustainable design features.
 - 6) Warranties.
 - 7) Other salient features and requirements.
 - 8) Include, as appropriate or requested, the following types of documentation:
 - (a) Product Data:
 - (b) Samples.
 - (c) Certificates, test, reports or similar qualification data.
 - (d) Drawings, when required to show impact on adjacent construction elements.
- d. Impact of Substitution:
 - 1) Savings to Owner for accepting substitution.
 - 2) Change to Contract Time due to accepting substitution.
- D. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.
- B. Submittal Form (before award of contract):

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Architect will consider requests for substitutions only within 15 days after date of Agreement.
- B. Substitutions will not be considered under one or more of the following circumstances:
 - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 - 2. Without a separate written request.
 - 3. When acceptance will require revisions to the Contract Documents.

3.04 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

3.05 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Submittals for review, information, and project closeout.
- E. Number of copies of submittals.
- F. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 00 72 00 - General Conditions: Dates for applications for payment.
- B. Section 01 32 16 - Construction Progress Schedule: Form, content, and administration of schedules.
- C. Section 01 60 00 - Product Requirements: General product requirements.
- D. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
- E. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

- A. Schedule meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Contractor.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 - 5. Designation of personnel representing the parties to Contract and Architect.
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 7. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.

- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required:
 - 1. Contractor.
 - 2. Owner.
 - 3. Architect.
 - 4. Contractor's superintendent.
 - 5. Major subcontractors.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems that impede, or will impede, planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Review of RFIs log and status of responses.
 - 7. Review of off-site fabrication and delivery schedules.
 - 8. Maintenance of progress schedule.
 - 9. Corrective measures to regain projected schedules.
 - 10. Planned progress during succeeding work period.
 - 11. Coordination of projected progress.
 - 12. Maintenance of quality and work standards.
 - 13. Effect of proposed changes on progress schedule and coordination.
 - 14. Other business relating to work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 - 1. Product data.
 - 2. Shop drawings.
 - 3. Samples for selection.
 - 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.04 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Design data.
 - 2. Certificates.
 - 3. Test reports.
 - 4. Inspection reports.
 - 5. Manufacturer's instructions.
 - 6. Manufacturer's field reports.
 - 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.05 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.

- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.06 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.07 SUBMITTAL PROCEDURES

- A. General Requirements:
 - 1. Use a single transmittal for related items.
 - 2. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
 - 3. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 - 4. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 - 5. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
 - 6. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 - 7. Provide space for Contractor and Architect review stamps.
 - 8. When revised for resubmission, identify all changes made since previous submission.
 - 9. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
 - 10. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
 - 11. Submittals not requested will be recognized, and will be returned "Not Reviewed",
- B. Product Data Procedures:
 - 1. Submit only information required by individual specification sections.
 - 2. Collect required information into a single submittal.
 - 3. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
 - 1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related work.
 - 2. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:
 - 1. Transmit related items together as single package.

2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.08 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
- D. Architect's and consultants' actions on items submitted for review:
 1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "Approved", or language with same legal meaning.
 - b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
 2. Not Authorizing fabrication, delivery, and installation:
- E. Architect's and consultants' actions on items submitted for information:
 1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.
 2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preliminary schedule.
- B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS

- A. Section 01 10 00 - Summary: Work sequence.

1.03 SUBMITTALS

- A. Within 10 days after date of Agreement, submit preliminary schedule.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.

1.04 SCHEDULE FORMAT

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- B. Sheet Size: Multiples of 8-1/2 x 11 inches.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

- A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 BAR CHARTS

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first work day of each week.

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Control of installation.
- F. Defect Assessment.

1.02 RELATED REQUIREMENTS

- A. Document 00 31 00 - Available Project Information: Soil investigation data.
- B. Document 00 72 00 - General Conditions: Inspections and approvals required by public authorities.
- C. Section 01 21 00 - Allowances: Allowance for payment of testing services.
- D. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- E. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).
- B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.
- C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2015a, with Editorial Revision (2016).
- D. 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; 2012a.
- E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2018.
- F. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.

1.04 DEFINITIONS

- A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.
- B. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents, or for Owner's information.
- C. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
 - 1. Include:
 - a. Date issued.

- b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
- D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
 - E. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
 - 1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents.
 - F. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
 - 1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents.

1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

1.07 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.08 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Owner will employ services of an independent testing agency to perform certain specified testing; payment for cost of services will be derived from allowance specified in Section 01 21 00; see Section 01 21 00 and applicable sections for description of services included in allowance.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TESTING AND INSPECTION

- A. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Submit reports of all tests/inspections specified.
- B. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- C. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 - 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

- D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.03 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION

SECTION 01 45 33
CODE-REQUIRED SPECIAL INSPECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Code-required special inspections.
- B. Testing services incidental to special inspections.
- C. Submittals.

1.02 RELATED REQUIREMENTS

- A. Document 00 31 00 - Available Project Information: Soil investigation data.
- B. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- C. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 DEFINITIONS

- A. Code or Building Code: ICC (IBC), 2015 Edition of the International Building Code and specifically, Chapter 17 - Special Inspections and Tests.
- B. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located.
- C. National Institute of Standards and Technology (NIST).
- D. Special Inspection:
 - 1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the AHJ that also require special expertise to ensure compliance with the approved contract documents and the referenced standards.
 - 2. Special inspections are separate from and independent of tests and inspections conducted by Owner or Contractor for the purposes of quality assurance and contract administration.

1.04 REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).
- B. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2018.
- C. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2015.
- D. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.
- E. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Special Inspection Agency Qualifications: Prior to the start of work, the Special Inspection Agency shall:
 - 1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 - 3. Submit certification that Special Inspection Agency is acceptable to AHJ.
- C. Testing Agency Qualifications: Prior to the start of work, the Testing Agency shall:
 - 1. Submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 3. Submit certification that Testing Agency is acceptable to AHJ.
- D. Special Inspection Reports: After each special inspection, Special Inspector shall promptly submit two copies of report; one to Architect and one to the AHJ.
1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of Special Inspector.
 - d. Date and time of special inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of special inspection.
 - h. Date of special inspection.
 - i. Results of special inspection.
 - j. Compliance with Contract Documents.

1.06 SPECIAL INSPECTION AGENCY

- A. Owner or Architect will employ services of a Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by the building code.
- B. The Special Inspection Agency may employ and pay for services of an independent testing agency to perform testing and sampling associated with special inspections and required by the building code.
- C. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.07 TESTING AND INSPECTION AGENCIES

- A. Owner or Architect may employ services of an independent testing agency to perform additional testing and sampling associated with special inspections but not required by the building code.
- B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL

- A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
 1. Continuous Special Inspection: Special Inspection Agency shall be present in the area where the work is being performed and observe the work at all times the work is in progress.
 2. Periodic Special Inspection: Special Inspection Agency shall be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

3.02 SPECIAL INSPECTIONS FOR CONCRETE CONSTRUCTION

- A. Reinforcing Steel, Including Prestressing of Tendons and Placement: Verify compliance with approved contract documents and ACI 318, Sections 3.5 and 7.1 through 7.7; periodic.
- B. Reinforcing Steel Welding: Verify compliance with AWS D1.4/D1.4M and ACI 318, Section 3.5.2; periodic.
- C. Design Mix: Verify plastic concrete complies with the design mix in approved contract documents and with ACI 318, Chapter 4 and 5.2; periodic.

- D. Specified Curing Temperature and Techniques: Verify compliance with approved contract documents and ACI 318, Sections 5.11 through 5.13; periodic.
- E. Concrete Strength in Situ: Verify concrete strength complies with approved contract documents and ACI 318, Section 6.2, for the following.
- F. Formwork Shape, Location and Dimensions: Verify compliance with approved contract documents and ACI 318, Section 6.1.1; periodic.

3.03 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

- A. Special Inspection Agency shall:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified reference standards.
 - 3. Ascertain compliance of materials and products with requirements of Contract Documents.
 - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Submit reports of all tests or inspections specified.
- B. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- C. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.04 TESTING AGENCY DUTIES AND RESPONSIBILITIES

- A. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Submit reports of all tests or inspections specified.
- B. Limits on Testing or Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the work.
- C. On instructions by Architect, perform re-testing required because of non-compliance with specified requirements, using the same agency.
- D. Contractor will pay for re-testing required because of non-compliance with specified requirements.

3.05 CONTRACTOR DUTIES AND RESPONSIBILITIES

- A. Contractor Responsibilities, General:
 - 1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
 - 2. Cooperate with agency and laboratory personnel; provide access to the work, to manufacturers' facilities, and to fabricators' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to work to be tested or inspected.

- b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
 - c. To facilitate tests or inspections.
 - d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing or inspection services.
 5. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

END OF SECTION

SECTION 01 45 34

Special Structural Testing and Inspection Program Summary Schedule

Project Name: _____ Project No.: _____

Location: _____ Permit No.: _____(1)

Technical (2)		Description (3)	Type of Inspector (4)	Specific Report Frequency (5)	Assigned Firm (6)
Section	Article				

Note: This schedule shall be filled out and included in a Special Structural Testing and Inspection Program.

(If not otherwise specified, assumed program will be "Guidelines for Special Inspection & Testing" as contained in the Minnesota State Building Code and as modified by the state adopted IBC.)

A complete specification-ready program can be downloaded directly by visiting CASE/MN at www.cecm.org

- (1) Permit No. to be provided by the Building Official.
- (2) Referenced to the specific technical scope section in the program.
- (3) Use descriptions per IBC Chapter 17, as adopted by Minnesota State Building Code.
- (4) Special Inspector – Technical (SIT); Special Inspector – Structural (SIS).
- (5) Weekly, monthly, per test/inspection, per floor, etc.
- (6) Name of Firm contracted to perform services.

ACKNOWLEDGEMENTS
(Each appropriate representative shall sign below)

Owner: _____ Firm: _____ Date: _____
 Contractor: _____ Firm: _____ Date: _____
 Architect: _____ Firm: _____ Date: _____
 SER: _____ Firm: _____ Date: _____
 SI-S: _____ 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 as an attachment.

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 _____

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Dewatering
- B. Temporary utilities.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Security requirements.
- F. Vehicular access and parking.
- G. Waste removal facilities and services.
- H. Project identification sign.
- I. Field offices.

1.02 RELATED REQUIREMENTS

- A. Section 01 51 00 - Temporary Utilities.
- B. Section 01 52 13 - Field Offices and Sheds.
- C. Section 01 55 00 - Vehicular Access and Parking.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

1.04 DEWATERING

- A. Provide temporary means and methods for dewatering all temporary facilities and controls.
- B. Maintain temporary facilities in operable condition.

1.05 TEMPORARY UTILITIES

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- B. Existing facilities may be used.
- C. New permanent facilities may be used.
- D. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.06 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

1.07 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.08 FENCING

- A. Construction: Commercial grade chain link fence.

- B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.09 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.10 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.11 VEHICULAR ACCESS AND PARKING

- A. Coordinate access and haul routes with governing authorities and Owner.
- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide means of removing mud from vehicle wheels before entering streets.
- D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.12 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.13 PROJECT IDENTIFICATION

- A. Provide project identification sign of design and construction indicated on drawings.
- B. Erect on site at location indicated.
- C. No other signs are allowed without Owner permission except those required by law.

1.14 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.15 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition.
- E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 57 13
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Prevention of erosion due to construction activities.
- B. Prevention 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.

1.02 RELATED REQUIREMENTS

- A. Section 31 10 00 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.
- B. Section 31 22 00 - Grading: Temporary and permanent grade changes for erosion control.
- C. Section 32 11 23 - Aggregate Base Courses: Temporary and permanent roadways.
- D. Section 32 92 19 - Seeding: Permanent turf for erosion control.
- E. Section 32 92 23 - Sodding: Permanent turf for erosion control.
- F. Section 32 93 00 - Plants: Permanent plantings for erosion control.

1.03 REFERENCE STANDARDS

- A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus; 2014.
- B. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2014).
- C. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2015.
- D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a.
- E. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2016.
- F. ASTM D4873/D4873M - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2017.
- G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.

1.04 PERFORMANCE REQUIREMENTS

- A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP).
- B. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
- C. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
- D. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- E. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.

1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.
- F. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
1. Control movement of sediment and soil from temporary stockpiles of soil.
 2. Prevent development of ruts due to equipment and vehicular traffic.
 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- G. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
1. Prevent windblown soil from leaving the project site.
 2. Prevent tracking of mud onto public roads outside site.
 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- H. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- I. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- J. Open Water: Prevent standing water that could become stagnant.
- K. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Erosion and Sedimentation Control Plan:
1. Include:
 - a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
 - b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
 - c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
 - d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
 - e. Other information required by law.
 - f. Format required by law is acceptable, provided any additional information specified is also included.
 2. Obtain the approval of the Plan by authorities having jurisdiction.
 3. Obtain the approval of the Plan by Owner.

- 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. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Mulch: Use one of the following:
 - 1. Straw or hay.
 - 2. Wood waste, chips, or bark.
 - 3. Erosion control matting or netting.
- 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.
- C. Bales: Air dry, rectangular straw bales.
 - 1. Cross Section: 14 by 18 inches, minimum.
 - 2. Bindings: Wire or string, around long dimension.
- D. Bale Stakes: One of the following, minimum 3 feet long:
 - 1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot.
 - 2. Wood, 2 by 2 inches in cross section.
- E. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
 - 1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
 - 2. Permittivity: 0.05 sec^{-1} , minimum, when tested in accordance with ASTM D4491.
 - 3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
 - 4. Tensile Strength: 100 pounds-force, minimum, in cross-machine direction; 124 pounds-force, minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
 - 5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
 - 6. Tear Strength: 55 pounds-force, minimum, when tested in accordance with ASTM D4533/D4533M.
 - 7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
- F. Silt Fence Posts: One of the following, minimum 5 feet long:
 - 1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot.
 - 2. Softwood, 4 by 4 inches in cross section.
 - 3. Hardwood, 2 by 2 inches in cross section.
- G. Gravel: See Section 32 11 23 for aggregate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

- B. Construction Entrances: Traffic-bearing aggregate surface.
 - 1. Width: As required; 20 feet, minimum.
 - 2. Length: 50 feet, minimum.
 - 3. Provide at each construction entrance from public right-of-way.
 - 4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.
- C. Linear Sediment Barriers: Made of silt fences.
 - 1. Provide linear sediment barriers:
 - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
 - 2. Space sediment barriers with the following maximum slope length upslope from barrier:
 - a. Slope of Less Than 2 Percent: 100 feet..
 - b. Slope Between 2 and 5 Percent: 75 feet.
 - c. Slope Between 5 and 10 Percent: 50 feet.
 - d. Slope Between 10 and 20 Percent: 25 feet.
 - e. Slope Over 20 Percent: 15 feet.
- D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
 - 1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
 - 2. Straw bale row blocking entire inlet face area; anchor into pavement.
- E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.
- F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- G. Soil Stockpiles: Protect using one of the following measures:
 - 1. Cover with polyethylene film, secured by placing soil on outer edges.
 - 2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.
- H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
 - 1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.
- I. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 INSTALLATION

- A. Traffic-Bearing Aggregate Surface:
 - 1. Excavate minimum of 6 inches.
 - 2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
 - 3. Place and compact at least 6 inches of 1 1/2 to 3 1/2 inch diameter stone.
- B. Silt Fences:
 - 1. Store and handle fabric in accordance with ASTM D4873/D4873M.
 - 2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
 - 3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
 - 4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
 - 5. Install with top of fabric at nominal height and embedment as specified.
 - 6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
 - 7. Fasten fabric to wood posts using one of the following:

- a. Four nails per post with 3/4 inch diameter flat or button head, 1 inch long, and 14 gage, 0.083 inch shank diameter.
 - b. Five staples per post with at least 17 gage, 0.0453 inch wire, 3/4 inch crown width and 1/2 inch long legs.
- 8. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
- 9. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.
- C. Straw Bale Rows:
 - 1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
 - 2. Install bales so that bindings are not in contact with the ground.
 - 3. Embed bales at least 4 inches in the ground.
 - 4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
 - 5. Fill gaps between ends of bales with loose straw wedged tightly.
 - 6. Place soil excavated for trench against bales on the upslope side of the row, compacted.
- D. Temporary Seeding:
 - 1. When hydraulic seeder is used, seedbed preparation is not required.
 - 2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
 - 3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
 - 4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
 - 5. Incorporate fertilizer into soil before seeding.
 - 6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
 - 7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
 - 8. Repeat irrigation as required until grass is established.

3.05 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
 - 1. Promptly replace fabric that deteriorates unless need for fence has passed.
 - 2. Remove silt deposits that exceed one-third of the height of the fence.
 - 3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Straw Bale Rows:
 - 1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
 - 2. Remove silt deposits that exceed one-half of the height of the bales.
 - 3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- E. Clean out temporary sediment control structures weekly and relocate soil on site.
- F. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.
- 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

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations.
- F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- B. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- C. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
- C. Where other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined in Section 01 61 16.
 - 2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 25 00 - Substitution Procedures.

3.02 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.
- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Prevent contact with material that may cause corrosion, discoloration, or staining.

- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Cutting and patching.
- C. Cleaning and protection.
- D. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures.
- C. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
- D. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.
- E. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties.
- F. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.

1.04 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Perform dewatering activities, as required, for the duration of the project.
- E. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.05 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and

conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 GENERAL INSTALLATION REQUIREMENTS

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

3.04 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.

- B. Perform whatever cutting and patching is necessary to:
 1. Complete the work.
 2. Fit products together to integrate with other work.
 3. Provide openings for penetration of mechanical, electrical, and other services.
 4. Match work that has been cut to adjacent work.
 5. Repair areas adjacent to cuts to required condition.
 6. Repair new work damaged by subsequent work.
 7. Remove samples of installed work for testing when requested.
 8. Remove and replace defective and non-complying work.
- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- F. Restore work with new products in accordance with requirements of Contract Documents.
- G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. Patching:
 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 2. Match color, texture, and appearance.
 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.05 PROGRESS CLEANING

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

3.06 PROTECTION OF INSTALLED WORK

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

3.07 ADJUSTING

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

3.08 FINAL CLEANING

- A. Use cleaning materials that are nonhazardous.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.
- F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.09 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- E. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

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

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

- A. See Section 01 60 00 - Product Requirements for substitution submission procedures.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. Provide containers as required.
 - 2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- B. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- C. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- D. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- E. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Section 00 72 00 - General Conditions and 00 73 00 - Supplementary Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.

- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
- F. Record Drawings: Legibly mark each item to record actual construction including:
 - 1. Field changes of dimension and detail.
 - 2. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 - 1. Product data, with catalog number, size, composition, and color and texture designations.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- E. Provide servicing and lubrication schedule, and list of lubricants required.
- F. Include manufacturer's printed operation and maintenance instructions.
- G. Include sequence of operation by controls manufacturer.
- H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- I. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- J. Arrangement of Contents: Organize each volume in parts as follows:
 - 1. Project Directory.
 - 2. Table of Contents, of all volumes, and of this volume.
 - 3. Operation and Maintenance Data: Arranged by system, then by product category.
 - a. Source data.
 - b. Product data, shop drawings, and other submittals.
 - c. Operation and maintenance data.
 - d. Field quality control data.
 - e. Photocopies of warranties and bonds.

3.06 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.

END OF SECTION

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

- A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
 - 1. HVAC systems and equipment.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:

1.02 RELATED REQUIREMENTS

- A. Section 01 78 00 - Closeout Submittals: Operation and maintenance manuals.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures; except:
 - 1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
 - 2. Submit one copy to the Commissioning Authority, not to be returned.
 - 3. Make commissioning submittals on time schedule specified by Commissioning Authority.
 - 4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.
- B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit to Architect for transmittal to Owner.
 - 2. Submit to Commissioning Authority for review and inclusion in overall training plan.
 - 3. Submit not less than four weeks prior to start of training.
 - 4. Revise and resubmit until acceptable.
 - 5. Provide an overall schedule showing all training sessions.
 - 6. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such as slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Include applicable portion of O&M manuals.
 - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.

1.04 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
 - 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.

2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.
- C. Demonstration may be combined with Owner personnel training if applicable.
- D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

- A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.
- B. Conduct training on-site unless otherwise indicated.
- C. Owner will provide classroom and seating at no cost to Contractor.
- D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.
- E. Provide training in minimum two hour segments.
- F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.
- G. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 3. Typical uses of the O&M manuals.
- I. Product- and System-Specific Training:
 1. Review the applicable O&M manuals.
 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 6. Discuss common troubleshooting problems and solutions.

7. Discuss any peculiarities of equipment installation or operation.
 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 10. Review spare parts and tools required to be furnished by Contractor.
 11. Review spare parts suppliers and sources and procurement procedures.
- J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 04 20 00 - Unit Masonry: Reinforcement for masonry.

1.03 REFERENCE STANDARDS

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- B. ACI 301 - Specifications for Structural Concrete; 2016.
- C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).
- D. ACI 347R - Guide to Formwork for Concrete; 2014.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.
- B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.
- C. Protect plastic foam products from damage and exposure to sunlight.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.
- C. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.
- D. Comply with relevant portions of ACI 347R, ACI 301, and ACI 318.

2.02 WOOD FORM MATERIALS

- A. Form Materials: At the discretion of the Contractor.

2.03 REMOVABLE PREFABRICATED FORMS

- A. Preformed Steel Forms: Minimum 16 gage, 0.0598 inch thick, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
- B. Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete mix until initial set; 2 inches thick.

2.04 FORMWORK ACCESSORIES

- A. Form Ties: Removable type, galvanized metal, fixed length, cone type, with waterproofing washer, free of defects that could leave holes larger than 1 inch in concrete surface.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.

3.03 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items that will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
- D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

3.04 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.

3.05 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength as indicated in structural notes sheet S1.00.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Floors and slabs on grade.
- B. Concrete foundation walls.
- C. Concrete reinforcement.
- D. Miscellaneous concrete elements, including equipment pads, light pole bases, flagpole bases, and manholes.
- E. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.

1.03 REFERENCE STANDARDS

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- B. ACI 301 - Specifications for Structural Concrete; 2016.
- C. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.
- D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- E. ACI 305R - Guide to Hot Weather Concreting; 2010.
- F. ACI 306R - Guide to Cold Weather Concreting; 2016.
- G. ACI 308R - Guide to External Curing of Concrete; 2016.
- H. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).
- I. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- J. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.
- K. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).
- L. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.
- M. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2017a.
- N. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.
- O. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
- P. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).
- Q. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.
- R. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2014.
- S. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2015.
- T. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011 (Reapproved 2017).

- U. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Mix Design: Submit proposed concrete mix design.
 - 1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures and structural general notes.
- C. Samples: Submit samples of underslab vapor retarder to be used.
- D. Test Reports: Submit report for each test or series of tests specified.
- E. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Comply with requirements of Section 03 10 00.

2.02 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1. Type: Deformed billet-steel bars.
 - 2. Finish: Unfinished, unless otherwise indicated.
- B. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 - 3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
 - 1. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
 - 1. Acquire aggregates for entire project from same source.
- C. Fly Ash: ASTM C618, Class C or F.
- D. Calcined Pozzolan: ASTM C618, Class N.
- E. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.
- F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.

2.05 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder: Sheet material complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
 - 1. Installation: Comply with ASTM E1643.
 - 2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
 - 3. Manufacturers:
 - a. Fortifiber Building Systems Group; Moistop Ultra 10: www.fortifiber.com/#sle.
 - b. Inteplast Group; Barrier-Bac VB-250: www.barrierbac.com/#sle.
 - c. ISI Building Products; Viper VaporCheck II 10-mil (Class A): www.isibp.com/#sle.
 - d. Poly-America; Husky Yellow Guard 10-mil Vapor Barrier: www.yellowguard.com/#sle.
 - e. Stego Industries, LLC: www.stegoindustries.com/#sle.
 - f. W. R. Meadows, Inc; PERMINATOR Class A - 10 mils: www.wrmeadows.com/#sle.
 - g. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 CURING MATERIALS

- A. Curing and Sealing Compound, High Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.
 - 1. Vehicle: Solvent-based.
 - 2. Solids by Mass: 25 percent, minimum.
 - 3. Manufacturers:
 - a. Kaufman Products Inc; Krystal 25: www.kaufmanproducts.net/#sle.
 - b. SpecChem, LLC; Cure and Seal WB: www.specchemllc.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
 - 1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- D. Normal Weight Concrete:
 - 1. Compressive Strength as indicated in structural notes.
 - 2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
 - 3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
 - 4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.

2.08 MIXING

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
- B. Transit Mixers: Comply with ASTM C94/C94M.
- C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in accordance with bonding agent manufacturer's instructions.
 - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
 - 2. Use latex bonding agent only for non-load-bearing applications.
- B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- C. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

- A. Locate joints as indicated on drawings. (Where not indicated 10 ft.x 10 ft. max. spacing)
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Maximum Variation of Surface Flatness as indicated in structural notes and levelness per Ff=25, Fl=20, unless indicated otherwise.
- B. Correct the slab surface if tolerances are less than specified.
- C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

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

3.08 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury. Follow hot/cold weather placement requirements per ACI301/ACI306.1/ACI305.1 as conditions occur.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Surfaces Not in Contact with Forms:

1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
2. Final Curing: Begin after initial curing but before surface is dry.

3.09 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- D. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure at least three concrete test cylinders for each day. Obtain test samples for every 50 cubic yards or less of each class of concrete placed.
- E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.10 DEFECTIVE CONCRETE

- A. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

3.11 PROTECTION

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

END OF SECTION

SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete block.
- B. Mortar and grout.
- C. Reinforcement and anchorage.
- D. Flashings.
- E. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

- A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- B. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.
- C. ASTM C91/C91M - Standard Specification for Masonry Cement; 2012.
- D. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2017.
- E. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2017.
- F. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- G. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.
- H. ASTM C476 - Standard Specification for Grout for Masonry; 2018.
- I. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units; 2016.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 - 2. Load-Bearing Units: ASTM C90, normal weight.
 - a. Hollow block.
 - b. Exposed Faces: Manufacturer's standard color and texture where indicated.
 - c. Manufacturers:
 - 1) Cemstone.

- 2) Substitutions: See Section 01 60 00 - Product Requirements.
- 3. Non-Loadbearing Units: ASTM C129.
 - a. Hollow block.
 - b. Manufacturers:
 - 1) Cemstone.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
- 4. Pre-Faced Units: ASTM C90, hollow block, with smooth resinous facing complying with ASTM C744.
 - a. Colors and styles: As indicated on drawings.
 - b. Manufacturers:
 - 1) Anchor Block Company.
 - 2) Cemstone.
 - 3) Amcon.
 - 4) Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C91/C91M, Type as indicated below.
 - 1. Colored Mortar: Premixed cement as required to match Architect's color sample.
- B. Mortar Aggregate: ASTM C144.
- C. Grout Aggregate: ASTM C404.
- D. Water: Clean and potable.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:
 - 1. Blok-Lok Limited: www.blok-lok.com/#sle.
 - 2. Hohmann & Barnard, Inc; X-Seal Anchor: www.h-b.com/#sle.
 - 3. WIRE-BOND www.wirebond.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; galvanized.
- C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated. Joint reinforcement shall be 0.148" diameter rods; hot-dipped galvanized; 16" o.c.

2.04 FLASHINGS

- A. Membrane Asphaltic Flashing Materials:
 - 1. Rubberized Asphalt Flashing: Self-adhering polymer modified asphalt sheet; 40 mils (0.040 inch) minimum total thickness; 8 mil cross-laminated polyethylene bonded to adhesive rubberized asphalt, with a removable release liner.
- B. Termination Bars: Stainless steel; compatible with membrane and adhesives.
- C. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.
- D. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.05 ACCESSORIES

- A. Weeps:
 - 1. Type: Polyester mesh.
- B. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.06 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
 - 1. Masonry below grade and in contact with earth: Type M.
 - 2. Exterior, loadbearing masonry: Type S.

3. Exterior, non-loadbearing masonry: Type S.
 4. Interior, loadbearing masonry: Type N.
 5. Interior, non-loadbearing masonry: Type O.
- B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- C. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

3.04 COURSING

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

3.05 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
- F. Interlock intersections and external corners, except for units laid in stack bond.
- G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- I. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
- J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.06 WEEPS/CAVITY VENTS

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

3.07 REINFORCEMENT AND ANCHORAGE - GENERAL AND SINGLE WYTHE MASONRY

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.
- E. Lap joint reinforcement ends minimum 6 inches.
- F. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches with at least 5/8 inch mortar cover to the outside face of the anchor.

3.08 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
- B. Extend plastic, laminated, and EPDM flashings to within 1/2 inch of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.
- C. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.09 LINTELS

- A. Install loose steel lintels over openings.
- B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
 - 1. Openings to 42 inches: Place one, No. 4 reinforcing bar 1 inch from bottom web.
 - 2. Openings from 42 inches to 78 inches: Place one, No. 4 reinforcing bar 1 inch from bottom web.
 - 3. Openings over 78 inches: Reinforce openings as detailed.
 - 4. Do not splice reinforcing bars.
 - 5. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
 - 6. Place and consolidate grout fill without displacing reinforcing.
 - 7. Allow masonry lintels to attain specified strength before removing temporary supports.
- C. Maintain minimum 8 inch bearing on each side of opening.

3.10 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.

3.11 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
 - 1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

3.12 TOLERANCES

- A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

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

3.13 CUTTING AND FITTING

- A. Cut and fit for pipes, conduit, and sleeves. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.14 CLEANING

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

3.15 PROTECTION

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

END OF SECTION

SECTION 04 20 01
MASONRY VENEER

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete Block.
- B. Mortar and Grout.
- C. Reinforcement and Anchorage.
- D. Flashings.
- E. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

- A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.
- E. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.
- F. ASTM C91/C91M - Standard Specification for Masonry Cement; 2012.
- G. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2017.
- H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- I. ASTM C476 - Standard Specification for Grout for Masonry; 2018.
- J. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units; 2016.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and mortar.
- C. Samples: Submit two samples of decorative block units to illustrate color, texture, and extremes of color range.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
- B. Handle and store pre-faced concrete block units in protective cartons or trays. Do not remove from protective packaging until ready for installation.

1.06 FIELD CONDITIONS

- A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depth of 4 inches.

2. Non-Loadbearing Units: ASTM C129.
 - a. Hollow block, as indicated.
 - b. Lightweight.
3. Pre-Faced Units: ASTM C90, hollow block, with smooth resinous facing complying with ASTM C744.
 - a. Colors and Styles: Limestone Trattino.
 - b. Manufacturer: Anchor Block Company.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C91/C91M Type N.
 1. Colored Mortar: Premixed cement as required to match Architect's color sample.
- B. Water: Clean and potable.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Joint Reinforcement: Truss type; ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M, Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
- B. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
 1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
 2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
 3. Vertical adjustment: Not less than 3-1/2 inches.

2.04 FLASHINGS

- A. Pre-Coated Galvanized Steel: ASTM A653/A653M, with G90/Z275 coating, 24 gage, 0.0239 inch base metal thickness, shop precoated with fluoropolymer coating in color matching masonry.
- B. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane, or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.

2.05 ACCESSORIES

- A. Weeps: Cotton rope.
- B. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.06 MORTAR AND GROUT MIXES

- A. Mortar for Unit Masonry: ASTM C270, Proportion Specification.
 1. Exterior, non-loadbearing masonry; Type N.
- B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
- C. Grout: ASTM C476; consistency as required to fill volumes completely for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- D. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 COURSING

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

3.03 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar as work progresses.
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- H. Isolate top joint of masonry veneer from horizontal structural framing members or support angles with compressible joint filler.

3.04 WEEPS/CAVITY VENTS

- A. Install weeps in veneer walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls.
- B. Install cavity vents in veneer walls at 32 inches on center horizontally below shelf angles and lintels and at top of walls.

3.05 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.
- C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.06 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Install horizontal joint reinforcement 16 inches on center.
- B. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.07 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
- B. Extend metal flashings to within 1/4 inch of exterior face of masonry.
- C. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.08 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.

3.09 TOLERANCES

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

3.10 CUTTING AND FITTING

- A. Cut and fit for pipes and conduit. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.11 CLEANING

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

3.12 PROTECTION

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

END OF SECTION

SECTION 04 72 00
CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Architectural cast stone.
- B. Units required are:
 - 1. Exterior wall units, including wall caps and sills.

1.02 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry: Installation of cast stone in conjunction with masonry.
- B. Section 07 92 00 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.03 REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- C. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2016.
- D. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.
- F. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).
- G. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
- H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- I. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.
- J. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2017.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Test results of cast stone components made previously by the manufacturer.
- C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.
- D. Mortar Color Selection Samples.
- E. Verification Samples: Pieces of actual cast stone components not less than 6 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.
- B. Number each piece individually to match shop drawings and schedule.
- C. Store cast stone components and installation materials in accordance with manufacturer's instructions.
- D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

- E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.
- F. Store mortar materials where contamination can be avoided.
- G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Architectural Cast Stone:
 1. Any current producer member of the Cast Stone Institute.

2.02 ARCHITECTURAL CAST STONE

- A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.
 1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
 2. Freeze-Thaw Resistance: Demonstrated by field experience.
 3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
 4. Color: Selected by Architect from manufacturer's full range.
 5. Remove cement film from exposed surfaces before packaging for shipment.
- B. Shapes: Provide shapes indicated on drawings.
 1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
 2. Unless otherwise indicated on drawings, provide:
 - a. Wash or slope of 1:12 on exterior horizontal surfaces.
 - b. Drips on projecting components, wherever possible.
 - c. Raised fillets at back of sills and at ends to be built in.
- C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.

2.03 MATERIALS

- A. Portland Cement: ASTM C150/C150M.
 1. For Units: Type I, white or gray as required to match Architect 's sample.
 2. For Mortar: Type I or II, except Type III may be used in cold weather.
- B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.
- C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.
- D. Admixtures: ASTM C494/C494M.
- E. Water: Potable.
- F. Reinforcing Bars: ASTM A615/A615M deformed bars, galvanized.
 1. Galvanized in accordance with ASTM A767/A767M, Class I.
- G. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.
- H. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.
- I. Mortar: Portland cement-lime, as specified in Section 04 05 11; do not use masonry cement.
- J. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.
- B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

- A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 20 00.
- B. Mechanically anchor cast stone units indicated; set remainder in mortar.
- C. Setting:
 - 1. Drench cast stone components with clear, running water immediately before installation.
 - 2. Set units in a full bed of mortar unless otherwise indicated.
 - 3. Fill vertical joints with mortar.
 - 4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
- D. Joints: Make all joints 3/8 inch, except as otherwise detailed.
 - 1. Rake mortar joints 3/4 inch for pointing.
 - 2. Remove excess mortar from face of stone before pointing joints.
 - 3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.
 - 4. Leave the following joints open for sealant:
 - a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
 - b. Joints in projecting units.
 - c. Joints between rigidly anchored units, including soffits, panels, and column covers.
 - d. Joints below lugged sills and stair treads.
 - e. Joints below ledge and relieving angles.
 - f. Joints labeled "expansion joint".
- E. Installation Tolerances:
 - 1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.
 - 2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
 - 3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.
 - 4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.
- F. Repairs: Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet.
 - 1. Repair with matching touchup material provided by the manufacturer and in accordance with manufacturer's instructions.
 - 2. Repair methods and results subject to Architect 's approval.

3.03 CLEANING

- A. Clean completed exposed cast stone after mortar is thoroughly set and cured.
 - 1. Wet surfaces with water before applying cleaner.
 - 2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
 - 3. Remove cleaner promptly by rinsing thoroughly with clear water.
 - 4. Do not use acidic cleaners.

3.04 PROTECTION

- A. Protect completed work from damage.
- B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural dimension lumber framing.
- B. Non-structural dimension lumber framing.
- C. Rough opening framing for doors, windows, and roof openings.
- D. Sheathing.
- E. Miscellaneous framing and sheathing.
- F. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

- A. Section 06 17 53 - Shop-Fabricated Wood Trusses.
- B. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.
- C. Section 07 62 00 - Sheet Metal Flashing and Trim: Sill flashings.

1.03 REFERENCE STANDARDS

- A. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2015.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. PS 20 - American Softwood Lumber Standard; 2015.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: As indicated in structural notes.
- B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.
- C. Stud Framing (2 by 2 through 2 by 6):
 - 1. As indicated in structural notes.

2.03 EXPOSED BOARDS

- A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.
- B. Moisture Content: Kiln-dry (15 percent maximum).
- C. Surfacing: S4S.
- D. Species: Western Cedar.
- E. Grade: No. 2, 2 Common, or Construction.

2.04 CONSTRUCTION PANELS

- A. Roof Sheathing: 5/8" category Structural I sheathing.

- B. Wall Sheathing: 15/32" category Structural I sheathing.

2.05 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
- B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
- C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
- D. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.
- E. Sill Flashing: As specified in Section 07 62 00.
- F. Water-Resistive Barrier: As specified in Section 07 25 00.

PART 3 EXECUTION

3.01 PREPARATION

- A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.
- B. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

3.03 FRAMING INSTALLATION

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices unless otherwise specifically detailed.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.
- E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.05 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.06 INSTALLATION OF CONSTRUCTION PANELS

- A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
 - 1. Nail panels to framing; staples are not permitted.
- B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with edges blocked and ends over firm bearing and staggered, using nails.

1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

3.07 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.08 CLEANING

- A. Waste Disposal: Comply with the requirements of Section 01 74 19 - Construction Waste Management and Disposal.
 1. Comply with applicable regulations.
 2. Do not burn scrap on project site.
 3. Do not burn scraps that have been pressure treated.
 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 17 53
SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated wood trusses for roof framing.
- B. Bridging, bracing, and anchorage.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Material requirements for blocking, bridging, plates, and miscellaneous framing.

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- B. TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction; 2014.
- C. TPI BCSI 1 - Building Component Safety Information Booklet: The Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses; 2015.
- D. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses; 1989.
- E. WWPA G-5 - Western Lumber Grading Rules; 2017.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.
 - 1. Include identification of engineering software used for design.
 - 2. Provide shop drawings stamped or sealed by design engineer.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- B. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handle and erect trusses in accordance with TPI BCSI 1.
- B. Store trusses in vertical position resting on bearing ends.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Truss Plate Connectors:
 - 1. Alpine, an ITW Company: www.alpineitw.com/#sle.
 - 2. MiTek Industries, Inc: www.mii.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Truss Fabricators:
 - 1. Lloyd Truss.
 - 2. Truss Pros.
 - 3. Marshall Truss Systems.
 - 4. Littfin Lumber Co.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 TRUSSES

- A. Wood Trusses: Designed and fabricated in accordance with TPI 1 and TPI DSB-89 to achieve structural requirements indicated.
 - 1. Species and Grade: As specified by truss supplier.
 - 2. Connectors: Steel plate.
 - 3. Structural Design: Comply with applicable code for structural loading criteria.
 - 4. Roof Deflection: 1/240, maximum. LL deflection = L/360 Maximum.

2.03 MATERIALS

- A. Lumber:
 - 1. Moisture Content: Between 7 and 9 percent.
 - 2. Lumber fabricated from old growth timber is not permitted.
- B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.
- C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.04 ACCESSORIES

- A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: Softwood lumber, any species, construction grade, 19 percent maximum and 7 percent minimum moisture content.
- B. Fasteners: Electrogalvanized steel, type to suit application.
- C. Bearing Plates: Electrogalvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that supports and openings are ready to receive trusses.

3.02 PREPARATION

- A. Coordinate placement of bearing items.

3.03 ERECTION

- A. Install trusses in accordance with manufacturer's instructions and TPI DSB-89 and TPI BCSI 1; maintain a copy of each TPI document on site until installation is complete.
- B. Set members level and plumb, in correct position.
- C. Do not field cut or alter structural members without approval of Architect.
- D. Install permanent bridging and bracing.

3.04 TOLERANCES

- A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Finish carpentry items.
- B. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 09 91 13 - Exterior Painting: Painting and finishing of finish carpentry items.
- C. Section 09 91 23 - Interior Painting: Painting and finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).
- C. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2016.
- D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect work from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Interior Woodwork Items:
 - 1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.
 - 2. Wall and Ceiling Paneling: 1x6 white pine Tongue and groove planks.

2.02 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.03 LUMBER MATERIALS

- A. Softwood Lumber: white pine species, plain sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.

2.04 SHEET MATERIALS

- A. Hardwood Plywood: Face species as indicated, plain sawn, book matched, medium density fiberboard core; HPVA HP-1, Front Face Grade AA, Back Face Grade 1, glue type as recommended for application.

2.05 PLASTIC LAMINATE MATERIALS

- A. Plastic Laminate: NEMA LD 3, HGS; color as selected by Architect; textured, low gloss finish.

2.06 FASTENINGS

- A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

2.07 ACCESSORIES

- A. Wood Filler: Solvent base, tinted to match surface finish color.

2.08 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

2.09 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail and screw indentations.
- C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.
- D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Transparent:
 - a. System - 12, Polyurethane, Water-based.
 - b. Stain: As selected by Architect.
 - c. Sheen: Semigloss.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Site Finishing: See Section 09 91 23.

3.04 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation at perimeter foundation wall.
- B. Batt insulation and vapor retarder in exterior wall construction.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Supporting construction for batt insulation.

1.03 REFERENCE STANDARDS

- A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2018.
- B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- D. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2016a.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.05 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.
- B. Insulation in Wood Framed Walls: Batt insulation with separate vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

- A. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces.
 - 1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 3. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.
 - 4. Manufacturers:
 - a. Dow Chemical Company; STYROFOAM HIGHLOAD 40:
www.dowbuildingsolutions.com/#sle.
 - b. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation:
www.ocbuildingspec.com/#sle.

2.03 BATT INSULATION MATERIALS

- A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
 - 1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 - 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 - 4. Formaldehyde Content: Zero.

5. Thickness: 6 inch.
6. Facing: Asphalt treated mesh reinforced Kraft paper, one side.
7. Manufacturers:
 - a. CertainTeed Corporation: www.certainteed.com/#sle.
 - b. Johns Manville: www.jm.com/#sle.
 - c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

- A. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch wide.
- B. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.
- C. Staples: Steel wire; electroplated or galvanized; type and size to suit application.
- D. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

- A. Apply adhesive to back of boards:
- B. Install boards horizontally on foundation perimeter.
 1. Place boards to maximize adhesive contact.
 2. Install in running bond pattern.
 3. Butt edges and ends tightly to adjacent boards and to protrusions.
- C. Extend boards over expansion joints, unbonded to foundation on one side of joint.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BATT INSTALLATION

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap and seal sheet retarder joints over member face.
- F. Tape seal tears or cuts in vapor retarder.
- G. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

3.04 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 21 19
FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Foamed-in-place insulation.
 - 1. In exterior wall crevices.

1.02 REFERENCE STANDARDS

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.
- B. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- E. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
- F. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.

1.04 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience.

1.05 FIELD CONDITIONS

- A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.
- B. Do not apply foam when temperature is within 5 degrees F of dew point.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Foamed-In-Place Insulation:
 - 1. Accella Polyurethane Systems: www.accellapolyurethane.com/#sle.
 - 2. BASF Corporation; SPRAYTITE 158 Closed Cell: www.spf.basf.com/#sle.
 - 3. Demilec LLC: www.demilec.com/#sle.
 - 4. Gaco Western: www.gaco.com/#sle.
 - 5. Henry Company: www.henry.com/#sle.
 - 6. Icynene-Lapolla; Icynene ProSeal: www.icynene.com/#sle.
 - 7. Johns Manville; JM Corbond III Closed Cell Spray Polyurethane Foam: www.jm.com/#sle.
 - 8. NCFI Polyurethanes: www.ncfi.com/#sle.
 - 9. Rhino Linings Corporation: www.rhino linings.com/#sle.
 - 10. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, open or closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
 - 1. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment, and overcoat limitations.

2. Thermal Resistance: R-value of 6.0, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
3. Water Vapor Permeance: Vapor retarder; 2 perms, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
4. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
5. Air Permeance: 0.04 cfm/sq ft, maximum, when tested at intended thickness in accordance with ASTM E2178 or ASTM E283 at 1.57 psf.
6. Closed Cell Content: At least 90 percent.
7. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

2.03 ACCESSORIES

- A. Primer: As required by insulation manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify work within construction spaces or crevices is complete prior to insulation application.
- B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.

3.02 PREPARATION

- A. Mask and protect adjacent surfaces from over spray or dusting.
- B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

- A. Apply insulation in accordance with manufacturer's instructions.
- B. Apply insulation by spray method, to a uniform monolithic density without voids.
- C. Patch damaged areas.
- D. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.
- E. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.04 PROTECTION

- A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 07 22 00
NON-VENTED NAIL BASE ROOF INSULATION PANELS

PART 1-GENERAL

1.01 WORK INCLUDES

- A. The work shall consist of covering all areas shown on the drawings with nail base roof insulation.

1.02 RELATED WORK

- A. Section 07 31 13 - Asphalt shingles or other roofing system over the nail base insulation.

1.03 SYSTEM DESCRIPTION

- A. Description of system:
 - 1. The insulated sheathing shall be a preassembled panel consisting of one layer of 7/16" oriented strand board top surface (FSC or standard) bonded to 5.5 thick polyisocyanurate foam.
 - 2. The Long Term Thermal Resistance (LTTR) R-Value of the non-vented roof insulation shall be no less than 33.5.
 - 3. Wood panel edges shall be rabbetted to allow the foam edges to fit together while providing clearance between the wood sheathing on adjoining panels.
 - 4. Foam sides and ends shall have a machined tongue and groove profile to reduce heat loss at the joints.
- B. Performance Requirements:
 - 1. The foam insulation shall have a Flame Spread Rating of 40-60.

1.04 QUALITY ASSURANCE

- A. The nail base insulation shall be classified by Underwriters Laboratories Inc. as a shingle decking accessory for use with any Class A, B or C asphalt glass mat or asphalt organic shingles. Each bundle of insulation panels shall bear an UL label. If applicable FSC Chain-of-Custody procedures will apply.

1.05 SUBMITTALS

- A. The following will be submitted to the architect for approval:
 - 1. Copies of the manufacturer's product information and installation instructions. A sample with the edge profile specified.
- B. The nail base insulation must be classified under UL as a roof covering accessory (TGDY) per ANSI/UL 790 (ASTM E180) and as a Building Unit (TIAR) per UL 1256 for Construction No. 120 and No. 123.

1.06 DELIVERY AND STORAGE

- A. The nail base insulation shall be protected in the transit by plastic covers and by truck tarps. When material is stored at the jobsite, a reasonably level, drained storage area shall be provided. The insulation shall rest on firm blocking and shall be covered with tarps.

1.07 SEQUENCING/SCHEDULING

- A. Erection of the nail base insulation shall be coordinated with the roofing subcontractor so the roofing is applied as soon as possible after insulation is in place.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Non-Ventilated Roof Insulation Panels:
 - 1. GAF Cornell; ThermaCal® Non-Ventilated Roof Insulation Panels: www.cornellcorporation.com and gaf.com.
- B. Fasteners:
 - 1. GAF Cornell; ThermaCal® Fasteners as required per the appropriate fastener pattern.

- C. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 - EXECUTION

3.01 PREPARATION

- A. The Structural roof deck shown in the plans shall be smooth and level and free of water or debris before the nail base insulation is installed. Apply vapor retarder if required.

3.02 SUBSTRATE INSTALLATION

- A. Installation shall follow the manufacturer's written installation instructions.
- B. Fasten with ThermaCal® Fasteners to the supporting roof deck shown in the plans.
- C. Protect nail base insulation work from exposure to moisture damage and deterioration, primarily by prompt installation of the roofing, sheet metal and waterproofing work.

END OF SECTION

SECTION 07 25 00
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.
- B. Vapor Retarders: Materials to make concrete slabs water vapor resistant and air tight.
- C. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Vapor retarder under concrete slabs on grade.
- B. Section 06 10 00 - Rough Carpentry: Water-resistive barrier under exterior cladding.
- C. Section 07 21 00 - Thermal Insulation: Vapor retarder installed in conjunction with batt insulation.

1.03 DEFINITIONS

- A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.
- B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.
- C. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.04 REFERENCE STANDARDS

- A. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications; 2016.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- C. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- D. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on material characteristics.

1.06 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

- A. Water-Resistive Barrier: Provide on exterior walls under exterior cladding.
 - 1. Use building paper or plastic sheet unless otherwise indicated.
- B. Interior Vapor Retarder:
 - 1. On bottom face of rafters, under cladding, use mechanically fastened vapor retarder sheet.

2.02 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

- A. Air Barrier Sheet, Mechanically Fastened:

1. Air Permeance: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
2. Water Vapor Permeance: 5 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant procedure).
3. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 180 days of weather exposure.
4. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, when tested in accordance with ASTM E84.
5. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2 inches wide, compatible with sheet material; unless otherwise specified.
6. Manufacturers:
 - a. DuPont Building Innovations; Tyvek Commercial Wrap with Tyvek Tape: www.dupont.com/#sle.
 - b. Fiberweb, Inc; Typar MetroWrap: www.typar.com/#sle.
 - c. Fortifiber Building Systems Group; WeatherSmart Commercial: www.fortifiber.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 VAPOR RETARDER MATERIALS (AIR BARRIER AND WATER-RESISTIVE)

- A. Vapor Retarder Sheet: ASTM D4397 polyethylene film, clear.
 1. Thickness: 10 mil, 0.010 inch.
 2. Water Vapor Permeance: As required by referenced standard for thickness specified.
 3. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2 inches wide, compatible with sheet material.

2.04 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- D. Mechanically Fastened Sheets - On Exterior:
 1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
 2. Overlap seams as recommended by manufacturer but at least 6 inches.
 3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
 4. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
 5. Install air barrier and vapor retarder UNDER jamb flashings.
 6. Install head flashings under weather barrier.
 7. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.

- E. Mechanically Fastened Sheets - Vapor Retarder On Interior:
 - 1. When insulation is to be installed in assembly, install vapor retarder over insulation.
 - 2. Seal seams, laps, perimeter edges, penetrations, tears, and cuts with self-adhesive tape, making air tight seal.
 - 3. Locate laps at a framing member; at laps fasten one sheet to framing member then tape overlapping sheet to first sheet.
 - 4. Seal entire perimeter to structure, window and door frames, and other penetrations.
 - 5. Where conduit, pipes, wires, ducts, outlet boxes, and other items are installed in insulation cavity, pass vapor retarder sheet behind item but over insulation and maintain air tight seal.
- F. Openings and Penetrations in Exterior Weather Barriers:
 - 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
 - 2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
 - 3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
 - 4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
 - 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
 - 6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 41 13
METAL ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Architectural roofing system of preformed steel panels.
- B. Attachment system.
- C. Finishes.
- D. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealing joints between metal roof panel system and adjacent construction.

1.03 REFERENCE STANDARDS

- A. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).
- B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2017.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Storage and handling requirements and recommendations.
 - 2. Installation methods.
 - 3. Specimen warranty.
- C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
 - 1. Show work to be field-fabricated or field-assembled.
- D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.
- E. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Provide strippable plastic protection on prefinished roofing panels for removal after installation.
- B. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of five years from Date of Substantial Completion.
- C. Waterproofing Warranty: Provide manufacturer's warranty for weathertightness of roofing system, including agreement to repair or replace roofing that fails to keep out water within specified warranty period of five years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Metal Sales Manufacturing Corporation; Magna-Loc Flat Pan: www.metalsales.us.com.
- B. Other Acceptable Manufacturers; Metal Roof Panels:
 - 1. ATAS International, Inc: www.atas.com/#sle.
 - 2. Berridge Manufacturing Company: www.berridge.com/#sle.
 - 3. Englert, Inc: www.englertinc.com/#sle.
 - 4. Firestone Building Products LLC: www.firestonebpco.com/#sle.
 - 5. Metal Roofing Systems, Inc: www.metalroofingsystems.biz/#sle.
 - 6. Metl-Span, a Division of NCI Group, Inc: www.metlspan.com/#sle.
 - 7. Petersen Aluminum Corporation: www.pac-clad.com/#sle.
 - 8. Sheffield Metals International: www.sheffieldmetals.com/#sle.
 - 9. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ARCHITECTURAL METAL ROOF PANELS

- A. Architectural Metal Roofing: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.
- B. Metal Panels: Factory-formed panels with factory-applied finish.
 - 1. Steel Panels:
 - a. Aluminum-zinc alloy-coated steel complying with ASTM A792/A792M; minimum AZ50 coating.
 - b. Steel Thickness: Minimum 24 gage (0.024 inch).
 - 2. Profile: Standing seam, with minimum 2.0 inch seam height; concealed fastener system for field seaming with special tool.
 - 3. Texture: Smooth.
 - 4. Width: Maximum panel coverage of 16 inches.

2.03 ATTACHMENT SYSTEM

- A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.04 FABRICATION

- A. Panels: Provide factory or field fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

2.05 FINISHES

- A. Custom Fluoropolymer Coating System: Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss Slate Grey (W38).
 - 1. Manufacturers:
 - a. PPG Metal Coatings; Duranar: www.ppgmetalcoatings.com/#sle.
 - b. Valspar; Fluropon: www.valsparcoilextrusion.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 ACCESSORIES

- A. Miscellaneous Sheet Metal Items: Provide flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.
- B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.

- C. Sealants:
 - 1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
 - 2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
- D. Underlayment: Self-adhering rubber-modified asphalt sheet complying with ASTM D1970/D1970M; 22 mil total thickness; with strippable release film and woven polypropylene sheet top surface.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Broom clean wood sheathing prior to installation of roofing system.
- B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.
- C. Remove protective film from surface of roof panels immediately prior to installation. Strip film carefully, to avoid damage to prefinished surfaces.
- D. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.
- E. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.03 INSTALLATION

- A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
 - 1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
 - 2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.
- B. Accessories: Install all components required for a complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.
- C. Install roofing felt and building paper slip sheet on roof deck before installing preformed metal roof panels. Secure by methods acceptable to roof panel manufacturer, minimizing use of metal fasteners. Apply from eaves to ridge in shingle fashion, overlapping horizontal joints a minimum of 2 inches and side and end laps a minimum of 3 inches. Offset seams in building paper and seams in roofing felt.
- D. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.

3.04 CLEANING

- A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.05 PROTECTION

- A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.
- B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 07 46 23
PRE-FINISHED COMPOSITION SIDING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Factory-finished engineered wood siding.
 - 2. Factory-finished trim and fascia.
 - 3. Starter boards and strips, moldings, flashing, and sealant.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate installation of siding, flashings, weather barriers, and adjoining construction.

1.03 ACTION SUBMITTALS

- A. Product Data:
 - 1. Engineered wood cladding.
 - 2. Trim and fascia.
 - 3. Sealant.
 - 4. Flashing.
 - 5. Accessories.
- B. Shop Drawings:
 - 1. Include details of construction and installation.
- C. Selection Samples: Submit manufacturer's full range of standard colors and textures.
- D. Verification Samples: Submit each exposed product, color, and texture specified, in sizes as follows:
 - 1. Lap Siding and Linear Trim: 9 inches long by full width.
 - 2. Panels: 9 inches long by full width.
 - 3. Other Trim: 9 inches long.
 - 4. Prefinished Accessories: Full size.

1.04 INFORMATIONAL SUBMITTALS

- A. Manufacturer Certificates: Signed by manufacturer certifying engineered wood cladding complies with requirements specified.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency.
 - 1. ICC-ES ESR-1301.
 - 2. APA PR-N124.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Firm or individual experienced in installing prefinished wood siding, with a record of successful performance.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and industry standards.
- B. Store products in manufacturer's labeled packaging until ready for installation. Protect from damage.
- C. Store products off ground, level, and under waterproof covering or roof.

1.08 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer. Do not install products under environmental conditions outside manufacturer's limits.

1.09 WARRANTY

- A. Manufacturer's Standard Warranty: Transferable limited warranty.
 - 1. Labor and Replacement Warranty: Manufacturer agrees to provide replacement materials and reimburse labor to repair or replace products that fail in materials or workmanship within five years from date of Substantial completion.
 - 2. Material Warranty: Manufacturer agrees to provide replacement materials to repair or replace products that fail in materials or workmanship from years six through fifty after date of delivery of the material.
 - 3. Failures include the following:
 - a. Structural failures including buckling.
 - b. Deterioration of materials beyond normal weathering.
 - c. Fungal degradation.
 - d. Cracking, peeling, separating, chipping, flaking, or rupturing of resin-impregnated surface overlay.
 - e. Hail damage consisting of a crack, chip, or dent in the surface overlay exceeding 3/8 inch (9.5 mm) in length or diameter. Warranty covers hail up to 1-3/4 inches (44.5 mm) in diameter.
- B. Wood Siding Finish Warranty: Manufacturer agrees to repair finishes that deteriorate within specified warranty period.
 - 1. Deterioration includes the following:
 - a. Discoloring due to chalking more than a No. 8 rating when tested according to ASTM D4214.
 - b. Peeling or blistering.
 - c. Eroding and exposing the substrate.
 - d. Discoloring due to yellowing.
 - e. Discoloring due to fading more than 3 Delta E when tested according to ASTM D2244.
 - 2. Warranty Period:
 - a. Thirty years, with prorated application costs after year seven and material-only after year fifteen.

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide Diamond Kote® Building Products built on LP® SmartSide®. 7102 Commerce Drive, Schofield, Wisconsin 54476; www.dksiding.com <<http://www.dksiding.com>>; (800) 236-1528.
- B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MANUFACTURED PRODUCTS

- A. Prefinished Strand Siding Materials:
 - 1. Description: Exterior-grade phenolic resin-saturated paper overlay laminated to EPA-registered zinc-borate-preserved-treated engineered wood siding; structurally rated; AWPA compliant; exposed edges sealed for moisture resistance; factory finished.
- B. Certified Wood: Wood products certified through qualified alternative compliance paths.

2.03 PANEL SIDING

- A. Strand Panel Siding: Wood panel appearance without grooves.
 - 1. Description: Pre-finished strand siding material.
 - 2. Nominal Thickness: 7/16 inch (11 mm).

3. Nominal Board Width: 48 inches (1220 mm).
4. Length: 10 feet (3048 mm).
5. Edges: Shiplap.
6. Texture: Woodgrained.
7. Batten Trim: Pre-finished strand siding material, 19/32 by 3 inches (15 by 76 mm), nominal, 16 feet (4877 mm) long.
8. Color: As selected by Architect from manufacturer's full range.

2.04 FASCIA AND TRIM

- A. Straight Nail Fin Trim: Pre-finished strand siding material manufactured with integral aluminum nailing fin.
 1. Thickness: 0.91 inches (23 mm).
 2. Exposure: 3-1/2 inches (89 mm).
 3. Length: 16 feet (4877 mm).
 4. Texture: Woodgrained.
 5. Color: As selected by Architect from manufacturer's full range.
- B. Inside Corner Nail Fin Trim: Pre-finished strand siding material manufactured with integral plastic nailing fin.
 1. Thickness: 0.91 inches (23 mm).
 2. Exposure: 1-3/4 inches (44 mm) each leg.
 3. Length: 10 feet (3048 mm).
 4. Texture: Woodgrained.
 5. Color: As selected by Architect from manufacturer's full range.
- C. Outside Corner Nail Fin Trim: Pre-finished strand siding material manufactured with integral plastic nailing fin.
 1. Thickness: 0.91 inches (23 mm).
 2. Exposure: 3-1/2 inches (89 mm) each leg.
 3. Length: 16 feet (4877 mm).
 4. Texture: Woodgrained.
 5. Color: As selected by Architect from manufacturer's full range.
- D. Strand Trim: Solid pre-finished trim members; same material as cladding.
 1. Thickness: 0.91 inch (23 mm).
 2. Width: 3-1/2 inch (89 mm).
 3. Length: 16 feet (4877 mm).
 4. Texture: Woodgrained.
 5. Color: As selected by Architect from manufacturer's full range.

2.05 ACCESSORIES

- A. Fasteners: ASTM A153, hot-dip galvanized or stainless steel nails; size recommended by manufacturer to achieve proper penetration of substrate.
 1. Colored Fasteners: Pre-finished nails, color to match siding.
- B. Flashing: Minimum 0.019 inch (0.48 mm) thick prefinished aluminum.
 1. Flashing Types:
 - a. Drip Cap Flashing: Preformed z-shaped flashing for use above horizontal trims.
 - b. Diverter Flashing: Preformed flashing used where sloped roofs meet vertical walls.
 - c. Spacer Flashing: Preformed flashing provides clearance gaps between siding materials and roofing, decks and hardscape materials.
 - d. Z-Flashing: Preformed flashing designed to keep water out of horizontal seams when stacking panel siding.
 - e. Trim Coil: 24 inch (610 mm) wide prefinished aluminum sheet stock for field forming, 50 feet (15.24 m) long.
 2. Aluminum Flashing Finish: As provided by siding manufacturer.
 - a. Color: As selected by Architect from manufacturer's full range.

- C. Starter Boards: Pre-finished composition siding manufacturer's standard PVC-based trim [with integral concealed fastener installation system] in colors to match siding.
 - 1. Nominal Thickness: 3/4 inch (19 mm).
 - 2. Height: 7-1/4 inches (184 mm).
 - 3. Exposure: 5-13/16 inches (148 mm).
 - 4. Length: 16 feet (4877 mm).
- D. Sealant: ASTM C920, minimum Class 25 sealant, type recommended by siding manufacturer.
- E. Touch-Up Paint: Pre-finished composition siding manufacturer's standard touch-up paint provided in 8 ounce (227 ml) bottles in colors matching siding.

2.06 FINISHES

- A. Factory Wood Finishing:
 - 1. Pre-finished composition siding manufacturer's oven-cured, water-based coating with metal oxide pigments.
 - 2. Basis of Design: Subject to compliance with requirements, provide Diamond Kote® Pre-finish.
- B. Aluminum Finishes:
 - 1. Pre-finished composition siding manufacturer's standard finishes in colors to match wood siding.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify concealed framing for support and anchorage of prefinished composition cladding and trim.
- B. Verify that substrate has been installed to permit proper installation of prefinished composition cladding and trim.

3.02 PREPARATION

- A. Prepare substrates using manufacturer's recommended methods.
- B. Do not install until substrates have been properly prepared and deviations from manufacturer's recommended tolerances are corrected.
- C. Commencement of installation constitutes acceptance of conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
 - 1. Install in accordance with conditions stated in ICC-ES ESR-1301.
 - 2. Properly space joints to allow for equilibration.
- B. Do not cut cladding to fabricate trim; use trim components.
- C. Install H-Moldings between siding butt joints as recommended by manufacturer.
- D. Vertical Siding for Board and Batten Applications: Vertical siding or batten may only span one plate to plate. Due to plate shrinkage, each vertical application shall not span beyond one floor to ceiling distance or one floor to top of gable distance.
- E. Seal around penetrations.
- F. Paint exposed cut edges, blemishes, and unfinished exposed fasteners with siding manufacturer's touch-up paint.

3.04 ADJUSTING AND CLEANING

- A. Remove and replace damaged, improperly installed, or otherwise defective materials.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

3.05 PROTECTION

- A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products.

END OF SECTION

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Snow guards.

1.02 RELATED REQUIREMENTS

- A. Section 07 41 13 - Metal Roof Panels.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Maintenance requirements.
- C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.
 - 1. Snow Guards: Submit design calculations for loadings and spacings based on manufacturer testing.
 - 2. Submit shop drawings sealed and signed by a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- D. Warranty Documentation:
 - 1. Submit manufacturer warranty.
 - 2. Ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 3. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.

1.05 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 SNOW GUARDS

- A. Fence Type Snow Guard: Continuous snow guard; manufacturer's standard pipe, bar, channel, or solid rod, set in brackets or posts, with optional plates and metal trim to match roof.
 - 1. Brackets: Zinc plated steel.
 - 2. Pipe or Square Tube: Aluminum, mill finish.
 - a. Outside Diameter, Round: 1 inch, nominal.
 - b. Threaded Couplings: Match pipe or tube, manufacturers standard.
 - c. End Collars and Caps: Metal to match tube.
 - 3. Clamps for Standing Seam Roof: Aluminum tube clamps attached to standing seams of roof panels; for attachment of fence type snow guard.
 - a. Seam Profile: Selected by Architect from manufacturer's standard range; match profile of metal roof.
 - 4. Manufacturers:
 - a. Berger Building Products: www.bergerbp.com/#sle.
 - b. LMCurbs; SnowGuard System: www.lmcurbs.com/#sle.

- c. Metal Roof Innovations, Ltd. S-5! Attachment Solutions; DualGard: www.s-5.com/#sle.
- d. PMC Industries, Inc; AceClamp - ColorSnap Snow Retention System: www.aceclamp.com/#sle.
- e. TRA Snow and Sun; C22Z Clamp-On: www.trasnowandsun.com/#sle.
- f. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

- A. Clean installed work to like-new condition.

3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Joint backings and accessories.

1.02 REFERENCE STANDARDS

- A. ASTM C834 - Standard Specification for Latex Sealants; 2017.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- C. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- D. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2008 (Reapproved 2012).
- E. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2002 (Reapproved 2013).
- F. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.04 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
 - 1. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
 - 2. Bostik Inc: www.bostik-us.com/#sle.
 - 3. Dow Chemical Company:
consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - 4. Fortifiber Building Systems Group: www.fortifiber.com/#sle.
 - 5. Franklin International, Inc: www.titebond.com/#sle.
 - 6. Hilti, Inc: www.us.hilti.com/#sle.
 - 7. Master Builders Solutions by BASF: www.master-builders-solutions.basf.us/en-us/#sle.
 - 8. Momentive Performance Materials, Inc (formerly GE Silicones):
www.momentive.com/#sle.
 - 9. Pecora Corporation: www.pecora.com/#sle.
 - 10. QUIKRETE Companies: www.quikrete.com/#sle.
 - 11. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - 12. Sika Corporation: www.usa-sika.com/#sle.
 - 13. Specified Technologies Inc: www.stifirestop.com/#sle.
 - 14. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
 - 15. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
 - 16. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

- A. Scope:

1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
 - a. Wall expansion and control joints.
 - b. Joints between door, window, and other frames and adjacent construction.
 - c. Joints between different exposed materials.
 - d. Openings below ledge angles in masonry.
 - e. Other joints indicated below.
 2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
 - a. Joints between door, window, and other frames and adjacent construction.
 - b. Other joints indicated below.
 3. Do not seal the following types of joints.
 - a. Intentional weepholes in masonry.
 - b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
 - c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
 - d. Joints where installation of sealant is specified in another section.
 - e. Joints between suspended panel ceilings/grid and walls.
- B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
- C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
 2. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
- D. Interior Wet Areas: restrooms; fixtures in wet areas include plumbing fixtures, countertops, and other similar items.

2.03 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

2.04 NONSAG JOINT SEALANTS

- A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.
 2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
 3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 4. Color: To be selected by Architect from manufacturer's standard range.
 5. Cure Type: Single-component, neutral moisture curing.
 6. Service Temperature Range: Minus 65 to 180 degrees F.
 7. Manufacturers:
 - a. Dow Chemical Company; 795 Silicone Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - b. Sika Corporation; Sikasil WS-295: www.usa-sika.com/#sle.
 - c. Tremco Commercial Sealants & Waterproofing; Tremsil 400: www.tremcosealants.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: White.
 2. Manufacturers:
 - a. Pecora Corporation: www.pecora.com/#sle.

- b. Sika Corporation; Sikasil GP: www.usa-sika.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
- 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Color: To be selected by Architect from manufacturer's standard range.
 - 3. Service Temperature Range: Minus 40 to 180 degrees F.
 - 4. Manufacturers:
 - a. Pecora Corporation: www.pecora.com/#sle.
 - b. The QUIKRETE Companies; QUIKRETE® Polyurethane Non-Sag Sealant: www.quikrete.com/#sle.
 - c. Sherwin-Williams Company; Stampede 2NS Polyurethane Sealant: www.sherwin-williams.com/#sle.
 - d. Sika Corporation; Sikaflex-2c NS: www.usa-sika.com/#sle.
 - e. Tremco Commercial Sealants & Waterproofing; Dymonic 100: www.tremcosealants.com/#sle.
 - f. W. R. Meadows, Inc; POURTHANE NS: www.wrmeadows.com/#sle.
 - g. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
- 1. Color: To be selected by Architect from manufacturer's standard range.
 - 2. Grade: ASTM C834; Grade - Minus 18 Degrees C.
 - 3. Manufacturers:
 - a. Hilti, Inc; CP 506 Smoke and Acoustical Sealant: www.us.hilti.com/#sle.
 - b. Sherwin-Williams Company; White Lightning 3006 Siliconized Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
 - c. Top Gun, a brand of PPG Architectural Coatings; Top Gun 200: www.ppgpaints.com/#sle.
 - d. Tremco Commercial Sealants & Waterproofing; Tremstop Smoke & Sound: www.tremcosealants.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
- 1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
 - 2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
 - 3. Open Cell: 40 to 50 percent larger in diameter than joint width.
 - 4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
 - 5. Manufacturers:
 - a. Nomaco, Inc; HBR: www.nomaco.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.

- C. Verify that backer rods are of the correct size.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Install bond breaker backing tape where backer rod cannot be used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

- A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.
- C. Thermally insulated hollow metal doors with frames.

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware.
- B. Section 09 91 13 - Exterior Painting: Field painting.
- C. Section 09 91 23 - Interior Painting: Field painting.

1.03 ABBREVIATIONS AND ACRONYMS

1.04 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.
- G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2017.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- I. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.
- J. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- K. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- L. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
- M. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.
- N. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.
- O. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 3. Steelcraft, an Allegion brand: www.allegion.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DESIGN CRITERIA

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel used for fabrication of doors and frames shall comply with one or more of the following requirements; Galvannealed steel conforming to ASTM A653/A653M, cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.
 - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
 - 4. Door Edge Profile: Manufacturers standard for application indicated.
 - 5. Typical Door Face Sheets: Flush.
 - 6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

- A. Exterior Doors: Thermally insulated.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 - Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum.
 - 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 - a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
 - 3. Door Thickness: 1-3/4 inch, nominal.
 - 4. Weatherstripping: Refer to Section 08 71 00.
 - 5. Door Finish: Factory primed and field finished.
- B. Interior Doors, Non-Fire Rated:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 - Standard-duty.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.

- c. Model 1 - Full Flush.
- d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
- 2. Door Thickness: 1-3/4 inch, nominal.
- 3. Door Finish: Factory finished.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Frame Finish: Factory primed and field finished.
- C. Exterior Door Frames: Full profile/continuously welded type.
 - 1. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
 - 2. Weatherstripping: Separate, see Section 08 71 00.
- D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 - 1. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
- E. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

2.05 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

- A. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- B. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Coordinate frame anchor placement with wall construction.
- C. Install door hardware as specified in Section 08 71 00.
- D. Touch up damaged factory finishes.

3.03 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION

SECTION 08 36 13
SECTIONAL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Overhead sectional door electrically operated.
- B. Operating hardware and supports.
- C. Electrical controls.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Rough wood framing for door opening.
- B. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.
- C. Section 26 05 83 - Wiring Connections.

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- B. DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors; 2011.
- C. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
- C. Product Data: Show component construction, anchorage method, and hardware.
- D. Manufacturer's Installation Instructions: Include any special procedures required by project conditions.
- E. Operation Data: Include normal operation, troubleshooting, and adjusting.
- F. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sectional Doors:
 - 1. C.H.I. Overhead Doors: www.chiohd.com/#sle.
 - 2. Clopay Building Products: www.clopaydoor.com/#sle.
 - 3. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com/#sle.

4. Overhead Door Corporation: 591 Series: www.overheaddoor.com.
5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 STEEL DOORS

- A. Steel Doors: Flush steel, insulated; standard lift operating style with track and hardware; complying with DASMA 102, Commercial application.
 1. Door Nominal Thickness: 1 5/8 inches thick.
 2. Exterior Finish: Factory finished with acrylic baked enamel; color as selected by Architect.
 3. Interior Finish: Factory finished with acrylic baked enamel; color as selected from manufacturers standard line.
 4. Electric Operation: Electric control station.
- B. Door Panels: Steel construction; outer steel sheet of 27 gage, 0.0164 inch minimum thickness, deep ribbed profile; inner steel sheet of 27 gage, 0.0164 inch minimum thickness, flat profile; core reinforcement sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; polyurethane insulation.

2.03 COMPONENTS

- A. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.
- B. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.
- C. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.
- D. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.
- E. Head Weatherstripping: EPDM rubber seal, one piece full length.
- F. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.
- G. Lock: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.

2.04 MATERIALS

- A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G60/Z180 coating, plain surface.
- B. Insulation: Foamed-in-place polyurethane, bonded to facing.

2.05 ELECTRIC OPERATION

- A. Electric Operators:
 1. Mounting: Side mounted on cross head shaft.
 2. Motor Enclosure:
 3. Motor Rating: 1/3 hp; continuous duty.
 4. Motor Voltage: 120 volts, single phase, 60 Hz.
 5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
 6. Controller Enclosure: NEMA 250, Type 1.
 7. Opening Speed: 12 inches per second.
 8. Brake: Adjustable friction clutch type, activated by motor controller.
 9. Manual override in case of power failure.
 10. Refer to Section 26 05 83 for electrical connections.
- B. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to conform to NFPA 70.
- C. Control Station: Provide standard three button (Open-Close-Stop) momentary-contact control device for each operator conforming to UL 325.
 1. 24 volt circuit.
 2. Surface mounted, at interior door jamb.

3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms conforming to UL 325.
 - a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.
- D. Safety Edge: Located at bottom of sectional door panel, full width; electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object; hollow neoprene covered to provide weatherstrip seal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.
- B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

- A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.
- B. Apply primer to wood frame.

3.03 INSTALLATION

- A. Install door unit assembly in accordance with manufacturer's instructions.
- B. Anchor assembly to wall construction and building framing without distortion or stress.
- C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
- D. Fit and align door assembly including hardware.
- E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.04 TOLERANCES

- A. Maximum Variation from Plumb: 1/16 inch.
- B. Maximum Variation from Level: 1/16 inch.
- C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.
- D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING

- A. Adjust door assembly for smooth operation and full contact with weatherstripping.

3.06 CLEANING

- A. Clean doors and frames.
- B. Remove temporary labels and visible markings.

3.07 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.
- B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION

SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Weatherstripping.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.
- B. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.
- C. Section 08 80 00 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.
- B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).
- C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.
- G. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
- H. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.
- I. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

1.04 ADMINISTRATIVE REQUIREMENTS

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
- D. Samples: Submit two samples 3 by 3 inches in size illustrating finished aluminum surface, glass, glazing materials.
- E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- F. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

- A. Center-Set Style, Thermally-Broken:
 - 1. Basis of Design: EFCO Corporation; Series 403, Thermal Storefront Framing: www.efcocorp.com/#sle.

2.02 BASIS OF DESIGN -- SWINGING DOORS

- A. Medium Stile, Insulating Glazing, Thermally-Broken:
 - 1. Basis of Design: EFCO Corporation; Series D302 Thermastile: www.efcocorp.com/#sle.
 - 2. Thickness: 2 inches.

2.03 STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Glazing Rabbet: For 1 inch insulating glazing.
 - 2. Finish: Superior performing organic coatings.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
 - 3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 - 4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 - 5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 - 6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
 8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
- B. Performance Requirements:
1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 - a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
 2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.
 3. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 psf pressure differential across assembly.

2.04 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
1. Glazing Stops: Flush.
 2. Cross-Section: As indicated on drawings.
- B. Glazing: As specified in Section 08 80 00.
- C. Swing Doors: Glazed aluminum.
1. Thickness: 1-3/4 inches.
 2. Top Rail: 4 inches wide.
 3. Vertical Stiles: 4-1/2 inches wide.
 4. Bottom Rail: 10 inches wide.
 5. Glazing Stops: Square.
 6. Finish: Same as storefront.

2.05 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209 (ASTM B209M).
- C. Fasteners: Stainless steel.
- D. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.06 FINISHES

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.
- B. Color: As selected by Architect from manufacturer's standard range.

2.07 HARDWARE

- A. For each door, include weatherstripping, sill sweep strip, and threshold.
- B. Other Door Hardware: As specified in Section 08 71 00.
- C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.
- E. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.

- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Set thresholds in bed of sealant and secure.
- J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 ADJUSTING

- A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

3.06 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Furnish door hardware for hollow metal, specified herein, listed in the hardware schedule, and/or required by the drawings.
 - 2. Cylinders for Aluminum Doors.
 - 3. Thresholds and Weatherstripping (Aluminum frame seals to be provided by aluminum door supplier).
- B. Where items of hardware are not definitely or correctly specified and is required for the intended service, such omission, error or other discrepancy should be directed to the Architect prior to the bid date for clarification by addendum. Otherwise furnish such items in the type and quantity established by this specification for the appropriate service intended.

1.03 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

- A. Furnish templates to the following Sections:
 - 1. Section 08 1113 for frame preparation.
 - 2. Section 08 1416 Flush Wood Doors.

1.04 RELATED WORK

- A. This Section includes coordination with related work in the following Sections:
 - 1. Section 08 1113 - Hollow Metal Doors & Frames.

1.05 REFERENCES

- A. Publications of agencies and organizations listed below form a part of this specification section to the extent referenced:
 - 1. ANSI/NFPA 80 - Fire Doors and Windows.
 - 2. AWLI - Architectural Woodwork Institute.
 - 3. BHMA - Builders' Hardware Manufacturers Association.
 - 4. DHI - Door and Hardware Institute.
 - 5. NAAMM - National Association of Architectural Metal Manufacturers.
 - 6. NFPA 80 - Standards for Fire Doors and Windows.
 - 7. NFPA 101 - Life Safety Code.
 - 8. DHI - Door and Hardware Institute
 - 9. SDI - Steel Door Institute.
 - 10. WHI - Warnock Hersey
 - 11. IBC - International Building Code 2018 Edition (as amended by local building code).
 - 12. UL - Building Material Directory.

1.06 COORDINATION

- A. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.

1.07 QUALITY ASSURANCE

- A. Manufacturers and model numbers listed are to establish a standard of function and quality. Similar items by approved manufacturers that are equal in design, function, and quality, may be considered for prior approval of the Architect, provided the required data and physical samples are submitted for approval as set forth in Section 01 6000 - Materials and Equipment.

- B. Obtain each type of hardware (hinges, latches, locksets, exit devices, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.
- C. Installation of hardware shall be installed or directly supervised and inspected by a skilled installer certified by the manufacturer of locksets, door closers, and exit devices used on the project, or with not less than 3 years experience in successful completion of projects similar in size and scope.
- D. Comply with all applicable provisions of the standards referenced within Section 1.5 of this specification.
- E. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this Section.

1.08 REGULATORY REQUIREMENTS

- A. Conform to applicable code for requirements applicable to doors and frames.

1.09 CERTIFICATIONS

- A. Architectural Hardware Consultant shall inspect complete installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified herein.
- B. Provide two copies of certifications to Architect.

1.10 SUBMITTALS

- A. Within ten days after award of contract, submit detailed hardware schedule in quantities as required by Division 01 - General Conditions.
- B. Schedule format shall be consistent with recommendations for a vertical format as set forth in the Door & Hardware Institute's (DHI) publication "Sequence and Format for the Hardware Schedule". Hardware sets shall be consolidated to group multiple door openings which share similar hardware requirements. Schedule shall include the following information:
 1. Door number, location, size, handing, and rating.
 2. Door and frame material, handing.
 3. Degree of swing.
 4. Manufacturer
 5. Product name and catalog number
 6. Function, type and style
 7. Size and finish of each item
 8. Mounting heights
 9. Explanation of abbreviations, symbols, etc.
 10. Numerical door index, indicating the hardware set/ group number for each door.
- C. The schedule will be prepared under the direct supervision of a certified Architectural Hardware Consultant (AHC) employed by the hardware distributor. The hardware schedule shall be signed and embossed with the DHI certification seal of the supervising AHC. The supervising AHC shall attend any meetings related to the project when requested by the architect.
- D. Check the specified hardware for suitability and adaptability to the details and surrounding conditions.
- E. Review drawings from related trades as required to verify compatibility with specified hardware. Indicate unsuitable or incompatible items, and proposed substitutions in the hardware schedule.
- F. Furnish manufacturers' catalog data for each item of hardware in quantities as required by Division 01 - General Conditions.
- G. Submit a sample of each type of hardware requested by the architect. Samples shall be of the same finish, style, and function as specified herein. Tag each sample with its permanent location so that it may be used in the final work.
- H. Furnish with first submittal, a list of required lead times for all hardware items.

- I. After final approved schedule is returned, transmit corrected copies for distribution and field use in quantities as required by Division 01 - General Conditions.
- J. Furnish approved hardware schedules, template lists, and pertinent templates as requested by related trades.
- K. After receipt of approved hardware schedule, Hardware supplier shall initiate a meeting including the owner's representative to determine keying requirements. Upon completion of the initial key meeting, hardware supplier shall prepare a proposed key schedule with symbols and abbreviations as set forth in the Door and Hardware Institute's publication "Keying Procedures, Systems, and Nomenclature". Submit copies of owner approved key schedule for review and field use.

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 01 7800.
- B. Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1.12 DELIVERY, STORAGE AND HANDLING

- A. Package hardware items individually; label and identify package with door opening code to match hardware schedule.
- B. Deliver keys to Owner by security shipment direct from hardware supplier.
- C. Coordinate with General Contractor prior to hardware delivery and recommend secure storage and protection against loss and damage at job site.
- D. General Contractor shall receive all hardware and provide secure and proper protection of all hardware items to avoid delays caused by lost or damaged hardware. General Contractor shall report shortages to the Architect and hardware supplier immediately after receipt of material at the job site.
- E. Coordinate with related trades under the direction of the General Contractor for delivery of hardware items necessary for factory installation.

1.13 WARRANTY

- A. Provide five year warranty under provisions of Section 01 7800.
- B. Warranty: Include coverage of door closers, latch sets and butt hinges.
- C. Repair, replace, or otherwise correct deficient materials and workmanship without additional cost to the Owner.

1.14 MAINTENANCE MATERIALS

- A. Provide special wrenches and tools applicable to each different or special hardware component.
- B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Hinges: 4 ½"x4 ½" 10 Ball Bearing; Hager, Stanley, McKinney.
- B. Locks: Mortise Lockset; Schlage L Series.
- C. Exit Devices: Von Duprin.
- D. Closers: LCN.
- E. Bolts: Glynn-Johnson, Ives, DCI.
- F. Stops: Glynn-Johnson, Ives, DCI, Burns.
- G. Holders: Glynn-Johnson, Ives.
- H. Sealing: Reese, Pemko, NGP, Stanley.
- I. Trim: Hiawatha, Burns, Ives.

- J. Pulls: Hager.
- K. Substitutions: Under provisions of Section 01 6000.

2.02 KEYING

- A. To be determined after award of contracts.

2.03 FINISHES AND PRODUCTS

- A. Finishes:
 - 1. Door Butts: US26D.
 - 2. Continuous Hinges: Clear
 - 3. Locksets: 26D.
 - 4. Exit Devices: 32D.
 - 5. Closers: 689.
 - 6. Trim: US32D.
 - 7. Stops: US32D.
 - 8. Holders: 626.
- B. Mortise Lock Lever Design: Schlage - Sparta.
- C. Lockset Backset: 2-3/4 inches.
- D. Door Closers: 4040 Series and related accessories.
- E. Kick Plate: 18 gage, 16" inch high, 2 inch LDW.
- F. Edging: 18 gage, 38 inch high, w/screws to clear butts.
- G. Gasketing/Smoke Seal: Number F797 at all rated doors, or as scheduled. (Sound, odor, dust).
- H. Silencers: At all Frames unless noted.
- I. Continuous Hinge: Roton 780-112HD Fit to Height Clear.
- J. Exit device: Von Duprin 99 Series.
- K. Butts to be 4-1/2 x 4-1/2 inch size, NRP at reverse bevel doors.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.
- B. Verify that power supply is available to power operated devices.
- C. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions.
- B. Use the templates provided by hardware item manufacturer.
- C. Mounting heights for hardware from finished floor to center line of hardware item:
 - 1. Locksets: 40".
 - 2. Push/Pulls: 42".
 - 3. Dead Locks: 48" max.
 - 4. Panic Devices: 42".
- D. Conform to ANSI A117.1 for positioning requirements for the handicapped.

3.03 SCHEDULE

<u>Group 1</u>	<u>Exterior Entry Function</u>	<u>Doors: 101.1, 101.2</u>
3 ea Hinges		Hager BB1199
1 ea Exit Device		Von Duprin 99 Series
1 ea Closer		LCN 4041 CUSH N STOP

1 ea Threshold		Pemko 171A
1 set Weatherstrip		Pemko 303S
1 ea Sweep		Pemko 315N
Cylinder		Schlage
1 ea Drip Cap		Pemko 346
<u>Group 2</u>	<u>Privacy Function</u>	<u>Doors: 103.1, 104.1, 105.1, 106.1</u>
3 ea Hinges		Hager BB1279
1 ea Privacy Lockset		Schlage L Series
1 ea Wall Stop		Hager 236W
Cylinder		Schlage
Silencers		
<u>Group 3</u>	<u>Storeroom Function</u>	<u>Door: 107.1</u>
3 ea Hinges		Hager BB1279
1 ea Storeroom Lockset		Schlage L Series
1 ea Closer		LCN 4041 CUSH N STOP
Cylinder		Schlage
Silencers		
<u>Group 4</u>	<u>Entry Function</u>	<u>Doors: 108.1, 108.2</u>
3 ea Hinges		Hager BB1199
1 ea Closer		LCN 4041 CUSH
1 ea Entry Lockset		Schlage L Series
1 ea Threshold		Pemko 171A
1 set Sweep		Pemko 315N
1 set Weatherstrip		Pemko 303S
1 ea Cylinder		Schlage

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.
- B. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.
- C. ASTM C1036 - Standard Specification for Flat Glass; 2016.
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- F. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.
- G. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.
- H. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.
- I. GANA (SM) - GANA Sealant Manual; 2008.
- J. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2017.
- K. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014, with Errata (2017).
- L. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2017.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data on Insulating Glass Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Samples: Submit two samples 12 by 12 inch in size of glass units.
- D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Glass Fabricators:
 - 1. Viracon, Inc: www.viracon.com/#sle.
 - 2. Substitutions: Refer to Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - 2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - 3. Glass thicknesses listed are minimum.
- B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
 - 1. In conjunction with vapor retarder and joint sealer materials described in other sections.
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
 - 1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless noted otherwise.
 - 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality-Q3.
 - 2. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and FT.
 - 3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 and 16 CFR 1201 criteria.
 - 4. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

2.04 INSULATING GLASS UNITS

- A. Manufacturers:
 - 1. AGC Glass North America, Inc: www.agcglass.com/#sle.
 - 2. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
 - 3. Guardian Glass, LLC: www.guardianglass.com/#sle.
 - 4. Pilkington North America Inc: www.pilkington.com/na/#sle.
 - 5. Viracon, Apogee Enterprises, Inc: www.viracon.com/#sle.
 - 6. Substitutions: Refer to Section 01 60 00 - Product Requirements.
- B. Insulating Glass Units: Types as indicated.
 - 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 - 2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 - 3. Spacer Color: Black.

4. Edge Seal:
 - a. Color: Black.
 5. Purge interpane space with dry air, hermetically sealed.
- C. Insulating Glass Units: Safety glazing.
1. Applications:
 - a. Glazed lites in exterior doors.
 - b. Glazed sidelights and panels next to doors.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations indicated on drawings.
 2. Space between lites filled with argon.
 3. Glass Type: Same as other vision glazing except use fully tempered float glass for both outboard and inboard lites.
 4. Tint: Clear.
 5. Total Thickness: 1 inch.
 6. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.47, nominal.

2.05 GLAZING UNITS

- A. Monolithic Exterior Vision Glazing:
1. Applications: Exterior glazing unless otherwise indicated.
 2. Glass Type: Fully tempered float glass.
 3. Tint: Clear.
 4. Thickness: 1/4 inch, nominal.
 5. Visible Light Transmittance (VLT): 88 percent, nominal.
 6. Shading Coefficient: 0.94, nominal.
 7. Solar Heat Gain Coefficient (SHGC): 0.82, nominal.
 8. Visible Light Reflectance, Outside: 8 percent, nominal.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that the minimum required face and edge clearances are being provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.
- E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- A. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

3.04 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove non-permanent labels immediately after glazing installation is complete.

- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.05 PROTECTION

- A. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 09 21 16
GYP SUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Gypsum sheathing.
- B. Gypsum wallboard.
- C. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Building framing.
- B. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.
- C. Section 07 21 00 - Thermal Insulation: Acoustic insulation.
- D. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

1.03 REFERENCE STANDARDS

- A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
- B. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2017a.
- C. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2016.
- D. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
- E. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2013a.
- F. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- G. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing.

PART 2 PRODUCTS

2.01 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 - 1. American Gypsum Company: www.americangypsum.com/#sle.
 - 2. CertainTeed Corporation: www.certainteed.com/#sle.
 - 3. Continental Building Products: www.continental-bp.com/#sle.
 - 4. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
 - 5. National Gypsum Company: www.nationalgypsum.com/#sle.
 - 6. PABCO Gypsum: www.pabco gypsum.com/#sle.
 - 7. USG Corporation: www.usg.com/#sle.
 - 8. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 - 2. Thickness:
 - a. Vertical Surfaces: 5/8 inch.

- b. Ceilings: 1/2 inch.
- 3. Paper-Faced Products:
 - a. American Gypsum Company; FireBloc Type X Gypsum Wallboard.
 - b. Continental Building Products; Firecheck Type X.
 - c. Georgia-Pacific Gypsum; ToughRock Fireguard X.
 - d. National Gypsum Company; Gold Bond BRAND Fire-Shield Gypsum Board.
 - e. USG Corporation; SHEETROCK brand EcoSmart Firecode X Gypsum Panels. (ULIX).
 - f. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
 - 1. Application: Exterior sheathing, unless otherwise indicated.
 - 2. Core Type: Regular, as indicated.
 - 3. Type X Thickness: 5/8 inch.
 - 4. Regular Board Thickness: 5/8 inch.
 - 5. Edges: Square.
 - 6. Glass Mat Faced Products:
 - a. American Gypsum Company; M-Glass Exterior Sheathing.
 - b. Continental Building Products; Weather Defense Platinum Exterior Sheathing.
 - c. Georgia-Pacific Gypsum; DensGlass Sheathing.
 - d. USG Corporation SECUREROCK brand Ultralight Glass-Mat Sheathing Firecode X.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

- A. Acoustic Insulation: As specified in Section 07 21 00.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- C. Water-Resistive Barrier: As specified in Section 07 25 00.
- D. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
 - 1. Rigid Corner Beads: Low profile, for 90 degree outside corners.
 - a. Products:
 - 1) Phillips Manufacturing Co; Everlast Corner Bead: www.phillipsmfg.com/#sle.
 - 2) Trim-Tex, Inc: www.trim-tex.com/#sle.
 - 3) Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. L-Trim with Tear-Away Strip: Sized to fit 5/8 inch thick gypsum wallboard.
 - a. Products:
 - 1) Phillips Manufacturing Co; gripSTIK L-Tear: www.phillipsmfg.com/#sle.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
- E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 - 1. Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
 - 2. Ready-mixed vinyl-based joint compound.
- F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

- A. Studs: Space studs at 16 inches on center.

1. Extend partition framing to structure where indicated and to ceiling in other locations.
 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
- B. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- C. Blocking: Install wood blocking for support of:
1. Framed openings.
 2. Wall mounted cabinets.
 3. Plumbing fixtures.
 4. Toilet partitions.
 5. Toilet accessories.
 6. Wall mounted door hardware.

3.03 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
1. Exception: Tapered edges to receive joint treatment at right angles to framing.
- C. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
1. Seal joints, cut edges, and holes with water-resistant sealant.
 2. Paper-Faced Sheathing: Immediately after installation, protect from weather by application of water-resistive barrier.
- D. Installation on Wood Framing: For non-rated assemblies, install as follows:
1. Single-Layer Applications: Screw attachment.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.05 JOINT TREATMENT

- A. Paper Faced Gypsum Board: Use fiberglass joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
 2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 3. Level 3: Walls to receive textured wall finish.
 4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 5. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
1. Feather coats of joint compound so that camber is maximum 1/32 inch.
- D. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.06 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

**SECTION 09 65 00
RESILIENT FLOORING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient base.
- B. Installation accessories.

1.02 REFERENCE STANDARDS

- A. ASTM F1861 - Standard Specification for Resilient Wall Base; 2016.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- D. Protect roll materials from damage by storing on end.
- E. Do not double stack pallets.

PART 2 PRODUCTS

2.01 RESILIENT BASE

- A. Resilient Base: ASTM F1861, Type TP, rubber, thermoplastic; top set Style B, Cove.
 - 1. Manufacturers:
 - a. Roppe Corp: www.roppe.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Height: 4 inch.
 - 3. Thickness: 0.125 inch.
 - 4. Finish: Satin.
 - 5. Length: Roll.
 - 6. Color: To be selected by Architect from manufacturer's full range.
 - 7. Accessories: Premolded external corners and internal corners.

2.02 ACCESSORIES

- A. Adhesives: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

3.02 PREPARATION

3.03 INSTALLATION - GENERAL

- A. Install in accordance with manufacturer's written instructions.
- B. Spread only enough adhesive to permit installation of materials before initial set.
- C. Fit joints and butt seams tightly.

3.04 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.05 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

END OF SECTION

SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints, stains, and varnishes.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Elevator pit ladders.
 - 3. Mechanical and Electrical:
 - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
 - c. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Floors, unless specifically indicated.
 - 6. Glass.
 - 7. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

- A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2016.
- B. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- C. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).
- D. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
- C. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures.
- E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
3. Label each container with color in addition to the manufacturer's label.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum two years experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
 1. Behr Process Corporation: www.behr.com/#sle.
 2. Diamond Vogel Paints: www.diamondvogel.com/#sle.
 3. PPG Paints: www.ppgpaints.com/#sle.
 4. Pratt & Lambert Paints: www.prattandlambert.com/#sle.
 5. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 6. Valspar Corporation: www.valsparpaint.com/#sle.
- C. Transparent Finishes:
 1. Behr Process Corporation: www.behr.com/#sle.
 2. PPG Paints Deft Interior Clears/Polyurethanes: www.ppgpaints.com/#sle.
 3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- D. Stains:
 1. Behr Process Corporation: www.behr.com/#sle.
 2. PPG Paints Deft Interior Stains: www.ppgpaints.com/#sle.
 3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- E. Primer Sealers: Same manufacturer as top coats.
- F. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
3. Supply each paint material in quantity required to complete entire project's work from a single production run.
4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

2.03 PAINT SYSTEMS - INTERIOR

- A. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete masonry units, wood, uncoated steel, shop primed steel, and galvanized steel.
 1. Two top coats and one coat primer.
 2. Top Coat(s): Interior Latex.
 - a. Products:
 - 1) Pratt & Lambert Pro-Hide Gold Interior Latex, Semi-Gloss. (MPI #43)
 - 2) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Semi-Gloss. (MPI #43)
 3. Top Coat Sheen:
 - a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
- B. Wood, Transparent, Varnish, Stain:
 1. One coat of stain.
 2. One coat sealer.
 3. Satin: One coat of varnish.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 1. Gypsum Wallboard: 12 percent.
 2. Masonry, Concrete, and Concrete Masonry Units : 12 percent.
 3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.

- E. Masonry:
 - 1. Prepare surface as recommended by top coat manufacturer.
- F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- G. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- H. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 - 2. Prepare surface according to SSPC-SP 2.
- I. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 - 3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- J. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- E. Sand wood and metal surfaces lightly between coats to achieve required finish.
- F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 10 14 00

SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Room and door signs.

1.02 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - 1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - 2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - 3. Submit for approval by Owner through Architect prior to fabrication.
- D. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
- E. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Flat Signs:
 - 1. Best Sign Systems, Inc: www.bestsigns.com/#sle.
 - 2. Inpro: www.inprocorp.com/#sle.
 - 3. Mohawk Sign Systems, Inc: www.mohawksign.com/#sle.
 - 4. Seton Identification Products: www.seton.com/aec/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SIGNAGE APPLICATIONS

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
 - 1. Sign Type: Flat signs with engraved panel media as specified.
 - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
 - 3. Character Height: 1 inch.
 - 4. Sign Height: 6 inches, unless otherwise indicated.
 - 5. Service Rooms: Identify with the room names and numbers indicated on drawings.
 - 6. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", and braille.

2.03 SIGN TYPES

- A. Flat Signs: Signage media without frame.
 - 1. Edges: Square.
 - 2. Corners: Square.
 - 3. Wall Mounting of One-Sided Signs: Tape adhesive.
- B. Color and Font: Unless otherwise indicated:
 - 1. Character Font: Helvetica, Arial, or other sans serif font.
 - 2. Character Case: Upper case only.
 - 3. Background Color: Clear.
 - 4. Character Color: Contrasting color.

2.04 TACTILE SIGNAGE MEDIA

- A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
 - 1. Total Thickness: 1/16 inch.

2.05 ACCESSORIES

- A. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Under-lavatory pipe supply covers.
- C. Diaper changing stations.

1.02 RELATED REQUIREMENTS

- A. Section 22 40 00 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- E. ASTM B86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings; 2013.
- F. ASTM C1036 - Standard Specification for Flat Glass; 2016.
- G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- I. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004, with Editorial Revision (2016).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. AJW Architectural Products: www.ajw.com/#sle.
 - 2. American Specialties, Inc: www.americanspecialties.com/#sle.
 - 3. Bradley Corporation: www.bradleycorp.com/#sle.
 - 4. Bobrick: www.bobrick.com.
 - 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Under-Lavatory Pipe Supply Covers:
 - 1. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.
 - 2. Substitutions: Section 01 60 00 - Product Requirements.

- C. Diaper Changing Stations:
 1. American Specialties, Inc: www.americanspecialties.com/#sle.
 2. Bradley Corporation: www.bradleycorp.com/#sle.
 3. Koala Kare Products; KB200 Horizontal Wall Mounted: www.koalabear.com/#sle.
 4. Substitutions: 01 60 00 - Product Requirements.
- D. Provide products of each category type by single manufacturer.

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 1. Grind welded joints smooth.
 2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
- B. Keys: Provide two keys for each accessory to Owner; master key lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- F. Zinc Alloy: Die cast, ASTM B86.
- G. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
- H. Adhesive: Two component epoxy type, waterproof.
- I. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
- J. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

- A. Toilet Paper Dispenser: Single roll, surface mounted bracket type, stainless steel.
 1. Products:
 - a. Bobrick B-6857.
 - b. Substitutions: Section 01 60 00 - Product Requirements.
- B. Paper Towel Dispenser: Folded paper type, stainless steel, surface-mounted, with viewing slots on sides as refill indicator and tumbler lock.
 1. Capacity: 200 C-fold minimum.
 2. Products:
 - a. Bobrick B-2621.
 - b. Substitutions: Section 01 60 00 - Product Requirements.
- C. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
 1. Minimum Capacity: 40 ounces.
 2. Products:
 - a. Bobrick B-2111.
 - b. Substitutions: Section 01 60 00 - Product Requirements.
- D. Mirrors: Stainless steel framed, 1/4 inch thick tempered safety glass; ASTM C1048.
 1. Frame: 0.05 inch channel shapes, with mitered corners, and tamperproof hanging system; satin finish.
 2. Products:
 - a. Bobrick B-1658.

- b. Substitutions: Section 01 60 00 - Product Requirements.
- E. Grab Bars: Stainless steel, smooth surface.
 - 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
 - c. Finish: Satin.
 - d. Length and Configuration: As indicated on drawings.
 - e. Products:
 - 1) Bobrick B-5806 Series.
 - 2) Substitutions: Section 01 60 00 - Product Requirements.
- F. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
 - 1. Products:
 - a. Bobrick B-270.
 - b. Substitutions: Section 01 60 00 - Product Requirements.

2.05 UNDER-LAVATORY PIPE AND SUPPLY COVERS

- A. Under-Lavatory Pipe and Supply Covers:
 - 1. Insulate exposed drainage piping including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
 - 2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
 - 3. Construction: 1/8 inch flexible PVC.
 - a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 4. Color: White.
 - 5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.
 - 6. Products:
 - a. Plumberex Specialty Products, Inc; Plumberex Handy-Shield Maxx: www.plumberex.com/#sle.
 - b. Substitutions: Section 01 60 00 - Product Requirements.

2.06 DIAPER CHANGING STATIONS

- A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
 - 1. Material: Polyethylene.
 - 2. Mounting: Surface.
 - 3. Color: White Granite.
 - 4. Minimum Rated Load: 250 pounds.
 - 5. Products:
 - a. Koala Kare Products; KB200 Horizontal Wall Mounted: www.koalabear.com/#sle.
 - b. Substitutions: 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.04 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

- A. NFPA 10 - Standard for Portable Fire Extinguishers; 2017.
- B. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide extinguisher operational features.
- C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Ansul, a Tyco Business: www.ansul.com/#sle.
 - 2. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
 - 3. Nystrom, Inc: www.nystrom.com/#sle.
 - 4. Oval Brand Fire Products: www.ovalfireproducts.com/#sle.
 - 5. Pyro-Chem, a Tyco Business: www.pyrochem.com/#sle.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
 - 1. Provide extinguishers labeled by UL (DIR) for purpose specified and as indicated.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Class: A:B:C type.
 - 2. Size: 10 pound.
 - 3. Finish: Baked polyester powder coat, color as selected.
 - 4. Temperature range: Minus 40 degrees F to 120 degrees F.

2.03 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure rigidly in place.
- C. Place extinguishers on wall brackets.

END OF SECTION

PLUMBING

DIVISION 22

SPECIFICATION INDEX

(Plumbing Contractor shall refer to Division 23 Specification Sections 23 05 00, 23 05 29, 23 05 53, and 23 07 00 for common HVAC/Plumbing Requirements)

22 11 00 Facility Water Distribution and Specialties

22 11 23 Facility Natural Gas Piping

22 13 00 Facility Sanitary Sewerage and Specialties

22 33 00 Electric Water Heaters

22 40 00 Plumbing Fixtures

END OF SECTION

BLANK PAGE

SECTION 22 11 00

FACILITY WATER DISTRIBUTION AND SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Domestic water piping, above grade.
 - 2. Unions and flanges.
 - 3. Valves.
 - 4. Wall Hydrants
 - 5. Hose Bibbs

- B. Related Sections:
 - 1. Division 07 - Firestopping: Product requirements for firestopping for placement by this section.
 - 2. Section 23 05 00 - Basic Plumbing and HVAC Requirements.
 - 3. Section 23 05 29 - Hangers and Supports and Firestopping for HVAC Piping, Plumbing Piping and Equipment
 - 4. Section 23 05 53 - Identification for HVAC Piping, Plumbing Piping, and Equipment.
 - 5. Section 23 07 00 - HVAC and Plumbing Insulation.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
 - 2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - 3. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
 - 4. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.

- B. American Society of Sanitary Engineering:
 - 1. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers.

- C. ASTM International:
 - 1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 2. ASTM B32 - Standard Specification for Solder Metal.
 - 3. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.
 - 4. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
 - 5. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
 - 6. ASTM F1282 - Standard Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe.
 - 7. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

- D. American Welding Society:
 - 1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

- E. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.
- B. Product Data:
 1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturer's catalog information.
 2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
 3. Domestic Water Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.
- C. Manufacturer's Installation Instructions: Submit installation instructions for pumps, valves and accessories.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of valves and equipment.
- C. Operation and Maintenance Data: Submit spare parts list, exploded assembly views and recommended maintenance intervals.
- D. Maintain one copy of each document on site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Division 01 - Product Requirements: Product storage and handling requirements.
- B. Accept valves and equipment on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 - Product Requirements.
- B. Do not install underground piping when bedding is wet or frozen.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.8 WARRANTY

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.1 WATER PIPING, COPPER TUBE AND FITTINGS

- A. Pipe: ASTM B88: Type L, hard temper. Soft temper only as called for. Plans show copper tube sizes.
 - 1. Tees, Elbows, Reducers: Wrought, ASME B16.22 or cast bronze, ASME B16.18; solder end connections.
 - 2. Unions and Flanges: 2 in. and smaller use unions, solder type, cast bronze, ground joint 150 lb. swp: 2-1/2 in. and over use flanges, cast bronze, companion type, ASME drilled solder connection, 150 lb. swp.
 - 3. Solder Materials: No-lead solder using alloys made from tin, copper, silver and nickel.

2.2 WATER PIPING. PEX TUBING AND FITTINGS

- A. 2" and smaller PEX Tubing: ASTM F876 and F877, single layer, cross linked polyethylene extrusion with an outer layer composed of an Evoh oxygen barrier. AquaPex, manufactured by Uponor. Refer to Section 23 0700 for insulation. Refer to 23 05 29 for Pex support requirements.
- B. Fittings for PEX tube: ASTM F 1807, metal-insert type with copper or stainless steel crimp rings and matching PEX tube dimensions.

2.3 COPPER PRESS FITTINGS AND BALL VALVES

- A. Viega Pro-Press type fittings shall be as manufactured by Rigid Tool Company.
- B. Press fittings: copper Pro-Press type fittings shall conform to the material and sizing requirements of ASME B16.18 or ASME B16.22. The fittings shall be acceptable for domestic water usage.
- C. Ball valves with Press Connections where Copper Press piping systems are allowed shall be Brass Body in accordance with ASTM B283 Alloy C37700, fully annealed. Ball shall be Chrome-Plated Brass in Full Port design with a smooth cylindrical port in ball (no hollow balls allowed). Valve must mate with standard Copper Tubing (K or L) conforming to ASTM B88, assembled by tooling recommended by the Copper Press Fitting manufacturer. The Ball Valve must have factory installed O-rings furnished in EPDM material of type and size compliant with the Copper Press Fittings. The ball valve must be certified to NSF 61 and MSS SP110 in all applicable areas.
- D. Quality Standard: Milwaukee UltraPress Model BA-480B, BA-490B or approved equal.

2.4 CHECK VALVES

- A. Horizontal Swing Check Valves:
 - 1. Manufacturers: Bronze
 - a. Crane 36
 - b. Hammond IB-944
 - c. Milwaukee 508
 - d. NIBCO 413-Y

2.5 WALL HYDRANTS

- A. Manufacturers:
 - 1. Woodford
 - 2. Zurn
 - 3. Josam
 - 4. Ancon
 - 5. J.R. Smith

- B. ANSI/ASSE 1019; Wall Hydrant shall be bronze nickel plated quarter turn self-draining non-freeze hydrant with hose connection, integral vacuum breaker, "T" handle key and stainless steel box with full 180 degree hinged locking cover. Model # 5509QT as manufactured by J.R. Smith.

2.6 HOSE BIBBS

- A. Manufacturers:
 - 1. Woodford - 26 or Y26
 - 2. Chicago
 - 4. Approved equal manufacturer prior to bidding.

- B. 3/4" hose bibb with metal handle and vacuum breaker.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.

3.3 INSTALLATION - ABOVE GROUND PIPING

- A. Install non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- C. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.
- D. Group piping whenever practical at common elevations.
- E. Slope piping and arrange systems to drain at low points.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 05 16.

- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 23 07 00.
- H. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors with Division 08.
- I. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Division 09.
- J. Install domestic water piping in accordance with ASME B31.9.
- K. Sleeve pipes passing through partitions, walls and floors. Refer to Section 23 05 29.
- L. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Section 23 05 29.
- M. Install unions downstream of valves and at equipment or apparatus connections.
- N. Install valves with stems upright or horizontal, not inverted.
- O. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- P. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- Q. Install gate valves for throttling, bypass, or manual flow control services.
- R. Remove scale and dirt on inside of piping before assembly.
- S. Install potable water protection devices on plumbing lines where contamination of domestic water may occur; janitor rooms, hood fire protection system, etc.
- T. Pipe relief from valves, back-flow preventers and drains to nearest floor drain.
- U. Test backflow preventers in accordance with ASSE 5013 or 5015.
- V. Solder and flux containing less than 0.2 percent lead shall be used. 95-5 tin-antimony or 96-4 tin-silver are approved solders.
- W. Solvent weld joints in PVC and CPVC pipe shall include use of a primer which is of contrasting color to the pipe and cement.
- X. All plumbing shall be installed in accordance with the Minnesota Plumbing Code.

3.4 INSTALLATION, COPPER PRESS FIT FITTINGS

- A. Press Connections: Copper Pro-Press type fittings shall be installed in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

3.5 RELIEF VALVES

- A. Run T & P relief drain line from water heater and terminate over floor drain or service sink.

3.6 TESTING REQUIREMENTS

- A. As per Minnesota Rules Part 4714, no plumbing work may be covered prior to completing the required tests and inspections.
- B. Mechanical Contractor shall verify that the State Department of Health has reviewed the Drawings for this Project prior to asking for an inspection of the underground piping.
- C. Submit certification to Engineer showing that all necessary and required tests were performed for the entire Project including the following:
 - 1. Water piping

3.7 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Division 01 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Disinfect water distribution system in accordance with Division 33.
- C. Prior to starting work, verify system is complete, flushed and clean.
- D. Verify pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- E. Inject disinfectant, free chlorine in liquid, powder and tablet or gas form, throughout system to obtain residual from 50 to 80 mg/L.
- F. Bleed water from outlets to obtain distribution and test for disinfectant residual at minimum 15 percent of outlets.
- G. Maintain disinfectant in system for 24 hours.
- H. When final disinfectant residual tests less than 25 mg/L, repeat treatment.
- I. Flush disinfectant from system until residual concentration is equal to incoming water or 1.0 mg/L.
- J. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

END OF SECTION

SECTION 22 11 23

FACILITY NATURAL-GAS PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Natural gas piping above grade.
 - 2. Unions and flanges.
 - 3. Valves.
 - 4. Strainers.
 - 5. Natural gas pressure regulators.
 - 6. Testing

- B. Related Sections:
 - 1. Division 09 - Painting and Coating: Product requirements for painting for placement by this section.
 - 2. Section 23 05 29 - Hangers and Supports for HVAC Piping, Plumbing Piping and Equipment: Product requirements for pipe hangers and supports and firestopping for placement by this section.
 - 3. Section 23 05 53 - Identification for HVAC Piping, Plumbing Piping and Equipment: Product requirements for valve and pipe identification for placement by this section.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI Z21.15 - Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves.

- B. American Society of Mechanical Engineers:
 - 1. ASME B16.3 - Malleable Iron Threaded Fittings.
 - 2. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
 - 3. ASME B16.33 - Manually Operated Metallic Gas Valves for Use in Gas Piping Systems Up to 125 psig (sizes 1/2 - 2).
 - 4. ASME B31.9 - Building Services Piping.

- C. ASTM International:
 - 1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 2. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
 - 3. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
 - 4. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

- D. American Welding Society:
 - 1. AWS D1.1 - Structural Welding Code - Steel.

- E. Manufacturers Standardization Society of the Valve and Fittings Industry:
 - 1. MSS SP 67 - Butterfly Valves.
 - 2. MSS SP 78 - Cast Iron Plug Valves, Flanged and Threaded Ends.
 - 3. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

- F. National Fire Protection Association:
 - 1. NFPA 54 - National Fuel Gas Code.
- G. Underwriters Laboratories Inc.:
 - 1. UL 842 - Valves for Flammable Fluids.
- H. American Gas Association
 - 1. International Fuel Gas Code (IFGC)

1.3 SYSTEM DESCRIPTION

- A. Provide flanges, unions, or couplings at locations requiring servicing. Use unions, flanges, or couplings downstream of valves and at equipment connections. Do not use direct welded or threaded connections to valves, equipment.
- B. Use ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

1.4 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.
- B. Product Data:
 - 1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
 - 2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
 - 3. Piping Specialties: Submit manufacturers catalog information including capacity, rough-in requirements, and service sizes for the following:
 - a. Strainers.
 - b. Natural gas pressure regulators.
 - c. Natural gas pressure relief valves.
- C. Design Data: Indicate pipe size. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

1.5 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of piping system, and system components.
- C. Operation and Maintenance Data: Submit for valves and gas pressure regulators installation instructions, spare parts lists, and exploded assembly views.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with applicable gas codes and local gas company requirements.
- B. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.
- C. Furnish shutoff valves complying with ASME B16.33 or ANSI Z21.15.
- D. Maintain one copy each document on site.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Division 01 - Product Requirements: Product storage and handling requirements.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation. Furnish temporary protective coating on cast iron and steel valves.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 - Product Requirements.
- B. Do not install underground piping when bedding is wet or frozen.

1.9 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.10 COORDINATION

- A. Division 01 - Administrative Requirements: Requirements for coordination.
- B. Coordinate trenching, excavating, bedding, backfilling of buried piping systems with requirements of Division 31.
- C. Local gas company shall be contacted for cost verification. Any cost associated with bringing gas to the building shall be included in the bids.

PART 2 PRODUCTS

2.1 NATURAL GAS PIPING, ABOVE GRADE DOWNSTREAM OF METER SET.

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M forged steel welding type.
 - 2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.
- B. Copper Tubing: ASTM B88, Type K.
 - 1. Fittings: ASME B16.26 cast bronze, compression type.
 - 2. Joints: Flared.

2.2 UNIONS AND FLANGES

- A. Unions for Pipe 2 inches and Smaller:
 - 1. Ferrous Piping: Class 150, malleable iron, threaded.
 - 2. Copper Piping: Class 150, bronze unions with [soldered] [brazed joints].
 - 3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
- B. Flanges for Pipe 2-1/2 inches and Larger:
 - 1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
 - 2. Copper Piping: Class 150, slip-on bronze flanges.
 - 3. Gaskets: 1/16 inch thick preformed neoprene gaskets.

2.3 BALL VALVES

- A. Manufacturers:
 - 1. Apollo - 70 or 80 Series
 - 2. Dezuric
 - 3. Milwaukee Valve Company - BA 475
 - 4. American - 2A
 - 5. Grinnell - 171N
 - 6. Jomar

- B. 1/4 inch to 1 inch: MSS SP 110, Class 125, two piece, threaded ends, bronze body, chrome plated bronze ball, reinforced teflon seats, blow-out proof stem, lever handle, UL 842 listed for flammable liquids, full port.

2.4 NATURAL GAS PRESSURE REGULATORS

- A. Manufacturers:
 - 1. Maxitrol
 - 2. Fischer

- B. Provide regulators with spring having an adjustment range from 4" or 5.5" W.C to 12 W.C. with 14" W.C. inlet pressure. Regulators shall provide full dead-end lock-up control. Regulators shall be sized to not exceed 0.5 lb. pressure drop at the required gas flow rate.

PART 3 EXECUTION

3.1 SERVICE CONNECTIONS

- A. Natural Gas Company shall provide a new gas service complete with gas meter and pressure regulator. Gas service distribution piping to have initial pressure of 14" w.c. Plumbing Contractor shall provide regulators on gas lines serving appliances and equipment that are not equipped to handle initial gas pressure of 14" w.c. Size regulators in accordance with appliances and equipment manufacturer's recommendations. Any cost associated with the gas service from the gas main to the building shall be the owner's responsibility.

3.2 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.

- B. Verify excavations are to required grade, dry, and not over-excavated.

3.3 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

- B. Remove scale and dirt, on inside and outside, before assembly.

- C. Prepare piping connections to equipment with flanges or unions.

3.4 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

- A. Install natural gas piping in accordance with NFPA 54 and IFGC.

- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

- C. Route piping in orderly manner and maintain gradient.
- D. Install piping to conserve building space and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Sleeve pipe passing through partitions, walls and floors. Refer to Section 23 05 29.
- H. Provide clearance for installation and access to valves and fittings.
- I. Provide access where valves and fittings are not exposed.
- J. Provide support for utility meters in accordance with requirements of utility company.
- K. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting.
- L. Install identification on piping systems. Refer to Section 23 05 53.
- M. Install valves with stems upright or horizontal, not inverted.
- N. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
- O. Natural Gas piping located in return air plenum ceilings must have all connections made by welding or brazing. No flanges, valves, threaded fittings, unions or connectors are permitted.

3.5 FIELD QUALITY CONTROL

- A. Division 01 - Quality Requirements; Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. All natural gas piping, appliances and equipment shall be installed as per the International Fuel Gas Code and NFPA 54.

3.6 GAS REGULATOR VENTING

- A. Provide Schedule 40 steel or copper tubing from the piping to atmosphere as per manufacturer. Vent pipe shall be same size as vent connection or larger. Terminate outside the building away from windows or other openings. Maintain a minimum of 15 feet between the termination of vent piping to a fresh air intake.
- B. If multiple vents are connected to a common vent, the vent pipe shall be sized as follows. The common vent line cross section dimension shall be not less than the largest connected vent plus 50 percent of the cross section of all other connected vents.
- C. Gas regulating valves shall be selected for gas pressure and capacities as indicated in the Contract Documents. Furnish and install regulating valves required to maintain proper pressure to appliances and heating equipment.
- D. If weather guards are necessary to prevent regulator failure due to weather conditions, they shall be provided at no additional cost.

3.9 TESTING REQUIREMENTS

- A. All gas piping shall be tested as per MSBC 1346.5406, Section 406. New gas lines may not be placed into service until this testing is complete.
- B. Submit certification to Engineer showing that all necessary and required tests were performed for piping installation.

3.10 GAS PIPE PAINTING

- A. All new gas piping shall be cleaned and all exposed gas piping shall be given two coats of Yellow Rustoleum. All concealed gas piping shall be given one coat of Yellow Rustoleum. Exterior gas pipe against an outside wall shall be painted to match the wall.

3.11 GAS SHUTOFF VALVE

- A. Install a main shutoff gas valve before the first branch line. The main shutoff valve shall be installed in the first available location inside the building that provides ready access and shall have a permanently attached handle. Install as per Minnesota Rules 1346.5409.

END OF SECTION

SECTION 22 13 00

FACILITY SANITARY SEWERAGE AND SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Sanitary sewer piping buried within 5 feet of building.
 2. Sanitary sewer and vent piping above grade.
 3. Equipment drains and overflow.
 4. Unions and flanges.
 5. Valves.
 6. Floor Drains.
 7. Trench Drains.
 8. Flammable Waste Trap
 9. Cleanouts.
 10. Bedding and cover materials.
- B. Related Sections:
1. Division 03 - Cast-In-Place Concrete: Execution requirements for placement of concrete specified by this section.
 2. Division 07 - Firestopping: Product requirements for firestopping for placement by this section.
 3. Division 09 - Painting and Coating: Product and execution requirements for painting specified by this section.
 4. Section 23 05 29 - Hangers and Supports for Plumbing Piping and Equipment: Product requirements for pipe hangers and supports and firestopping for placement by this section.
 5. Section 23 05 53 - Identification for HVAC Piping, Plumbing Piping and Equipment: Product requirements for pipe identification for placement by this section.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
1. ASME A112.21.1 - Floor Drains.
 2. ASME B16.3 - Malleable Iron Threaded Fittings.
 3. ASME B16.4 - Gray Iron Threaded Fittings.
 4. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings (DWV).
 5. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
 6. ASME B31.9 - Building Services Piping.
- B. ASTM International:
1. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
 2. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 3. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
 4. ASTM D2464 - Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 5. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

6. ASTM D2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
7. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
8. ASTM D2665 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
9. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
10. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
11. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
12. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
13. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes for interceptors, and manholes.
- C. Product Data:
 1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
 2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
 3. Sanitary Drainage Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.
- D. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of equipment and clean-outs.
- C. Operation and Maintenance Data: Submit frequency of treatment required for interceptors. Include, spare parts lists, exploded assembly views for equipment.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Division 01 - Product Requirements: Product storage and handling requirements.
- B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 - Product Requirements.

- B. Do not install underground piping when bedding is wet or frozen.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.8 WARRANTY

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. PVC Pipe: ASTM D2665, Schedule 40, polyvinyl chloride (PVC) material, bell and spigot style solvent sealed joint ends.
 - 1. Fittings: ASTM D2466, Schedule 40, PVC
 - 2. Joints: ASTM D2855, solvent weld with ASTM D2564 Solvent cement.

2.2 SANITARY SEWER PIPING, ABOVE GRADE

- A. PVC Pipe: ASTM D2665, polyvinyl chloride (PVC) material.
 - 1. Fittings: ASTM D2665, PVC.
 - 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.3 EQUIPMENT DRAIN AND OVERFLOW LINES

- A. Copper Tubing: ASTM B88, Type M and DWV, hard drawn. (Shall be insulated.)
 - 1. Fittings: ASME B16.18, cast brass or ASME B16.22 solder wrought copper.
 - 2. Joints: Solder, lead free, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F (220 to 280 degrees C).
- B. PVC Pipe: ASTM D1785, Schedule 40. (No insulation necessary)
 - 1. Fittings: ASTM D2466 or D2467, PVC.
 - 2. Joints: ASTM D2955, solvent weld.

2.4 UNIONS AND FLANGES

- A. Unions for Pipe 2 inches and Smaller:
 - 1. Copper Piping: Class 150, bronze unions with soldered joints.
 - 2. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
 - 3. PVC Piping: PVC.
- B. Flanges for Pipe 2-1/2 inches and Larger:
 - 1. 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping; neoprene gaskets for gas service; 1/16 inch thick pre-formed neoprene.
 - 2. PVC Piping: PVC flanges.
 - 3. Gaskets: 1/16 inch thick preformed neoprene gaskets.
- C. PVC Pipe Materials: For connections to equipment and valves with threaded connections, furnish solvent-weld socket to screwed joint adapters and unions, or ASTM D2464, Schedule 80, threaded, PVC pipe.

- D. Grooved and shouldered pipe end couplings: malleable iron housing clamps to engage and lock, designed to permit some angular, contraction, and expansion; "C" shape composition sealing gasket; steel bolts, nuts, washers; galvanized couplings for galvanized pipe.

2.5 FLOOR DRAINS

- A. Manufacturers:
 - 1. Zurn
 - 2. Wade
 - 3. Smith
 - 4. Josam
 - 5. Ancon
- B. **Floor Drain (FD-1):** ASME A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze leveling strainer. Model #Z415-5BZ manufactured by Zurn.
- C. **Floor Drain (FD-2):** ASME A112.21.1; same as FD-1 except strainer shall be 8" diameter. Model Z415-8BZ manufactured by Zurn.

2.6 TRENCH DRAINS

- A. Manufacturers
 - 1. Zurn
 - 2. ACO-Drain
 - 3. Josam
 - 4. J.R. Smith
- B. Trench Drains TD-1: Channels shall be 80" long, 6" wide, and have a 4" wide throat. Modular Channel sections shall be made of High Density Polyethylene (HDPE), have interlocking ends, and radiused bottom. Channel shall be provided either flat (neutral) or with a .75% built-in slope. Channels shall have clips molded into the sides of the channel to accommodate vertical rebar for positioning and anchoring purposes. Grates shall be Reinforced Galvanized Steel Slotted and have mechanical lock down devices. 4" end or bottom outlets. Trench Drain shall be Zurn Flo-Thru model # Z886 with Heavy Duty 6" Frame Z706-RFG (see floor plan for length of trench drain)

2.7 CLEANOUTS

- A. Manufacturers:
 - 1. Zurn
 - 2. Wade
 - 3. Smith
 - 4. Josam
 - 5. Ancon
- B. Exterior and Unfinished Surfaced Areas (CO-1): Round cast nickel bronze access frame and non-skid cover. Model ZN1400-2HD manufactured by Zurn.
- C. Interior Finished Floor Areas (CO-2): Lacquered cast iron, two piece body with double drainage flange, weep holes, reversible clamping collar, and adjustable nickel-bronze cover, round with scoriated cover in service areas and round with depressed cover to accept floor finish in finished floor areas and stamped stainless steel cleanout marker in carpeted areas; Model ZN1400-2 manufactured by Zurn.

- D. Interior Finished Wall Areas (CO-3): Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw; Model Z1445-1 manufactured by Zurn.
- E. Interior Unfinished Accessible Areas (CO-4): Caulked or threaded type. Provide bolted stack cleanouts on vertical rain water leaders.

2.8 FLAMMABLE WASTE TRAP

- A. Manufacturers
 1. PPF Metal Fabricating – Dundas, MN (507) 664-0322
 2. Midwest Tank – Big Lake, MN (763) 263-0747
- B. Construction: Two coats of black asphaltum on fabricated steel for fully recessed installation, with baffle assembly, integral deep seal trap, integral flow control, and non-skid steel cover with gasket securing handle.
- C. All fittings and seams below the liquid level shall undergo oil penetration tests to ensure vessel tightness.
- D. Unit Ratings: 35 cu.ft. retention capacity minimum. Six feet (6') high by three feet, 3 inches (3'-3") in diameter. Approximate weight - 886 lbs. Provide welded neck extension to extend waste trap to floor level as required.

PART 3 EXECUTION

3.1 SERVICE CONNECTIONS

- A. Connect new Sanitary Sewer to sewer services provided within 5'-0" of building.

3.2 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Verify excavations are to required grade, dry, and not over-excavated.

3.3 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.4 EXCAVATION AND BACKFILLING

- A. Underground Work (Inside the Buildings Outside Walls)
 1. Mechanical Contractor to carry out all excavation, backfilling and compaction of earth required for the installation of underground lines within the buildings outside walls.
 2. All backfill (on excavations inside of the building outside perimeter walls) shall be vibratory rolled or otherwise compacted to 95 percent of proctor density, tested at

the rate of one test per 2500 sq. ft and re-packed and retested where the test results are under.

3. Mechanical Contractor shall note inverts of the sanitary runs inside and outside of the buildings and shall run lines to meet these inverts. Where these lines cross underground foots or foundations the Mechanical Contractor shall provide oversized steel pipe sleeves before foundations are poured.

3.5 TESTING REQUIREMENTS

- A. The sanitary sewer and vent piping systems shall be tested as per Minnesota Plumbing Code 4714.
- B. As per Minnesota Rules Part 4714, no plumbing work may be covered prior to completing the required tests and inspections.
- C. Mechanical Contractor shall verify that the State Department of Health has reviewed the Drawings for this Project prior to asking for an inspection of the underground piping.
- D. Submit certification to Engineer showing that all necessary and required tests were performed for the entire Project including the following:
 1. Sewer/Vent piping

3.6 SEWER AND DRAIN PIPING NEAR WATER PIPING

- A. All underground sections of building drain and building sewer pipe located within 10 feet of buried water supply pipe shall be constructed in accordance with Minnesota Rules, part 4714.

3.7 INSTALLATION - BURIED PIPING SYSTEMS

- A. Remove scale and dirt on inside of piping before assembly.
- B. Excavate pipe trench in accordance with Division 31.
- C. Install pipe to slope at a minimum 1/4" per foot of run.
- D. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 4 inches compacted depth.
- E. Install pipe on prepared bedding.
- F. Route pipe in straight line.
- G. Install a cleanout where there is an increase in pipe size from 2 inches to 3 inches and from 3 inches to 4 inches.

3.8 INSTALLATION - PIPING

- A. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Provide clearances at cleanout for snaking drainage system.
- B. Install floor cleanouts at elevation to accommodate finished floor.
- C. Install vent piping above suspended ceiling. Do not spread piping, conserve space.

- D. Group piping whenever practical at common elevations.
- E. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
- F. Install bell and spigot pipe with bell end upstream.
- G. Sleeve pipes passing through partitions, walls and floors.
- H. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Section 23 05 29.
- I. Plumbing vents shall extend a minimum of 12" above roof. Install frost-proof flashing over vent. Verify final HVAC equipment and air intake locations and confirm required clearances.
- J. Plumbing vents shall be a minimum of 15'-0" away from roof-mounted or wall-mounted fresh air intakes. Verify final HVAC equipment and air intake locations and confirm required clearances.
- K. Solvent weld joints in PVC pipe shall include use of a primer which is of contrasting color to the pipe and cement.
- L. All piping shall be installed in accordance with the Minnesota Plumbing Code.

3.9 FIELD QUALITY CONTROL

- A. Division 01 - Quality Requirements, Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

END OF SECTION

BLANK PAGE

SECTION 22 33 00

ELECTRIC WATER HEATERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Electric water heaters.
- B. Related Sections:
 - 1. Section: 22 11 00 - Facility Water Distribution: Supply connections to domestic water heaters.
 - 2. Division 26 - Equipment Wiring Connections: Execution requirements for electric connections specified by this section.

1.2 REFERENCES

- A. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - 1. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- B. American Society of Mechanical Engineers:
 - 1. ASME PTC 25 - Pressure Relief Devices.

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate heat exchanger dimensions, size of taps, and performance data. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, taps, and drains.
- C. Product Data: Submit dimensioned drawings of water heaters indicating components and connections to other equipment and piping. Submit electrical characteristics and connection locations.
- D. Manufacturer's Installation Instructions: Submit mounting and support requirements.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit replacement part numbers and availability.

1.5 QUALITY ASSURANCE

- A. Water Heater Performance Requirements: Equipment efficiency not less than prescribed by ASHRAE 90.1.
- B. Maintain one copy of each document on site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Division 01 - Product Requirements: Products storage and handling requirements.
- B. Accept water heaters on site in original labeled cartons. Inspect for damage.
- C. Protect tanks with temporary inlet and outlet caps. Maintain caps in place until installation.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.8 WARRANTY

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. See Product Description for warranty requirements.

PART 2 PRODUCTS

2.1 ELECTRIC STORAGE TYPE WATER HEATERS

- A. Acceptable Manufacturers:
 - 1. Hubbell
 - 2. A.O. Smith (basis of design)
 - 3. Rheem
 - 4. State
 - 5. Bradford/White
- B. Type: Automatic, electric, vertical storage.
- C. Tank: Glass lined welded steel, thermally insulated with one inch thick glass fiber; encased in corrosion-resistant steel jacket with baked-on enamel finish.
- D. Controls: Automatic water thermostat with externally adjustable temperature range from 120 to 170 degrees F, flanged or screw-in nichrome elements, enclosed controls and electrical junction box and operating light.
- E. Accessories: Brass water connections and dip tube, drain valve, magnesium anode, and ASME temperature and pressure relief valve.
- F. see schedule on drawings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Maintain manufacturer's recommended clearances around and over water heaters.
- B. Install tank type water heater on housekeeping pad or wall mounted stand as called for on schedules.

- C. Connect domestic hot water and domestic cold soft water piping to inlet and outlet water heater connections.
- D. Install the following piping accessories.
 - 1. On inlet:
 - a. Strainer.
 - b. Shutoff valve.
 - 2. On outlet:
 - a. Thermometer well and thermometer.
- E. Install discharge piping from relief valves and drain valves to nearest floor drain or service sink.
- F. Install water heater trim and accessories furnished loose for field mounting.
- G. Install electrical devices furnished loose for field mounting.

END OF SECTION

BLANK PAGE

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Water closets.
 - 2. Lavatories.
 - 3. Outdoor Drinking Fountain
 - 4. Service sinks.

- B. Related Sections:
 - 1. Section 07 90 00 - Joint Protection: Product requirements for calking between fixtures and building components for placement by this section.
 - 2. Section 22 11 00 - Facility Water Distribution: Supply connections to plumbing fixtures.
 - 3. Section 22 13 00 - Facility Sanitary Sewerage: Waste connections to plumbing fixtures.
 - 4. Section 23 05 00 - Basic Plumbing and HVAC Requirements.
 - 5. Section 26 05 03 - Equipment Wiring Connections: Execution requirements for electric connections to sensor valves and faucets specified by this section.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.

- B. American Society of Mechanical Engineers:
 - 1. ASME A112.6.1 - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use.
 - 2. ASME A112.18.1 - Plumbing Fixture Fittings.
 - 3. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures.
 - 4. ASME A112.19.2M - Vitreous China Plumbing Fixtures.
 - 5. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks and Urinals.

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.

- B. Product Data: Submit catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim and finishes.

- C. Manufacturer's Installation Instructions: Submit installation methods and procedures.

- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

- E. All flush valves for water closets and urinals shall be provided by the same manufacturer.

1.4 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

- B. Operation and Maintenance Data: Submit fixture, trim, exploded view and replacement parts lists.

1.5 QUALITY ASSURANCE

- A. Faucets: All faucets must comply with NSF 61 - Drinking Standards.
- B. Provide products requiring electrical connections listed and classified by Underwriters Laboratories Inc., as suitable for purpose specified and indicated.
- C. Maintain one copy of each document on site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Division 01 - Product Requirements: Product storage and handling requirements.
- B. Accept fixtures on site in factory packaging. Inspect for damage.
- C. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.7 WARRANTY

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. The Contractor shall be responsible for the proper installation and working of everything in their portion of the project and shall guarantee to remedy free of charge any defects in workmanship and materials that may appear to give or gives rise to trouble of any kind for a period of one year from the date of Substantial Completion of the work (unless noted otherwise as a longer warranty period in an individual specification section). Refer to Division 01 for more details.

PART 2 PRODUCTS

2.1 SILICONE FOAM PLUMBING CAULKING AND SEALANTS

- A. Foam to be Dow Corning 3-6548 Silicone RTV Foam.
- B. Sealant to be Dow Corning 96-081 RTV Silicone Adhesive sealant.

2.2 CAULKING AND SEALANTS

- A. Material shall be asbestos-free, having code approvals as listed in Article 1.03 of this specification.

2.3 ACCEPTABLE MANUFACTURERS - ADA DRAIN & SUPPLY INSULATION

- A. IPS Corporation - Truebro®
- B. Goodwill Industries
- C. McGuire
- D. Plumberex Specialty Products

2.4 HANDICAPPED LAVATORY INSULATED PROTECTORS

- A. Handicap lavatory P-trap and angle valve assemblies shall be insulated with the fully molded, IPS Corporation "TRUEBRO", Lav Guard 2 undersink piping covers, White in color.

2.5 ACCEPTABLE MANUFACTURERS – FIXTURES

- A. Kohler
- B. American Standard
- C. Sloan
- D. Zurn One
- E. Fiat
- F. Mustee

2.6 ACCEPTABLE MANUFACTURERS - FIXTURE TRIM

- A. Moen
- B. Chicago
- C. Sloan
- D. Delta
- E. Zurn

2.7 ACCEPTABLE MANUFACTURERS - FLUSH VALVES

- A. Sloan
- B. Zurn
- C. Chicago

2.8 ACCEPTABLE MANUFACTURERS - WATER CLOSET SEATS

- A. Church
- B. Kohler
- C. Bemis Mfg. Co.
- D. Olsonite

2.9 ACCEPTABLE MANUFACTURERS - FIXTURE CARRIERS

- A. Zurn Ind.
- B. J.R. Smith
- C. Wade

- D. Josam
- E. Ancon

2.10 ACCEPTABLE MANUFACTURERS - MISCELLANEOUS FITTINGS

- A. Zurn
- B. Wolverine Brass
- C. Brass Craft
- D. Dearborn Brass
- E. McGuire
- F. Promax

2.11 MISCELLANEOUS FITTINGS

- A. Miscellaneous fittings shall include P.O. plugs, basket strainers, lavatory supplies, closet supplies and traps.

2.12 PLUMBING FIXTURES

- A. **ADA COMPLIANT WALL-HUNG WATER CLOSET – HWC-1**
 - 1. ASME A112.19.2; Complete HET system with exposed, sensor activated, Royal Optima True Mechanical Override closet flushometer and vitreous china wall hung fixture. 1.28 GPF, Model # WETS 2450.1320-1.28 ES-S TMO as manufactured by Sloan.
 - 2. Provide 120 VAC/24VAC Transformer. Each transformer shall be capable of handling up to 10 flush valves. See locations shown on drawings.
 - 3. Seat: Solid white plastic, open front, extended back, self-sustaining ring, stainless steel bolts with cover; Model # 1955SSCT manufactured by Bemis.
 - 4. Furnish and install a Zurn Series 1200 Fixture Carrier for wall hung water closet.
- B. **WALL HUNG WATER CLOSET – WC-2**
 - 1. ASME A112.19.2; Complete HET system with exposed, sensor activated, Royal Optima True Mechanical Override closet flushometer and vitreous china wall hung fixture. 1.28 GPF, Model # WETS 2050.1303-1.28 ES-S TMO as manufactured by Sloan.
 - 2. Seat: Solid white plastic, open front, extended back, self-sustaining ring, stainless steel bolts with cover; Model # 1955SSCT manufactured by Bemis.
 - 3. Furnish and install a Zurn Series 1200 Fixture Carrier for wall hung water closet.
- C. **ADA COMPLIANT WALL-HUNG LAVATORY – HL-1**
 - 1. Basin: ASME A112.19.2; Wall hung lavatory shall be made of vitreous china. Lavatory shall have a rear overflow. Lavatory shall be a 4" centerset. Model # SS-3065 w/ optional ceramic shroud as manufactured by Sloan
 - 2. Trim: ASME A112.18.1, Sensor Metering BASYS Hardwired, Deck Mounted IR and Capacitance Faucet with low spout. Advanced Features and Vandal Resistant Integrated Base, 1.5 GPM, Polished Chrome. Model # EFX 600-213-0010 CP as manufactured by Sloan. Furnish and install chrome plated 17 gauge brass P-trap with clean-out plug and arm with escutcheon.
 - 3. Furnish and install a Zurn series 1200 fixture carrier for wall hung lavatories
 - 4. Furnish and install ADA wrap on supplies and traps.

D. WALL-HUNG LAVATORY – L-2

1. Basin: ASME A112.19.2; Wall hung lavatory shall be made of vitreous china. Lavatory shall have a rear overflow. Lavatory shall be a 4" centerset. Model # SS-3065 w/ optional ceramic shroud as manufactured by Sloan
2. Trim: ASME A112.18.1, Sensor Metering BASYS Hardwired, Deck Mounted IR and Capacitance Faucet with low spout. Advanced Features and Vandal Resistant Integrated Base, 1.5 GPM, Polished Chrome. Model # EFX 600-213-0010 CP as manufactured by Sloan. Furnish and install chrome plated 17 gauge brass P-trap with clean-out plug and arm with escutcheon.
3. Furnish and install a Zurn series 1200 fixture carrier for wall hung lavatories

E. SERVICE SINK – SS-1

1. Bowl: 36x24x10" high white molded stone, floor mounted with 1" wide shoulders, stainless steel strainer; Model #MSB-3624 manufactured by Fiat.
2. Trim: ANSI A112.18.1; exposed wall type supply with cross lever handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges; 5 feet of 1/2" diameter plain end reinforced rubber hose, hose clamp, mop hanger; Model #897 manufactured by Chicago.

F. DRINKING FOUNTAIN – DF-1

1. Outdoor Bottle Filling Station, Bi-Level with Pet Station. Non-Filtered Non-Refrigerated. Drinking Fountain shall include 316 Stainless, Laminar Flow, Heavy Duty Vandal Resistant, Pet Fountain. Furnish with Vandal Resistant bubbler, front button activation. Product shall be Floor Mount/Freestanding, for outdoor applications, serving 2 stations. Drinking Fountain shall be lead-free design which is certified to NSF/ANSI 61 & 372 and meets Federal and State low-lead requirements. Basis of Design is Model # 4420BF1UDB as manufactured by Halsey Taylor. Drinking Fountain shall be Blue in color. Install per Manufacturers instructions.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Verify walls and floor finishes are prepared and ready for installation of fixtures.
- C. Verify electric power is available and of correct characteristics.

3.2 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 LEAD-FREE CERTIFICATION

- A. The Mechanical Contractor must certify in writing that all equipment installed on this project is lead-free and will replace such fittings if determined that lead is contained in the equipment.

3.4 PLUMBING CAULKING AND SEALING

- A. Use silicone seal between plumbing fixtures and wall, floor or cabinetry.

- B. Provide a neat concave joint without excess material and/or overlapping. Clear or white

3.5 HANDICAPPED LAVATORY INSULATION

- A. Install shut off valve and supply line PVC pipe protectors and waste trap protectors at each exposed handicap lavatory.

3.6 INSPECTION

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- B. Verify adjacent construction is ready to receive rough-in work of this Section.

3.7 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with screwdriver, stops, reducers and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall carriers and bolts.
- E. Mount fixtures to the following heights above finished floor. All handicapped fixtures shall be mounted to meet ADA Standards. Verify all mounting heights with architectural elevations. Any discrepancies shall be reported to Engineer/Architect before mounting fixture.
- F. Mount handicapped flush valves for water closets below grab bar. See architectural elevations. Verify rough-in requirements with manufacturer's shop drawings, a minimum of 1-1/2" shall be provided from the top of flush valve to the bottom of grab bar.

3.8 INTERFACE WITH OTHER PRODUCTS

- A. Review millwork shop-drawings. Confirm location and size of fixtures and openings before rough in and installation.

3.9 ADJUSTING

- A. Division 01 - Execution and Closeout Requirements: Testing, adjusting and balancing.
- B. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.10 CLEANING

- A. Division 01 - Execution and Closeout Requirements: Final cleaning.
- B. Clean plumbing fixtures and equipment.

3.11 PROTECTION OF INSTALLED CONSTRUCTION

- A. Division 01 - Execution and Closeout Requirements: Protecting installed construction.
- B. Do not permit use of fixtures before final acceptance.

3.12 SCHEDULES

A. Fixture Rough-In:

Fixture	Hot inches	Cold inches	Waste inches	Vent inches
Water Closet (Flush Valve):		1	3 or 4	2
Lavatory:	1/2	1/2	1-1/2	1-1/4
Service Sink:	1/2	1/2	3	1-1/2
Drinking Fountain		1/2		

B. Fixture Mounting Heights:

1. Water Closet:
 - a. Standard: 15 inches to top of bowl rim.
 - b. Accessible: 18 inches to top of seat.
2. Water Closet Flush Valves:
 - a. Standard: 11 inches min. above bowl rim.
3. Lavatory:
 - a. Accessible: 34 inches to top of basin rim.

END OF SECTION

BLANK PAGE

SECTION 23 00 00

HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC) SPECIFICATION INDEX

23 05 00	Plumbing and HVAC Requirements
23 05 29	Hangers, Supports, Safety Rails and Firestopping for Plumbing, HVAC Piping and Equipment
23 05 53	Identification for HVAC, Plumbing Piping and Equipment
23 05 93	Testing, Adjusting, and Balancing for HVAC
23 07 00	HVAC and Plumbing Insulation
23 09 02	Electric/Electronic Controls and Control Equipment Furnace
23 09 15	Carbon Monoxide Sensing
23 23 00	Refrigerant Piping and Insulation
23 31 00	HVAC Ducts and Casings
23 33 00	Air Duct Accessories
23 34 05	HVAC Fans
23 37 00	Air Outlets and Inlets
23 51 00	Chimneys and Stacks
23 54 00	Furnaces
23 55 00	Gas Fuel-Fired Unit Heaters
23 63 13	Air-Cooled Refrigerant Condensers

END OF SECTION

BLANK PAGE

SECTION 23 05 00
PLUMBING AND HVAC REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Basic Mechanical Requirements specifically applicable to Divisions 22 and 23 Sections, in addition to Division 01 - General Requirements.

1.2 SCOPE OF WORK

- A. The Mechanical Contract Installation shall include a complete plumbing installation of outside and inside utilities for the new building. All piping, fixtures and equipment herein specified, mentioned or shown on Drawings, shall be furnished and installed in place, connected up and ready for normal operation except for such items as are specifically mentioned to be furnished by others.
- B. Plumbing installation shall include pipe, fittings, fixtures and specialties specified and necessary for a complete and acceptable system of waste, vent and water supply. This includes sewer lines, connections to water supply and to all fixtures and outlets shown or specified, excavation, backfilling, protection of public, Owner's property. Any minor details not covered or shown but necessary for successful operation shall be furnished without additional cost to Owner by this Contractor.
- C. The Mechanical Contract shall also include furnishing and installing a complete system of warm air heating, ventilating and air conditioning for the new building with:
 - 1. Gas fired furnaces and unit heaters.
 - 2. Exhaust and relief equipment.
 - 3. Ductwork for air delivery systems with required accessories.
 - 4. DX Condenser equipment, piping and accessories.
 - 5. All other related work as called for under Specifications and shown on Drawings.

1.3 WORK INCLUDED

- A. The Mechanical Contract shall include all Work under the listed Sections of the Specifications Index and all related Mechanical Work as shown on the Drawings for the Project.
- B. A complete table of Mechanical Reference Symbols is shown on the Drawings.

1.4 WORK NOT INCLUDED

- A. The following Work is not included as part of the Mechanical Contract.
 - 1. Electrical Contractor shall furnish and install all power wiring, magnetic starters, disconnect switches, etc., except as called for to be included with the equipment and shall make all final connections to the equipment provided by the Mechanical Contractors.
 - 2. Natural Gas Service to building. The Mechanical Contractor shall contact the Gas Utility Company include any applicable Gas Utility Company costs associated with new gas service to the building.

1.5 CODES, FEES AND LATERAL COSTS

- A. The Mechanical Installation shall meet all applicable local, state and federal codes and standards.

- B. All required permits necessary for a complete mechanical installation shall be paid for by this Contractor.
- C. The plumbing Work shall be installed in strict accordance with the Minnesota State Plumbing Code. Any change from the Drawings and Specifications required by the State or City Plumbing Inspector shall be made by this Contractor at no additional cost to the Owner.
- D. Except in those municipalities which provide state-approved electrical inspection, all installation of electrical equipment wiring shall be inspected by the State Board of Electricity. Allowance shall be made in the bid and Contract for the cost of such inspection.
 - 1. Fees for such inspection shall be charged in accordance with the rules and regulations of the State Board of Electricity. Evidence of payment of fees shall be provided by the Contractor with their Application for Payment.
- E. Mechanical Contractor(s) shall be responsible to provide for all State or local inspector tests required by the current codes. Verify with the project inspector the tests, reports and witnessing that is required before construction begins.

1.6 CONTRACT TYPE

- A. The Mechanical addition and remodeling installation to be made under Divisions 22 and 23 is set up for Contract bidding as follows:
 - 1. Combined or Individual Plumbing, Heating, Ventilating and Air Conditioning Contract as sub bids to the General Contractor.
 - 2. See Division 01 for Contract breakdown and bid package requirements.

1.7 REFERENCES

- A. All equipment, piping, etc., shall be new and shall be installed to meet the approval of the following additional ordinances: ASME Rules for Pressure Tanks, National Board of Fire Underwriter's Rules, American WaterWorks and the American Gas Association.

1.8 SUBMITTALS

- A. Submit shop drawings under provisions of Division 01 and/or where noted in specific sections of the Specification.
- B. Proposed Products List: Include information on products specified in the following Sections for Engineer's review, approval and for inclusion in the Owner's Manuals:
 - 1. 23 05 53 Identification for HVAC, Plumbing Piping and Equipment
 - 2. 23 05 93 Testing, Adjusting, and Balancing for HVAC
 - 3. 23 07 00 HVAC and Plumbing Insulation
 - 4. 23 09 02 Electric/Electronic Controls and Control Equipment (Furnace RTU)
 - 5. 23 23 00 Refrigerant Piping and Insulation
 - 6. 23 33 00 Air Duct Accessories
 - 7. 23 34 05 HVAC Fans
 - 8. 23 37 00 Air Outlets and Inlets
 - 9. 23 51 00 Breechings, Chimneys, and Stacks
 - 10. 23 54 00 Furnaces
 - 11. 23 55 00 Gas Fuel-Fired Unit Heaters
 - 12. 23 63 13 Air-Cooled Refrigerant Condensers
- C. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal for each specification section.

- D. Mark dimensions and values in units to match those specified.
- E. Electronic Submittals:
 1. If shop drawings are being submitted electronically they shall be submitted in the same format as described above and shall bear the contractors dated review stamp.
 2. All shop drawings shall include a transmittal cover sheet from the contractor that shall be attached to the same shop drawing file so the Engineer or Construction Manager do not have to electronically merge files. If there are multiple transmittals involved due to construction management or sub-contracting, all of the transmittals shall be attached within the same shop drawing file.
 3. Multiple shop drawings in a book format with one transmittal shall not be acceptable as each specification section requires its own transmittal and review stamp.
- F. **NOTICE:** Before release of the shop drawing is acceptable, the Contractor's stamp, initialed or signed, must be provided certifying their review of the submittal, verification of products, verification of field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work and the Contract Documents. **If shop drawings are not stamped by the Contractor and marked as "Reviewed", "Approved" or "Approved as Noted", they may not be processed by the Engineer. If the Engineer does review them in this instance, the contractor is still responsible for reviewing them and stamping them before release to their supplier.**
- G. It is the contractor's responsibility to provide submittals that are fully-compliant with the requirements of the construction documents. The engineer will review the equipment submittals for compliance with the requirements of the plans and specifications. After the submittals have been reviewed, they will be marked "Approved", "Approved as Noted" or "Rejected – Re-Submit". The engineer will make every effort to identify non-compliant equipment in the submittal process, but the engineer will not be responsible for any costs that may be required to correct non-compliant conditions (up to and including replacement of installed non-compliant equipment with the correct equipment), regardless of the fact that the submittal may be marked "Approved" or "Approved as Noted".

1.9 SYMBOLS AND ABBREVIATIONS

- A. Refer to symbol sheets on drawings. Other symbols are in common usage, but if uncertainty exists regarding any plan symbols or abbreviations, they shall be brought to the attention of the Engineer and he shall clarify same by issuing an addendum or clarification.
- B. Where the phrase starts "Provide.....," "provide" shall be construed to mean the same as "Furnish and install.....".

1.10 APPROVED MANUFACTURERS

- A. Throughout these specifications or addendums, manufactures and materials are listed as approved equal. The approval applies only in so far as they comply with the requirements of the drawings and specification and is subject to final approval with submission of shop drawings.
- B. Any extra costs of any changes in any trade's work, as a result of any substitutions, shall be borne by the CONTRACTOR making the substitutions.

1.11 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. If requested by the Engineer, provide a sketch or drawings showing proposed revisions to make the new work meet with actual Project conditions, including changes to Work specified in other Sections. Obtain permission of Engineer, Owner/Architect before proceeding.

1.12 SEQUENCING AND SCHEDULING

- A. Construct Work in sequence under provisions of Division 01.

1.13 PRE-CONSTRUCTION COORDINATION AND VERIFICATION

- A. This Contractor shall coordinate his Work with other Contractors on this job. Any conflict which cannot be resolved shall be settled by the Architect/Engineer.
- B. Field verification of scale dimensions on Drawings is directed since actual locations, distances and levels shall be governed by actual field conditions.
- C. The Contractors shall check architectural, structural, plumbing, heating, ventilating and electrical drawings to avert possible installation conflicts. Shall drastic changes from original Drawings be necessary to resolve such conflicts this Contractor shall notify the Architect/Engineer and secure written approval and agreement on necessary adjustments before the installation is started.
- D. Discrepancies shown on different Drawings or between Drawings and actual field conditions or between Drawings and Specifications shall promptly be brought to the attention of the Architect/Engineer for a decision. Contractor shall not scale drawings for exact locations of equipment. (Verify final location.) All dimensions shall be taken from Architectural Drawings.
- E. The Contractor shall consider and review the complete set of documents including Architectural, Structural, Mechanical, Electrical, etc., (Drawings and Specifications) as his complete set of documents. He shall be responsible for all mechanical work shown or stated (to be by him), to include this Work in his bid and install such items even though they are not specifically shown or stated on the Mechanical Section of the Drawings and Specifications.

1.14 INTERPRETATIONS OF DOCUMENTS

- A. Contractors shall promptly notify the Engineer of inconsistencies, errors and omissions found in the Drawings and Specifications prior to bid date.
- B. Questions regarding the bidding and requests for interpretation of the Drawings and Specifications shall be submitted to the Engineer in writing in sufficient time to be received prior to the date for receipt of bids.
- C. Interpretation and correction of the Drawings and Specifications shall be made by addendum. Interpretations and corrections made by any other method shall not be binding on the Owner or the Engineer.
- D. The drawings and Specifications are complementary to one another. This defines a relationship such that any item which is called for in one document is to be considered called for in both sets of documents. Where conflicts exist between the Specifications and/or drawings, the more stringent requirement shall apply.

1.15 TEMPORARY HEATING FOR NEW CONSTRUCTION WORK

- A. The various types of air handling equipment and systems **shall not** be used for temporary heating, ventilation or cooling during the construction of this project.
- B. If air handling equipment and systems are operated in deference to the restrictions, the Engineer may request all affected ductwork, equipment and coils be internally cleaned, by the Mechanical Contractor, at no additional cost to the owner or Engineer.
- C. All installed ductwork and air handling equipment openings shall be protected from intrusion of construction dust and dirt using taped or securely fastened plastic protective covers. Leave protection in place until final connections are completed.

1.16 ACCESS DOORS

- A. The Mechanical Contractor shall furnish and install all necessary hinged access doors on finished walls or ceilings to adjust and/or reset the mechanical systems behind these finished surfaces.
- B. The Contractor shall familiarize themselves with the plans, wall, floor and ceiling finish schedules, details and fire ratings.
- C. Provide fire-rated access doors on fire-rated surfaces.

1.17 CUTTING, PATCHING AND FIRESTOPPING

- A. This Mechanical Contractor shall set all sleeves in construction for the mechanical equipment installation. Where cutting is required, it shall be done by this Contractor. All patching left after demolition and left by new cutting shall be done by the Mechanical Contractor. Mechanical Contractor shall provide and install firestopping materials as specified in Divisions 22 and 23 for mechanical penetrations.
- B. All penetrations of masonry wall by piping and round ducts shall be core drilled for neat appearance and minimal patching.
- C. Lintels:
 - 1. The installation of support lintels masonry walls, brick faces or stone faces (where the openings are cut by the Mechanical Contractor) shall be the responsibility of the Mechanical Contractor unless specifically noted or detailed otherwise on the Architectural or Structural drawings.

1.18 ELECTRICAL

- A. Electrical Contractor shall furnish all motor starters and motor controls and provide all wiring for motor control operation, except if specified otherwise.

1.19 ADDITIONAL ELECTRICAL AND AUTOMATIC TEMPERATURE CONTROLS COSTS

- A. If the Mechanical Contractor substitutes equipment that was approved equal for bidding instead of the scheduled units, the Mechanical Contractor shall be responsible for any additional electrical A.T.C. installation costs for this substitution regardless of whether the other equipment was listed as equal in the Specification or was listed as an approved equal after the Project was in the bidding process.

1.20 GUARANTEE / WARRANTY

- A. The Contractor shall be responsible for the proper installation and working of everything in their portion of the project and shall guarantee to remedy free of charge any defects in

workmanship and materials that may appear to give or gives rise to trouble of any kind for a period of one year from the date of Substantial Completion of the work (unless noted otherwise as a longer warranty period in an individual specification section).

1.21 OWNER'S MANUALS AND OPERATING INSTRUCTIONS

- A. Under this Contract the Mechanical Contractor shall furnish the Owner with two 3-ring binders of all pertinent systems information and related documents. Submit these manuals to the Engineer for his review. The Engineer shall then return the books to the Contractor for distribution to the Owner. The books shall contain the following items:
 - 1. Shop drawings on all major equipment, complete with Engineer's approval stamp.
 - 2. Operating Instructions for all major equipment.
 - 3. Boiler second start-up during heating season with follow-up reports and a list of personnel that was present.
 - 4. Packaged Condensing Unit start-up reports.
 - 5. Document Condensing Unit training method, date of training and list of personnel that was present.
 - 6. Submit certification reports to Engineer showing that all required testing for the project, including water piping, sewer/vent piping, natural gas piping and storm piping.
 - 7. Water heater start-up report and combustion test report.
 - 8. Maintenance instructions for all major equipment.
 - 9. Wiring diagrams for all equipment.
 - 10. Final Test and Balance Report.
- B. Using the Owner's manuals, the Mechanical Contractor shall instruct the Owner/Owner's Representative on the proper operation of all equipment installed as part of this Contract. These instructions shall include, but not be limited to preventative maintenance, safety instructions and normal operating procedures.
- C. After the Owner has been instructed, the Contractor shall submit a letter to the Mechanical Engineer documenting that the information was given to the Owner and that he has signed off on this part of the Contract.

1.22 EQUIPMENT START-UP AND TRAINING

- A. The Mechanical Contractor shall be responsible for providing both a heating season start-up and cooling season start-up of heating, cooling, humidification, BAS and dehumidification equipment including:
 - 1. Training the Owner in all methods needed for winterization of equipment, coils, drain down, etc.
 - 2. Training the Owner regarding lubrication of all components and establishing a preventative maintenance schedule.
 - 3. Training the Owner in proper operation and maintenance of all seasonal equipment, again using the O & M manuals.
 - 4. Observing and establishing a recommended filter changing schedule or establishing a static pressure point for change based on pressure differential measuring.

1.23 EQUIPEMENT ACCESS

- A. The installing Contractor shall be responsible for determining means and methods for gaining access to building spaces for the purpose of installing new equipment. The plans may or may not include information related to equipment access. In the process of installing new equipment.

- B. The installing Contractor shall coordinate adequate space for maintenance personnel to work on the installed equipment regardless of location. This is a critical issue that needs to be discussed and coordinated early in the Contractor coordination meetings.

PART 2 PRODUCTS

\\Not Used

PART 3 EXECUTION

\\Not Used

END OF SECTION

BLANK PAGE

SECTION 23 05 29

HANGERS, SUPPORTS, SAFETY RAILS AND FIRESTOPPING FOR PLUMBING, HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe hangers and supports.
 - 2. Hanger rods.
 - 3. Flashing.
 - 4. Equipment curbs.
 - 5. Sleeves.
 - 6. Formed steel channel. (Unitstrut)
 - 7. Exterior pipe support.
 - 8. Firestopping.
 - 9. Firestopping accessories.
 - 10. Equipment bases and supports.
 - 11. Housekeeping pads.

- B. Related Sections:
 - 1. Section 22 11 00 – Water Distribution and Specialties: Execution requirements for placement of hangers, supports.
 - 2. Section 22 11 23 - Facility Natural Gas Piping: Execution requirements for placement of hangers, supports specified by this section.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B31.5 - Refrigeration Piping.
 - 2. ASME B31.9 - Building Services Piping.

- B. ASTM International:
 - 1. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
 - 2. ASTM E119 - Method for Fire Tests of Building Construction and Materials.
 - 3. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
 - 4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

- C. American Welding Society:
 - 1. AWS D1.1 – Structural Welding Code – Steel.

- D. FM Global:
 - 1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.

- E. Manufacturers Standardization Society of the Valve and Fittings Industry:
 - 1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
 - 2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
 - 3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

- F. Underwriters Laboratories Inc.:
 - 1. UL 263 - Fire Tests of Building Construction and Materials.
 - 2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
 - 3. UL 1479 - Fire Tests of Through-Penetration Firestops.
 - 3. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
 - 4. UL - Fire Resistance Directory.

1.3 DEFINITIONS

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 SYSTEM DESCRIPTION

- A. Firestopping Materials: ASTM E119, ASTM E814, UL 263 and UL 1479 to achieve fire ratings as noted on Drawings for adjacent construction, but not less than 1 hour fire rating.
- B. Firestopping Materials: ASTM E119, ASTM E814, UL 263 and UL 1479 to achieve fire ratings of adjacent construction in accordance with FM and UL Design Numbers.
- C. Surface Burning: ASTM E84 and UL 723 with maximum flame spread / smoke developed rating of 25/450.
- D. Firestop interruptions to fire rated assemblies, materials and components.

1.5 PERFORMANCE REQUIREMENTS

- A. Firestopping: Conform to FM and UL for fire resistance ratings and surface burning characteristics.
- B. Firestopping: Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

1.6 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate pipe hanger types and sizes.
- C. Product Data:
 - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
 - 2. Firestopping: Submit data on product characteristics, performance and limitation criteria.
- D. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
- E. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers. Indicate calculations used to determine load carrying capacity of trapeze, multiple pipe, and riser support hangers.

- F. Manufacturer's Installation Instructions:
 - 1. Hangers and Supports: Submit special procedures and assembly of components.
 - 2. Firestopping: Submit preparation and installation instructions.
- G. Engineering Judgments: For conditions not covered by FM or UL listed designs, submit judgments by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.

1.7 QUALITY ASSURANCE

- A. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10 inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
 - 1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.
- B. Through Penetration Firestopping of Non-Fire Rated Assemblies: Materials to resist free passage of flame and products of combustion.
 - 1. Noncombustible Penetrating Items: Noncombustible materials for penetrating connecting maximum of three stories.
 - 2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.
- C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.
- D. Surface Burning Characteristics: 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Division 01 - Product Requirements: Requirements for transporting, handling, storing and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60°F.
- C. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.
- D. Provide ventilation in areas to receive solvent cured materials.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.11 WARRANTY

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for pipe hangers and supports.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURERS - PIPE HANGERS AND SUPPORTS

- A. Hangers - B-Line
- B. Riser Clamps - B-Line
- C. Expansion Anchors - Hilti
- D. Power Driven Fasteners - Hilti
- E. Anvil International (Hangers and Clamps)
- F. Tolco/Nibco
- G. Pipe Hangers and Devices "P.H. & D."

2.2 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch split ring or clevis of malleable iron with adjustable swivel.
- B. Hangers for Pipe Sizes 2 to 4 Inches carbon steel, adjustable, clevis.
- C. Wall Support for Pipe Sizes to 3 Inches: Clevis hanger.
- D. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- E. Shield for Insulated Piping 2 Inches and Smaller: 18 gauge galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.
- F. Shields for Insulated Piping 2-1/2 Inches and Larger: Hard block non-conducting saddles in 90 degree segments, 12 inch minimum length, block thickness same as insulation thickness.
- G. All cold water plumbing water piping shall have hangers sized to accommodate pipe insulation so the pipe does not come in contact with the hanger.

2.3 HANGER RODS

- A. Steel Hanger Rods: Threaded both ends, threaded one end or continuous threaded.

2.4 FLASHING

- A. Flexible Flashing: Compatible with roofing.
- B. Caps: Steel, 22 gauge minimum; 16 gauge at fire resistant elements.

2.5 EQUIPMENT CURBS

- A. Mechanical Contractor shall provide curbs for equipment. Refer to Plan Sheets for details and scheduling of any curbs that may be provided with the equipment served.

2.6 HOUSEKEEPING PADS

- A. Provide 3-1/2" tall concrete housekeeping pad under equipment in mechanical rooms.
- B. Refer to PART 3 schedule and plan details.

2.7 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 20 gauge galvanized steel or Schedule 40 PVC.
- B. Sleeves for Pipes Through Walls and Potentially Wet Floors: Form with steel pipe or 20 gauge galvanized steel or Schedule 40 PVC.
- C. Sleeves for Round Ductwork: Form with galvanized steel.
- D. Sleeves for Rectangular Ductwork: Form with galvanized steel or wood. (Remove wood blocking after concrete has set.)
- E. Stuffing Insulation: Glass fiber type, non-combustible.
- F. Caulk: Silicone sealant of quality specified in Division 07.
- G. Pre-fabricated wall sleeves by Thunderline or equal.
- H. Wall and floor seals by Pyropal or equal are an acceptable option.

2.8 FABRICATION

- A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping through sleeve.
- B. Design hangers with disengagement of supported pipe.
- C. Provide copper plated hangers and supports for copper hot water piping.

2.9 EXTERIOR PIPE SUPPORT

- A. Manufacturer
 1. PHP Systems Design
 2. Erico
 3. MIPO Industries
- B. Base:
 1. PHP Systems Design with a 18"x18"x3" or 18" round x 3" base weighing 7 or 10.5 pounds. Injection molded HDPE with UV inhibitors and antioxidants.

2. Erico Pyramid "Caddy" with 8"x19"x 4" high base weighing 5 pounds. Injection molded HDPE with UV inhibitors.
 3. MIRO Industries with 16"x18"x3" high base made with polycarbonate.
- C. Framing: 1-5/8" or 1-7/8" 12 gauge struts as required by load and as recommended by manufacturer. Struts are roll-formed, three-sided tubular shape with 9-1/16" holes at 1-7/8" centers on all three sides.
- D. Finish: Hot dipped G90 galvanized.
- E. Hardware: Hot dipped galvanized.

2.10 FIRESTOPPING

- A. Manufacturers:
1. Dow Corning Corp.
 2. Fire Trak Corp.
 3. Hilti Corp.
 4. International Protective Coating Corp.
 5. 3M fire Protection Products.
 6. Specified Technology, Inc.
 7. Metacaulk.
- B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
1. Silicone Firestopping Elastomeric Firestopping: Single or multiple component silicone elastomeric compound and compatible silicone sealant.
 2. Foam Firestopping Compounds: Single or multiple component foam compound.
 3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
 4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
 5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
 6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
 7. Firestop Pillows: Formed mineral fiber pillows.

2.11 FIRESTOPPING ACCESSORIES

- A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.
- B. Dam Material: Permanent:
1. Mineral fiberboard.
 2. Sheet metal.
 3. Alumina silicate fire board.
- C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams and other devices required to position and retain materials in place.
- D. General:
1. Furnish UL listed products.
 2. Select products with rating not less than rating of wall or floor being penetrated.

- E. Non-Rated Surfaces:
 1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.
 2. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop type wall sleeve.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Division 01 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.
- C. Verify openings are ready to receive firestopping.

3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.
- C. Install backing or damming materials to arrest liquid material leakage.
- D. Obtain permission from Architect/Engineer before using power-actuated anchors.
- E. Obtain permission from Architect/Engineer before drilling or cutting structural members.

3.3 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as follows:

MAXIMUM HANGER SPACING FEET

<u>PIPE SIZE</u>	<u>STEEL</u>	<u>COPPER</u>	<u>HANGER DIAMETER</u>
1/2" to 3/4"	6	5	3/8"
1" - 1-1/2"	6	6	3/8"
2"	7	7	3/8"
2-1/2"	10	8	1/2"
3"	10	10	1/2"

MAXIMUM HANGER SPACING FEET

HANGER DIAMETER

PVC (ALL SIZES)	2'-8"	3/8"
2" – 8" CAST IRON	5'-0" AND AT JOINTS	5/8"

1. If local Code is more stringent, install per local Code requirements.
- B. Install hangers to provide minimum 1/2 inch space between finished insulation covering and adjacent work.
 - C. Place a hanger within 12 inches of each horizontal elbow.

- D. Use hangers with 1-1/2 inch minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each joint, with 5 feet maximum spacing between hangers.
- F. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- G. Support riser piping independently of connected horizontal piping.

3.4 HOUSEKEEPING BASES

- A. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
- B. Construct support of steel members. Brace and fasten with flanges bolted to structure.
- C. Provide rigid anchors for pipes after vibration isolation components are installed.
- D. Mechanical Contractor shall install concrete housekeeping pad under the following equipment in Mechanical Rooms
 1. Water heater systems.
 2. Water softener systems.
 3. Furnace unit.
 4. Compressor/Condenser unit slab on grade.
- E. Pads shall project minimum of 3-1/2" above floor or grade.
- F. Properly anchor all equipment to equipment bases and supports (i.e. floor slab).

3.5 FLASHING

- A. Provide flexible flashing and metal counter-flashing where piping and ductwork penetrate weather or waterproofed walls, floors and roofs.
- B. Flash vent and soil pipes projecting 8 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash and seal.

3.6 SLEEVES

- A. Set sleeves in position in form work. Provide re-enforcing around sleeves.
- B. Extend sleeves through floors one inch above finished floor level. Caulk sleeves full depth and provide floor plate.
- C. Where piping or ductwork penetrates floor, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk seal air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- D. Install chrome plated steel escutcheons at finished surfaces. Use plastic escutcheons in damp areas of toilet/showers.

3.7 HANGER AND SUPPORT PAINTING

- A. None.

3.8 EXTERIOR PIPE SUPPORTS

- A. Install per manufacturer's instructions based on material weights, sizes and wind exposure.
- B. Verify spacing requirements with manufacturer.

3.9 INSTALLATION – FIRESTOPPING

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, and other items, requiring firestopping.
- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply firestopping material in sufficient thickness with uniform density and texture to achieve required fire and smoke rating.
- D. Compress fibered material to maximum 40 percent of its uncompressed size.
- E. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.
- F. Place intumescent coating in sufficient coats to achieve rating required.
- G. Fire Rated Surface:
 - 1. Seal opening at floor, wall, partition, ceiling as follows:
 - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
 - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
 - c. Pack void with backing material.
 - d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
 - 2. Where conduit or wire-way penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.
- H. Non-Rated Surfaces:
 - 1. Seal opening through non-fire rated wall, partition, ceiling, as follows:
 - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
 - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
 - c. Install type of firestopping material recommended by manufacturer.

3.10 DUCT HANGERS AND SUPPORTS

- A. Refer to SMACNA standards for recognized methods of support, hanger strength and spacing.

3.11 FIELD QUALITY CONTROL

- A. Division 01 - Quality Requirements and Execution and Closeout Requirements: Field inspecting, testing, adjusting and balancing.
- B. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.12 CLEANING

- A. Division 01 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean adjacent surfaces of firestopping materials.

3.13 PROTECTION OF FINISHED WORK

- A. Division 01 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect adjacent surfaces from damage by material installation.

3.14 PROTECTION OF FINISHED WORK

- A. Division 01 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 23 05 53
IDENTIFICATION FOR HVAC, PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Nameplates.
 - 2. Pipe markers.
 - 3. Labels.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit manufacturers catalog literature for each product required.
- C. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification and valve chart and schedule, including valve tag number, location, function and valve manufacturer's name and model number.
- D. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures and installation.

1.4 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

1.5 QUALITY ASSURANCE

- A. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Manufacturers:
 - 1. Craftmark Identification Systems.
 - 2. Safety Sign Co.
 - 3. Seton Identification Products.
 - 4. Brady Markers.
 - 5. Marking Services, Inc. (MSI)
 - 6. EMED, Inc.
 - 7. Brimar Industries
 - 8. Mifab

2.2 TAGS

- A. Metal Tags:
 - 1. Brass with stamped letters; tag size minimum 1-1/2 inches diameter with finished edges.

2.3 PIPE MARKERS

- A. Color and Lettering: Conform to ASME A13.1.
- B. Plastic Tape Pipe Markers:
 - 1. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Wrap arrows on-a-roll pressure sensitive tape completely around the pipe label overlapping itself and the end of the pipe marker by 1/2 inch.

2.4 EQUIPMENT NAMEPLATES

- A. Indoor type description: Engraved phenolic, size 4.0 inch wide x 1-1/2 inch tall, adhesive backed with 3/4" high printed identification. Yellow label with black lettering.
- B. Outdoor type description: 0.020" thick aluminum, size 4.0 inch wide x 1-1/2 inch tall with two mounting holes.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Equipment Nameplates: Install with corrosive-resistant mechanical fasteners, or adhesive.
 - 1. Install outdoor equipment tags on north or shadiest side of equipment to minimize damage from sun exposure.
- B. Tags: Install stamped type with corrosive-resistant chain.
- C. Pipe Markers: Install in accordance with manufacturer's instructions.
- D. Equipment: Identify compressor-condenser units, vent sets, PRV's, and water treatment devices with nameplates if equipment is inside and aluminum nameplates for exterior equipment.
- E. Valves: Identify valves in main and branch piping with tags indicating a valve number and fluid type being circulated.
- F. Piping: Identify piping, concealed or exposed, with pipe markers.

3.2 DUCT MARKING

- A. Identify all ductwork in Mechanical Rooms. Marking shall be a minimum of 2" letters and indicate the direction of airflow and type of duct, i.e. supply, return, relief, etc. and shall be clearly visible from the floor.

3.3 PIPE MARKING

- A. Identify piping, concealed above ceilings with pipe markers or color coded banding. Identify service, flow direction and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and

drops, adjacent to each valve, at each side of penetration of structure or enclosure and at each obstruction.

1. Provide a marker every ten feet of piping in Mechanical Rooms and at all equipment connections.
2. In all other locations deemed necessary by the Architect/Engineer for ease of maintenance.

B. All exposed piping both covered and uncovered shall be designated by color code in accordance with the following:

1. Coding shall be accomplished by self-adhesive pipe markers running parallel to pipe axis. Similar to Seaton "Opti-Code" pipe markers 8" long with 3/4" high letters up to 2-3/8" OD and 12" long with 1-1/4" high letters up to 7-7/8" OD. (8" long color field)
2. **At each end of the marker**, directional flow arrows shall completely encircle the pipe/or pipe covering. Banding shall be similar to Seaton arrows on-a-roll tape, two inch wide band. Overlap marker and arrow tape.
3. As part of each color band, the function of the particular pipe and an arrow denoting the direction of flow shall be included in each band.

C. The standard piping color code is as follows:

<u>Color</u>	<u>Opti-Code No.</u>	<u>Legend Function</u>
Green/White	M4208	Domestic Cold Water
Green/White	M4208	Hard Domestic Cold Water
Yellow/Black	M4267	Domestic Hot Water
Yellow/Black	M8146	Dom. Hot Wtr Return (Recirc.)
Yellow/Black	M4159	Natural Gas Piping
Yellow/Black	M4160	Gas Regulator Vent Piping

or other markers from ANSI/OSHA standard list.

END OF SECTION

BLANK PAGE

SECTION 23 05 93
TESTING, ADJUSTING AND BALANCING

PART I GENERAL

- A. The Mechanical Contractor shall put all equipment installed into satisfactory operation. The Mechanical Contractor shall operate the various fans, registers, controls, ventilation equipment and shall do all adjusting required to deliver the air specified and shown on the plans.
- B. The Mechanical Contractor shall be responsible that the entire furnace system performs with the least possible noise and vibration and shall take all necessary precautions during the installation to insure this. Submit balancing schedule showing all final settings to Engineer for approval. Final payments will not be approved until balancing is complete.
- C. The Mechanical Contractor shall be responsible that the entire air handling system performs with the least possible noise and vibration and shall take all necessary precautions during the installation to insure this. Submit balancing schedule showing all final settings to Engineer for approval. Final payments will not be approved until balancing is complete.

PART 2 COMPUTER SYSTEM

\\NOT USED

PART 3 EXECUTION

3.1 IMPORTANCE AND PAYMENTS

- A. The entire HVAC portion of this project shall not be considered substantially complete until the balancing is acceptable to the Engineer. Total mechanical payment for HVAC portion of the project beyond 90 percent will not be approved until such balancing and commissioning is acceptable to the Engineer.

END OF SECTION 230593

BLANK PAGE

SECTION 23 07 00
HVAC AND PLUMBING INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Piping system insulation.
 2. Piping insulation jackets.
 3. Insulation accessories including vapor retarders and accessories.
 4. Ductwork insulation.
 5. Ductwork insulation jackets.
 6. Duct Liner.
- B. Related Sections:
1. Section 23 05 29 - Hangers and Supports and Firestopping for Piping and Equipment: Product and Execution requirements for inserts at hanger locations.
 2. Section 23 05 53 - Identification for Piping and Equipment: Product requirements for piping and equipment identification.

1.2 REFERENCES

- A. ASTM International:
1. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 2. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 3. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
 4. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
 5. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
 6. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
 7. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.
 8. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 9. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 10. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
 11. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
 12. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
 13. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
 14. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 15. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
 16. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.
- B. Sheet Metal and Air Conditioning Contractors':
1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.
- C. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.

1.4 QUALITY ASSURANCE

- A. Test pipe, duct and equipment insulation for maximum flame spread index of 25 and maximum smoke developed index not exceeding 50 within plenum in accordance with ASTM E84.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Division 01 - Product Requirements: Requirements for transporting, handling, storage and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 - Product Requirements: Environmental conditions affecting products on site.
- B. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
- C. Maintain temperature during and after installation for minimum period of 24 hours.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.8 WARRANTY

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS (PIPE INSULATION)

- A. Owens Corning Fiberglass
- B. Certainteed
- C. Johns-Manville
- D. Knauf, Inc.

- E. Rubatex
- F. Armoflex
- G. Imcoshield/Imcolock
- H. Therma-Cel

2.2 INSULATION (PIPE INSULATION)

- A. Type A: Glass fiber insulation; ANSI/ASTM C547; 'k' value of 0.24 at 75°F noncombustible. ASTM C-335.
- B. Type D: Cellular Foam Insulation: Standard of design is Armaflex Model #AP ASTM C518 and C534; flexible, cellular elastomeric, molded or sheet.
 - 1. 'K' ('ksi') value: ASTM C177 or C518; 0.28 at 75°F.
 - 2. Minimum service temperature: -40°F.
 - 3. Maximum service temperature: 220°F.
 - 4. Maximum moisture absorption: ASTM D1056; 1.0 by volume. Pipe or sheet.
 - 5. Moisture vapor transmission: ASTM E96; 0.17 perm inches.
 - 6. Connection: Waterproof vapor barrier adhesive.

2.3 JACKETS (PIPE INSULATION)

- A. Vapor Barrier Jacket "ASJ"
 - 1. ASTM C921, ASJ white kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
 - 2. Vapor barrier for polyisocyanurate foam is 4 mil saran vapor barrier film with saran tape at the joints and fittings.
 - 3. Moisture Vapor Transmission: ASTM E96; 0.02 perm inches.
- B. Indoor, Exposed or Concealed Applications: Insulated pipes conveying fluids above ambient temperature shall have standard ASJ type jacket stapled on six inch centers. Cover fittings, joints and valves.
- C. Indoor, Exposed or Concealed Applications: Insulated cold pipes conveying fluids below ambient temperature shall have vapor barrier jackets, ASJ or saran type with positive sealing system. Cover all That fittings, joints, and valves.
- F. Where jacketing is near a hot surface, use white aluminum covering for the last six inches of covering.
- G. PVC Plastic
 - 1. Jacket: ASTM C921, one piece molded type fitting covers and sheet material, off white color.
 - a. Minimum Service Temperature: -40°F.
 - b. Maximum Service Temperature: 150°F.
 - c. Moisture Vapor Transmission: ASTM E96; 0.002 perm inches.
 - d. Maximum Flame Spread: ASTM E84; 25.
 - e. Maximum Smoke Developed: ASTM E84; 50.
 - f. Thickness: 20 mil.
 - g. Connections: Brush on welding adhesive or pressure sensitive color matching vinyl tape.

2.4 ACCESSORIES (PIPE INSULATION)

- A. Adhesives: Compatible with insulation.

- B. Insulation Bands: 3/4 inch wide; 0.015 inch thick galvanized steel or 0.007 inch thick aluminum.
- C. PVC Covers: Zestone, Foster, Speedline or equal 0.020 inch thick pre-formed covers for fittings, valves and joints.

2.5 ACCEPTABLE MANUFACTURERS - (DUCT INSULATION)

- A. Owens Corning
- B. Certainteed
- C. Johns Manville
- D. Knauf
- E. CSG

2.6 MATERIALS (DUCT INSULATION)

- A. Type B: Rigid glass fiber; ANSI/ASTM C612, Class 1; 'k' value of 0.24 per inch at 75°F; 3.0 lb/cu ft minimum density, 0.002 inch foil scrim or FSK facing for air conditioning, heating and venting ducts.
- B. Type C: Flexible glass fiber; ANSI/ASTM C612; commercial grade; 'k' value of 0.29 per inch at 75°F, 0.75 lb/cu ft minimum density, 0.002 inch foil scrim or FSK facing for air conditioning, heating and venting ducts.
- C. Type D: Flexible glass fiber; ANSI/ASTM C612, Class 1; 'k' value of 0.29 per inch at 75°F, 0.75 lb/cu.ft. Minimum density, 0.002 metalized fiberglass scrim provided in five foot slide-over sleeve length.
- D. Type E: AP Armaflex sheet or AP Coilflex Duct Liner: Flexible elastomeric thermal insulation board, 'k' value of 0.25 per inch at 75°F, 3.0 lb/cu.ft. density, with anti-microbial coating, manufactured without use of CFCs, HFCs or HCFCs and suitable for mechanical fasteners or for gluing only with Armaflex 520 adhesive. Support LEED, IECC and ASHRAE 90.1 with R-4.2 at 1" thick, R-6 at 1.5" thick and R-8 at 2" thick.
- E. Adhesives: Waterproof fire-retardant type.
- F. Mechanical Fasteners: Pin-type with welded connection to duct side wall. Do not use nail-type fasteners or glue type connections.
- G. Vapor Barrier Jacket
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, 0.0032 inch ASJ jacket.
 - 2. Moisture vapor transmission: ASTM #96; 0.04 perm.
 - 3. Secure with pressure sensitive tape.

2.7 ADHESIVE FOR DUCT INSULATION

- A. Water Base Type
 - 1. Cain – Hydrotak
 - 2. Duro Dyne – WSA
 - 3. Hardcast - IA-901
 - 4. Kingco - 10-568
 - 5. Miracle - PF-101
 - 6. Mon-Eco - 22-67
 - 7. Techno Adhesive – 133

8. United McGill - Unitack
- B. Solvent Base (Non-Flammable)
 1. Cain - Safetak
 2. Duro Dyne - FPG
 3. Hardcast - Glas-Grip 648-NFSE
 4. Kingco - 15-137
 5. Miracle - PF-91
 6. Mon-Eco - 22-24
 7. Techno Adhesive - 'Non-Flam' 106

2.8 FASTENERS FOR DUCT INSULATION

- A. Adhesively secured fasteners not allowed.
- B. Approved Manufacturers
 1. AGM Industries, Inc - "DynaPoint" Series DD-9 pin
 2. Cain
 3. Duro Dyne
 4. Omark dished head "Insul-Pins"
- C. Grip nails may be used if each nail is installed by "Grip Nail Air Hammer" or by Automatic Fastener Equipment" in accordance with Manufacturer's recommendations.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Division 01 - Administration Requirements: Coordination and project conditions.
- B. Verify that piping has been tested before applying insulation materials.
- C. Verify that surfaces are clean, foreign material removed and dry.

3.2 INSTALLATION (PIPE INSULATION)

- A. Install materials in accordance with manufacturer's instructions and as required to meet or exceed the Model Energy Code minimum values.
- B. Insulated pipe supported on trapeze type supports shall have a sheet metal saddle installed between the insulation jacket and support (see Specification Section 23 0529). Notching of pipe insulation around the support member is not acceptable.
- C. Continue insulation with vapor barrier through penetrations, i.e. through wall sleeves.
- D. In exposed piping, locate insulation and cover seams in least visible locations.
- E. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints. For insulation with self-sealing adhesive tab, install insulation such that the vapor barrier seal tab folds down towards the bottom of the pipe.
- F. For insulated pipes conveying fluids above ambient temperature:
 1. Provide standard jackets, with or without vapor barrier.
 2. For hot piping conveying fluids 140°F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation. (Domestic water)
 3. For hot piping conveying fluids over 140°F insulate flanges and unions at equipment but bevel and seal ends of insulation at such locations. (Steam piping)

- and Hydronic Piping)
4. Piping: Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe and finish with ASJ or PVC jacket as follows in this Part 3.
- G. Insulated cold pipes conveying fluids below ambient temperature. (Domestic cold)
1. Provide vapor barrier jackets with the factory applied positive sealing system at seams. (Also seal all joints.)
 2. Continue insulation through walls, sleeves, pipe hangers and other pipe penetrations.
 3. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies and expansion joints.
 4. Piping: Insulate fittings, joints and valves with insulation of like material and thickness as adjacent pipe finish with ASJ or PVC jacket as follows in this Part 3.
- H. Provide an insert, not less than 6 inches long, of same thickness and contour as adjoining insulation, between support shield and piping, but under the finish jacket, on piping 2 inches diameter or larger, to prevent insulation from sagging at support points. Inserts shall be cork or other heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used.
- I. Neatly finish insulation at supports, protrusions and interruptions.
- J. Pipe covering shall be started at the piece of equipment. All piping and valves serving each item of equipment including all branch arms shall be insulated. The last few feet of piping may not be left uninsulated.
- K. For pipe exposed in finish spaces finish with PVC jacket and fitting covers.
- L. For pipe exposed in mechanical equipment rooms finish with PVC jacket and fitting covers.

3.3 TOLERANCE

- A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated. Substituted materials must be submitted for Engineer's approval prior to installation.

3.4 SCHEDULE

<u>PIPING</u>	<u>TYPE</u>	<u>PIPE SIZE</u>	<u>INSULATION THICKNESS</u>
Domestic Cold Water	A/D	Up to 3/4"	1/2"
Domestic Cold Water	A/D	1" and Over	1"
Domestic Hot Water	A/D	Up to 1-1/4"	1"
Domestic Hot Water	A/D	1-1/2" and Over	1-1/2"
Circulating Hot Water (Insulate same as domestic hot water)			
Rain Water, A.F.F., Vertical Piping	A	All	1"
Rain Water, A.F.F., Horizontal Piping	A	All	1"
Roof Drain Sump Bowls	A	All	1"

3.5 PAINTING (PIPE INSULATION)

- A. None.

3.6 EXPOSED TOILET PIPING INSULATION

- A. All exposed hot water, cold water, drain, in the toilet areas shall be insulated and covered with PVC jacket from floor, wall or ceiling to connected equipment.

3.7 PREPARATION (DUCT INSULATION)

- A. Install external materials after ductwork has been tested or and approved.
- B. Insulated ductwork conveying air conditioning, room air or air below ambient temperature:
 - 1. Provide insulation with vapor barrier jackets.
 - 2. Finish with tape and vapor barrier jacket.
 - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- C. Insulated ductwork conveying heating air or air above ambient temperature:
 - 1. Provide with or without standard vapor barrier jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- D. For exterior applications, provide insulation with vapor barrier jacket. Cover with caulked aluminum jacket with seams located on bottom side of horizontal duct section.
- E. External Insulation (Type B or Type C) Application:
 - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 - 2. Secure insulation without vapor barrier with staples, tape, or wires.
 - 3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
 - 4. Seal all insulation butt joints and insulation terminations at diffusers, registers, branch ducts and main duct connections with tape such that no insulation is left exposed to ambient air.
- F. External Insulation (Type D) Application:
 - 1. Secure insulation with vapor barrier sleeve using vapor barrier adhesive tape.
 - 2. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping or vapor barrier.
 - 3. Slide sleeve over round branch ducts in five foot lengths.
 - 4. Seal all insulation butt joints and insulation terminations at diffusers, registers, branch ducts and main duct connections with tape such that no insulation is left exposed to ambient air.
- G. Ductwork dimensions indicated on Drawings are actual metal dimensions. Increasing duct dimensions for duct liner insulation thickness is not necessary. Round dimensions are the clear inside diameter after insulation.

3.8 TOLERANCE (DUCT INSULATION)

- A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.9 FAN POWER SYSTEMS (DUCT INSULATION)

- A. All fan powered supply air system such as furnaces, unit shall have Type E liner for a minimum of the first fifteen feet of supply and return duct (or more as shown on the plan sheets).
- B. After the minimum fifteen feet (or more as shown) of Type-E lined duct from the fan discharge, externally wrapped duct insulation and vapor barrier jacket shall be used.

3.10 FLEXIBLE CONNECTORS (DUCT INSULATION)

- A. Provide 1" fiberglass insulation and vapor barrier jacket over entire connector to a point 12" downstream of connector.

3.11 DUCT INSULATION SCHEDULE

<u>DUCTWORK</u>	<u>TYPE</u>	<u>INSULATION THICKNESSFINISH</u>	
Internal Acoustic Lining	E	1"	None
Internal Lining in Supply Ducts (Where noted)	E	1"	None
Internal Lining in Return Ducts (Where noted)	E	1"	None
Internal Lining in Return Air Transfer	E	1"	None
Exhaust/Relief Ducts (where exposed to view In finished spaces)	E	1"	None
Unlined Exh/Relief within 10' of Exterior Opening (Refer to notes below about R-8 requirements)	B	1-1/2"	Vapor Barrier
Round Metal Supply Ducts	C	1-1/2"	Vapor Barrier
Round Metal Supply Ducts	D	1-1/4"	Vapor Barrier
Outside Air Intake & Relief Ducts	B / C	1-1/2"	Vapor Barrier
Combustion Air	B / C	1-1/2"	Vapor Barrier
Rectangular Supply Ducts (Where duct is unlined)	B / C	1-1/2"	Vapor Barrier
Flexible Connectors at Supply Air Ductwork	B / C	1-1/2"	Vapor Barrier

- Notes:
1. On the Plans where ductwork is noted as "10/10L", the "L" designates duct liner.
 2. On the Plans where ductwork is noted as ___ "Ø I.D.", "the I.D." designates the duct as double wall insulated duct. External insulation is not required.
 3. Supply air ductwork downstream of VAV box shall have 1" Type E liner for a minimum of five feet or more as shown on plans.
 4. All external wrap insulation exposed from floor to 8' above finish floor shall be rigid Type-B insulation with vapor barrier jacket.
 5. Return Air Plenum Ceilings - Refer to Plan Details for further information on external wrap of interior ductwork.
 6. Insulation thickness shall be verified for all ductwork that is installed in attics, garages and ventilated crawl spaces such that a R-8 value is maintained and a vapor barrier jacket is included.

3.12 LOCAL CODES - INSULATION THICKNESS

- A. Where local codes are more stringent than the material thickness specified above, Contractor shall increase insulation thickness to comply with applicable Codes. **Do not** increase duct liner thickness without consulting the Engineer.

END OF SECTION

SECTION 23 09 02
ELECTRIC/ELECTRONIC CONTROLS AND CONTROL EQUIPMENT FURNACE

PART 1 GENERAL

1.1 SECTIONS INCLUDED

- A. Electric/Electronic Automatic Temperature Controls for Furnaces.

1.2 RELATED SECTIONS

- A. Section 26 05 03 - Equipment Wiring Systems: Electrical supply to units.

1.3 REFERENCES

- A. ASHRAE 85 - Automatic Control Terminology for Heating, Ventilating, Air Conditioning.
- B. AMCA 500 - Test Methods for Louvers, Dampers and Shutters.
- C. ANSI/NEMA 250 - Enclosure for Electrical Equipment (1000 Volts Maximum).
- D. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- E. MIL-S-29175 - Switch, Thermostatic, Low Voltage, Non-(Setback/Setup) and Setback/Setup, limiting: heating, cooling and heating-cooling.
- F. NEMA DC 3 - Low-Voltage Room Thermostats.

1.4 SYSTEM DESCRIPTION

- A. This specification is intended to cover a complete control system consisting of dampers and operators, control of equipment and other apparatus and accessories required to operate the mechanical systems and to perform functions specified. All items will be of the same manufacturer to provide a complete system. All control damper operators shall be of the electric type.
- B. Provide all electric and electric/electronic accessories and auxiliary equipment needed to provide a complete system.

1.5 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams and written detailed operational description of sequences. For automatic dampers indicate arrangement, velocities and static pressure drops for each system.

1.6 QUALIFICATIONS

- A. This system shall be furnished and installed with components of the same manufacturer.
- B. The installer shall coordinate the final operational test and system checkout with other contractors. The installer shall also be responsible for coordinating training sessions with owner's operational personnel.

1.7 SEQUENCING AND SCHEDULING

- A. Sequence work under the provisions of Division 01.
- B. Schedule work under the provisions of Division 01.
- C. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.
- D. Coordinate work under provisions of Division 1 and ensure system is completed and commissioned by date of substantial completion.
- E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

1.8 ELECTRICAL WIRING

- A. All electric wiring and/or conduit in connection with the temperature control system shall be furnished and installed by the Mechanical Contractor and is included as part of these specifications.
- B. The installation of all control equipment and the final electrical connections shall be the responsibility of the Mechanical Contractor or their Temperature Control Sub-Contractor.

1.9 INSTALLATION OF DAMPERS

- A. All automatic control dampers will be furnished by Temperature Control sub-contractor and shall be installed by the Mechanical Contractor.

1.10 WARRANTY

- A. Provide one year warranty following final acceptance of the project by the Architect/Owner under provisions of Division 01.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Honeywell, Inc.
- B. Johnson Controls Co., Inc.
- C. Carrier/Bryant
- D. Pro-1 IAQ
- E. Or approved equal manufacturer prior to bidding.

2.2 DAMPERS

- A. Dampers supplied by control contractor will be sized by control contractor. Installing contractor will include any necessary blank-off pieces for proper installation or transitions necessary to accommodate the dampers.
- B. Modulating dampers shall be opposed blade. Two-position dampers shall be parallel blade. Blades shall be constructed of two hot dipped sheets welded together to form a

corrugated blade. Frames shall be hot dipped galvanized steel. Blade width shall be a maximum of 8". All blades shall have elastomeric edge and stainless steel end seals. Frames shall have metal stops with neoprene or stainless steel seals to seat against ends of each blade. Dampers shall have nylon oil impregnated bearings and shall be enclosed in the damper frame. No linkage shall be allowed in the airstream. All outside dampers must be tight closing.

- C. The particular dampers to be furnished on this job are shown on the plans. The responsibility for including all necessary dampers for proper control will be that of this Temperature Control Sub-contractor.

2.3 DAMPER MOTORS

- A. Damper motors shall be provided by control contractor and shall be capable of providing smooth proportioning control under design conditions. Motors shall have composition diaphragms, opposing springs and installed outside of the air flow.

2.4 THERMOSTATS

- A. General - Control thermostats shall be provided and installed by this contractor.
- B. Thermostat shall be Honeywell Vision-Pro #TH811OR as basis of design with the following capabilities:
 1. Programmable scheduling and set points.
 2. Programmable lockout of set-points to minimize tampering.
 3. Programmable unoccupied to occupied over-ride feature that is adjustable, but has a 3-hour over-ride default.

2.5 OUTSIDE AIR DAMPER

- A. Occupied Position - Damper shall be modulated whenever furnace fan unit is operating.
- B. Unoccupied Position - Damper shall be in closed position.

2.6 RELIEF AIR

- A. Provide a motor operated relief air damper that will open whenever outside air damper of furnace is more than 50 percent open.

2.7 FURNACE CONTROL

- A. The furnace system shall have a thermostat and sub-base to control heating, cooling, fan operation and outside air dampers. Furnace with auxiliary economizer contact package.
- B. The thermostats shall be a, PRO-1 IAQ # T705 Series or Honeywell Vision Pro 8000 Series or Honeywell T-7350 Series, programmable commercial unit with 7-day flexible control with two up and two down settings per day including the following features:
 1. Liquid crystal display
 2. Individual heating/cool set point
 3. Intelligent recovery
 4. Intelligent fan control
 5. Auto Heating/Cool change-over
 6. Fan controlled switching sub-base
 7. Short cycling prevention
 8. Remote 3-hour override of unoccupied setting with annunciation
 9. Stages of heating and cooling control
 10. Battery back-up of memory

11. 24 volt control voltage
 12. Sub-base with auxiliary contacts for economizer
- C. Economizer damper control for Furnace shall be as follows:
1. During unoccupied setting the outside air damper and relief dampers will be closed and return air damper 100 percent open.
 2. During the occupied cycle the outside air damper shall be set at the minimum position (15 percent open).
 3. The outside air and return air dampers shall maintain 60° mixed air temperature during occupied winter setting.
 4. During occupied summer setting the outside air dampers shall be set at 15 percent open and will modulate along with return air damper to utilize "free cooling" outside air.
- D. In heating mode furnace unit blower speed shall be medium and the cooling mode blower speed shall be high.
- E. Unoccupied Sequence
1. O.A. damper shall be closed.
- F. Occupied Sequence
1. O.A. damper shall open to minimum scheduled position.
- G. Provide all sensors, relays and motors necessary to make system described above function.

2.8 GARAGE MAKE-UP AIR AND HEATING SYSTEM

- A. Space sensors, thermostats, carbon monoxide sensors and nitrogen dioxide sensors shall control both the exhaust and make-up air unit.
- B. When any of the two control devices call for unit operation, the motorized dampers shall open. When the exhaust fan damper trips an end switch, the interlocked fan starters shall enable both fans.
1. CO Sensor - Detector maintains maximum CO level of 25 ppm by cycling the interlocked fans at high speed and discharging 60°F supply air. Signal an alarm of CO Level exceeds 100 ppm.
 2. NO₂ Sensor - Detector maintains maximum NO₂ level of 1.0 ppm by cycling the interlocked fans at high speed and discharging 60°F supply air.
 3. Remote Heat Thermostat - When space temperature drops below 50°F setpoint (adjustable) the units shall operate at low speed with burner modulating to maintain discharge setpoint of 60°F (adjustable).
- C. When CO and space set points are satisfied, both fans shall be off and the MO dampers shall be closed.

2.9 UNIT HEATERS

- A. Space stat shall cycle the unit heater fan. A strap-on aquastat shall prevent the fan from operation when the return pipe temperature is below 100°. Wiring by the Sub-Contractor.

2.10 DUCT THERMOSTATS

- A. All duct thermostats shall be supplied with liquid-filled capillaries with bulb of thermostat mounted in air flow that is being sensed and controlled. All duct thermostats will be supplied with air gauges, a minimum of 1-1/2" in diameter, in each main and branch line. Thermostat bulbs in mixed air and discharge air locations on each air

handling unit will be of the 20' averaging type sensing an average temperature over the total 20' of the element. Elements will be distributed across the air stream to sense all variations in delivered air temperatures.

2.11 MISCELLANEOUS CONTROL DEVICES

- A. All necessary relays, switches, miscellaneous controllers and appurtenances to accomplish the hereinafter described sequence of operation shall be installed as required. Controls will be of the proper quality designed for minimum maintenance and shall be furnished for the application intended. All necessary controls to complete the satisfactory operation of the system shall be provided as part of this contract.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Division 01 - Administration Requirements: Coordination and Project Conditions.
- B. Verify that systems are ready to receive work.
- C. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Conceal wiring conduit in walls and ceiling. Run exposed conduit only in mechanical rooms, in neat manner, properly supported.
- C. Check and verify location of thermostats, humidistats and other exposed control sensors with plans and room details before installation. Locate room thermostats 48 inches above floor. Vertically align controls with lighting switches, and humidistats. Refer to Division 26.
- D. Mount duct mounted thermostats using flanges and element holders.
- E. Mount outdoor reset thermostats and outdoor sensors indoors with sensing elements outdoors on the north side of the building and/or with sun shield.
- F. Provide guards on thermostats in public areas and all thermostats where indicated on plans.
- G. Provide mixing dampers of opposed blade construction arranged to mix streams. Two position blades shall be parallel.
- H. Mount control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet shall accommodate all systems in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved lamincoid nameplates on cabinet face.
- I. Provide conduit and electrical wiring where required. Refer to Electrical Specification 26 05 03 for approved materials to be used.
- J. After completion of installation, test and adjust control equipment.

3.3 FIELD QUALITY CONTROL

- A. Division 01 - Quality Requirements and Execution and Closeout Requirements: Field inspecting, testing, adjusting and balancing.
- B. After completion of installation, test and adjust control equipment. Submit data showing set points and final adjustments of controls.

3.4 DEMONSTRATION AND TRAINING

- A. Division 01 - Execution and Closeout Requirements: Requirements for demonstration and training.
- B. Demonstrate complete operation of systems, including Sequence of Operation prior to Date of Substantial Completion.
- C. Demonstrate complete and operating system to Owner.

END OF SECTION

SECTION 23 09 15
CARBON MONOXIDE SENSING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Building sensors for carbon monoxide. (Provided by Mechanical Contractor.)

1.2 RELATED SECTIONS

- A. Section 23 09 02 – Electric/Electronic Controls and Control Equipment Furnace.
- B. Section 26 05 03 - Equipment Wiring Systems.

1.3 REFERENCES

- A. ASHRAE 62-2001 Acceptable Indoor Air Quality Standards.
- B. NFPA Monoxide Handbook.

1.4 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Coordinate submittals with information requested in Section 23 09 93.
- C. Product Data: Submit description and engineering data for each control system component. Include sizing as requested.
- D. Manufacturer's Installation Instructions: Submit.

1.5 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of control components, including panels and sensors.
- C. Operation and Maintenance Data: Submit inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Minnesota standards.
- B. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of Project.

- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Division 01 - Product Requirements: Product storage and handling requirements.
- B. Accept controls on site in original factory packaging Inspect for damage.

1.9 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.10 WARRANTY

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

1.11 MAINTENANCE SERVICE

- A. Division 01 - Execution and Closeout Requirements: Requirements for maintenance service.
- B. Furnish service and maintenance of control system for one year from Date of Substantial Completion.
- C. Furnish complete service of controls systems, including callbacks. Make minimum of two complete normal inspections of approximately four hours duration in addition to normal service calls to inspect, calibrate and adjust controls. Submit written report after each inspection.
- D. Include systematic examination, adjustment, and calibration of controls. Repair or replace parts in accordance with manufacturer's operating and maintenance data. Use parts produced by manufacturer of original equipment.
- E. Perform work without removing units from service during building normal occupied hours.
- F. Provide emergency call back service during working hours for this maintenance period.
- G. Maintain locally, near Place of the Work, adequate stock of parts for replacement or emergency purposes. Have personnel available to ensure fulfillment of this maintenance service, without unreasonable loss of time.
- H. Perform maintenance work using competent and qualified personnel under supervision and in direct employ of manufacturer or original installer.
- I. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of Owner.

1.12 ENVIRONMENTAL REQUIREMENTS

- A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Brasch
- B. Intec by QEL, Inc.
- C. Tox-Alert
- D. Approved equal prior to bidding.

2.2 CONTROL PANEL: BRASH MODEL #GDCP-A

- A. The control panel shall be ETL listed containing a digital control board and power supply/relay board and shall conform completely to the UL 61010B-1 and certified to CAN/CSA STD. C22.2, No. 1010.1.
- B. The NEMA 1 enclosure shall be constructed of heavy gauge, bonderized steel with gray, painted finish and conforms to the UL 61010B-1 standard. The cover shall close flush with the sides of the box and be secured with a keyed lock that protects the front panel controls when locked.
- C. The enclosure shall have 6, 1/2" knockouts and 6, 3/4" knockouts, pre-punched for connection of field conduit.
- D. The unit shall be protected against static discharge, excessive electrical noise, and tested for safety in accordance with the UL 61010B-1 standard.
- E. The unit shall have a four line, 20 characters per line, LC display that will continually indicate the present date and time on the top two lines and user instructions on the top two lines and user instructions on the bottom two lines.
- F. Programming and current status of the unit and all sensors shall be controlled from a front panel 5 key keypad. Factory programming to the user's specifications is available.

2.3 SWITCHES AND CONTROLS

- A. Each sensor connected to the control panel shall provide an 8-bit, digital signal in direct relationship to the concentration of the type of gas being monitored. Sensors are connected in "daisy chain" fashion for both power and signal.
- B. The control panel shall have the capability of assigning each sensor to a specific output ventilation control zone, or to multiple control zones. Sensors may control zones individually or in combination with other sensors.
- C. A key on the keypad shall be provided to silence the internal alarm. The alarm circuit will automatically be reset once the current alarm condition ceases to exist.
- D. Output relays providing a normally closed set of contacts for low alert and the alarm shall be provided. These relays shall provide a fail-safe situation and will automatically operate ventilation equipment upon power loss to the control panel or sensor. The low and high alert relays shall have a field selectable configuration for 2-speed or 50%/100% fan control. Relays shall be suitable for the connection of 24 VAC, 24 VA inductive circuits.
- E. Field adjustment of the low-alert detection level shall be available for each sensor. The range of the detection level shall depend upon the type of gas being monitored. An on/off

time delay range of 0 to 10 minutes in increments of one (1) minute shall be available for all sensors.

- F. The control panel shall come standard with the capability to accept up to 20 transmitters/sensors and control up to six (6) output zones.
- G. The control panel shall have a battery backup feature capable of retaining the programmed parameters in case of a power loss.

2.4 CONTROL PANEL ELECTRICAL

- A. The control panel shall contain a supply fuse rated for 1-amp at 250 VAC. Each output relay shall have a fuse rated for 5-amps at 250 VAC. The fuses shall be of the time-log type similar to Wickmann Series 374.
- B. Keypad: 5 embossed keys with tactile feedback.
- C. Timing: Real-time clock with output for minutes, hours, day-of-week, day, month and year.
- D. Circuit: Microprocessor controlled digital circuitry with battery backup, (up to 10 year lifetime).
- E. Input Channels:
 - 1. Number - 20 inputs, (max.).
 - 2. Type - Model GSE-CM-TRA, Model GSE-ND-TRA transmitters.
 - 3. Input Signal - 8-bit digital word, RS-485 transceiver.
 - 4. Connection - Inputs are true daisy-chain, both power and communication.
 - 5. Maximum Distance - 1000 feet between most remote input transmitter and panel.
- F. Output Channel
 - 1. Number - 6 outputs, (std.)
 - 2. Type of Output - Two each, dry-contact, mechanical relays per channel, fused at amps.
 - 3. Maximum Voltage Rating - 125 VAC, 50/60 Hz.
 - 4. Current Capacity - 5 amps, resistive at 30 VDC.
 - 5. Power (Inductive) - 250 VA (1/8 HP)

2.5 CARBON MONOXIDE - ELECTRO-CHEMICAL SENSOR #GSE-CM-TRA

- A. The sensor/transmitter shall be an ETL listed unit and conform completely to the UL 61010-1 standard.
- B. The NEMA 1 enclosure shall be constructed of heavy polycarbonate plastic, which consists of two pieces, cover and chassis. The cover shall close flush with the sides of the box and shall require a special tool to open it. The sensor module shall be protected from damage inside the enclosure. The gas sensor shall be exposed to the ambient air to allow for proper sensing. The case shall conform to the UL 61010-1 standard.
- C. The sensor/transmitter shall contain an electro-chemical carbon monoxide (CO) sensor with temperature compensation circuits.
- D. The enclosure shall be provided with one, 1/3" pre-punched opening for connection of field conduit.
- E. The sensor/transmitter shall be protected against static discharge, excessive electrical noise and tested for safety in accordance with the UL 61010-1 standard.

- F. The sensor/transmitter shall have a green "power" LED.
- G. Overcurrent Protection: The sensor/transmitter shall contain two power supply fuses rated for 0.200 amp at 250 VAC. Fuses shall be of the time-lag type.
- H. Switches and Controls: The sensor/transmitter shall provide a 4-20 ma DC, 0-1 VDC, 0-5 VDC or 0-10 VDC signal in direct relationship to the carbon monoxide (CO) gas concentration. The signal type can be selected at time of order or changed in the field. This signal shall be compatible with building and energy management systems and/or Brasch Manufacturing, Multi-Sensor Control Panels.
- I. Alarm Channel - One internal and one external, common to all output channels.
 - 1. Internal
 - a. Type - Piezoelectric ceramic element
 - b. Frequency - 3.7 KHz
 - c. Sound Level - 110 db. @ 10 cm
 - 2. External (for optional, remote-mounted horn/strobe)
 - a. Type - One each, dry-contact, mechanical relay, fused at 5 amps.
 - b. Maximum voltage - 125 VAC, 50/60 Hz
 - c. Current capacity - 5 amps, (resistive) at 30 VDC
 - d. Power, (inductive) - 250 VA, (1/8 HP)
- J. Environmental:
 - 1. Temperature
 - a. Operating: -15°C to 40°C, (5°F to 104°F)
 - b. Storage: -50°C to 120°C, (-58°F to 248°F)
 - 2. Humidity
 - a. Operating: 10% to 90%, (non-condensing)
 - b. Storage: 10% to 90%, (non-condensing)
- K. Accuracy:
 - 1. CSE-CM-TRA transmitters shall be accurate to within $\pm 10\%$ of the full scale value for carbon monoxide with 0-200ppm range.
- L. Expected Useful Lifetime:
 - 1. GSE-CM-TRA - 5 years or greater.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install remote sensors for each system where directed by plan.
- C. Sensors shall be provided as required to provide a minimum of one sensor for every 9,000 square feet of building volume.

END OF SECTION

BLANK PAGE

SECTION 23 23 00
REFRIGERANT PIPING AND INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Refrigerant piping.
 2. Pipe hangers and supports.
 3. Refrigerant moisture and liquid indicators.
 4. Valves.
 5. Refrigerant strainers.
 6. Refrigerant pressure regulators.
 7. Refrigerant pressure relief valves.
 8. Refrigerant filter-driers.
 9. Refrigerant expansion valves.
- B. Related Sections:
1. Section 23 05 29 - Hangers and Supports for HVAC Piping, Plumbing Piping and Equipment: Product requirements for pipe hangers and supports, sleeves and firestopping for placement by this section.
 2. Section 23 05 53 - Identification for HVAC Piping, Plumbing Piping and Equipment: Product requirements for pipe identification for placement by this section.
 3. Section 26 05 03 – Equipment Wiring Connections: Execution, requirements for electric connections specified by this section.

1.2 REFERENCES

- A. Air-Conditioning and Refrigeration Institute:
1. ARI 495 - Refrigerant Liquid Receivers.
 2. ARI 710 - Liquid-Line Driers.
 3. ARI 730 - Flow-Capacity Rating and Application of Suction-Line Filters and Filter Driers.
 4. ARI 750 - Thermostatic Refrigerant Expansion Valves.
 5. ARI 760 - Solenoid Valves for Use with Volatile Refrigerants.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
1. ASHRAE 15 - Safety Code for Mechanical Refrigeration.
- C. American Society of Mechanical Engineers:
1. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 2. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
 3. ASME B31.5 - Refrigeration Piping.
- D. ASTM International:
1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 2. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
 3. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
 4. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
 5. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

- E. American Welding Society:
 1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
 2. AWS D1.1 - Structural Welding Code - Steel.
- F. Manufacturers Standardization Society of the Valve and Fittings Industry:
 1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
 2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
 3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.3 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections when joining dissimilar metals in systems.
- B. Provide flanges, unions, or couplings at locations requiring servicing. Use unions, flanges, or couplings downstream of valves and at equipment connections. Do not use direct welded or threaded connections to valves or equipment.
- C. Provide pipe hangers and supports in accordance with ASME B31.5, ASTM F708, MSS SP 58, MSS SP 69 and MSS SP 89.
- D. Provide receivers on systems where recommended by manufacturer, sized to accommodate pump down charge.
- E. Flexible Connectors: Use at or near compressors where piping configuration does not absorb vibration.

1.4 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate layout of refrigeration piping system, including equipment, critical dimensions, and sizes.
- C. Product Data:
 1. Piping: Submit data on pipe materials, fittings, and accessories.
 2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
 3. Refrigerant Specialties: Submit manufacturers catalog information including capacity, component sizes, rough-in requirements and service sizes for the following:
 - a. Refrigerant moisture and liquid indicators.
 - b. Refrigerant strainers.
 - c. Refrigerant filter-driers.
 - d. Refrigerant expansion valves.
 - e. Verify the requirement for the following equipment with the manufacturer of the condensing unit(s) and provide as necessary and required:
 - 1) Electronic expansion valves
 - 2) Pressure regulators
 - 3) Pressure relief valves
 - 4) Check valves
 - 5) Solenoid valves
 - 6) Receivers
- D. Design Data: Indicate pipe size.

- E. Test Reports: Indicate results of refrigerant leak test and piping system pressure test.
- F. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures and isolation.

1.5 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of valves, equipment and refrigerant accessories.
- C. Operation and Maintenance Data: Submit instructions for installation and changing components, spare parts lists, exploded assembly views.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ASME B31.5 code for installation of refrigerant piping systems.
- B. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Fabricator or Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.8 PRE-INSTALLATION MEETINGS

- A. Division 01 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Division 01 - Product Requirements: Product storage and handling requirements.
- B. Dehydrate and charge refrigeration components including piping and receivers, seal prior to shipment. Maintain seal until connected into system.
- C. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 PIPING

- A. Copper Tubing: ASTM B280, Type ACR hard drawn or annealed.
 - 1. Fittings: All elbows shall be long radius. ASME B16.22 wrought copper.
 - 2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480°F.

- B. Pipe Supports and Anchors:
 - 1. Hangers for Pipe: Carbon steel, adjustable swivel, split ring.
 - 2. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
 - 4. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
 - 5. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
 - 6. Vertical Support: Steel riser clamp.

2.2 REFRIGERANT

- A. Refrigerant: ASHRAE 34;
 - 1. R-410A: Non-Chlorine (Ozone Friendly)

2.3 MANUFACTURERS

- A. Spartan
- B. Alco
- C. Sporlan

2.4 UNIONS AND COUPLINGS

- A. 2 inches and Smaller:
 - 1. Ferrous Piping: 150 psig malleable iron, threaded.
 - 2. Copper Pipe: Bronze, soldered joints.

- B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper colder end, water impervious isolation barrier.

2.5 MOISTURE AND LIQUID INDICATORS

- A. Indicators: Single or Double port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum working pressure of 500 psig and maximum temperature of 200°F.

2.6 VALVES

- A. Diaphragm Packless Valves: UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275°F.

- B. Packed Angle Valves: Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, solder or flared ends; for maximum working pressure of 500 psig and maximum temperature of 275°F.
- C. Packed Ball Valves: Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psig and maximum temperature of 325°F.

2.7 STRAINERS

- A. Straight Line or Angle Line Type: Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psig.
- B. Straight Line, Non-Cleanable Type: Steel shell, copper plated fittings, stainless steel wire screen, for maximum working pressure of 500 psi.

2.8 FILTER-DRIERS

- A. Replaceable Cartridge Angle Type: (Ten tons and over)
 1. ANSI/ARI 710, UL listed, brass, removable cap, for maximum working pressure of 350 psig.
 2. Filter Cartridge: Pleated media with integral end rings, stainless steel support.
 3. Filter/Dryer Cartridge: Pleated media with solid core sieve with activated alumina.
 4. Wax Removal Cartridge: Molded bonded core of activated charcoal with integral gaskets and desiccant.
- B. Permanent Straight-through Type: (Systems less than ten tons)
 1. ANSI/ARI 710, UL listed, steel shell with molded desiccant filter core, for maximum working pressure of 350.
 2. Rating: ARI 710 for moisture and flow.

2.9 EXPANSION VALVES

- A. Angle or Straight Thru Type: ARI 750; design suitable for refrigerant, brass body, internal or external equalizer, adjustable superheat setting, replaceable inlet strainer, with replaceable capillary tube and remote sensing bulb well.
- B. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10° F superheat. Select to avoid being undersized at full load and oversized at part load.

2.10 ELECTRONIC EXPANSION VALVES

- A. Valve:
 1. Brass body with flared or solder connection, needle valve with floating needle and machined seat, stepper motor drive.
- B. Evaporation Control System:
 1. Electronic microprocessor based unit in enclosed case, proportional integral control with adaptive superheat, maximum operating pressure function, pre-selection allowance for electrical defrost and hot gas bypass.
- C. Refrigeration System Control: Electronic microprocessor based unit in enclosed case, with proportional integral control of valve, on/off thermostat, air temperature alarm (high

and low), solenoid valve control, liquid injection adaptive superheat control, maximum operating pressure function, night setback thermostat, timer for defrost control.

- D. Verify requirement with manufacturer of condensing unit.

2.11 SOLENOID VALVES

- A. Valve: ARI 760, pilot operated, copper or brass or steel body and internal parts, synthetic seat, stainless steel stem and plunger assembly, with flared, solder, or threaded ends; for maximum working pressure of 500 psi. Stem shall permit manual operation in case of coil failure.
- B. Coil Assembly: UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box.
- C. Equipment supplier shall coordinate refrigeration pipe sizing requirement for solenoid valve installation, service clearances and any deviation in electrical connection loads. Mechanical Contractor shall be responsible to provide for all of the afore mentioned items and any electrical power and control connections required for the solenoid valves.
- D. Verify requirement with manufacturer of condensing unit.

2.12 ACCEPTABLE MANUFACTURERS - PIPE INSULATION

- A. Armoflex
 - 1. Basis of design is Armoflex # AP
- B. Rubatex
- C. Imcoshield/Imcolock
- D. Therma-Cel
- E. Aerocel
- F. U.T. Solaflex

2.13 ACCEPTABLE MANUFACTURERS - PIPE INSULATION

- A. Armoflex
 - 1. Basis of design is Armoflex # AP
- B. Rubatex
- C. Imcoshield/Imcolock
- D. Therma-Cel
- E. Aerocel
- F. U.T. Solaflex

2.14 INSULATION DESCRIPTION

- A. Type A: Phenolic foam, chemically neutral; 'k' value of 0.24 at 75°F.
- B. Type B: Cellular foam or elastomer; flexible, plastic, "k" value of 0.28 at 75°F.

2.15 INSULATION ACCESSORIES

- A. Adhesives: Compatible with insulation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.

3.2 PREPARATION

- A. Ream pipe and tube ends and remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.3 INSTALLATION

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Installation of refrigeration piping shall be per manufacturer's recommendations and shall be done by installation and service personnel with certification for handling and installing R-410A and other HFC refrigerants.
- C. Piping sizes shown on plan are specified unit connection sizes and are provided for estimating and bidding purposes only. Verify all sizing with manufacturer's installation instructions.
- D. Route piping in orderly manner, with piping parallel to building structure, and maintain gradient.
- E. Install piping to conserve building space and not interfere with use of space.
- F. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.
- G. Provide non-conducting dielectric connections when joining dissimilar metals.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.
- I. Provide clearance for installation of insulation and access to valves and fittings.
- J. Provide access to concealed valves and fittings. (Coordinate size and location access doors with Division 8.
- K. Where pipe support members are welded to structural building frame, brush clean and apply one coat of zinc rich primer to welding.
- L. Inserts:
 - 1. Refer to Specification Section 23 05 29.

- M. Pipe Hangers and Supports:
 1. Install in accordance with ASTM B31.5, ASTM F708 and MSS SP89.
 2. Support horizontal piping as scheduled.
 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 4. Place hangers within 12 inches of each horizontal elbow.
 5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 7. Provide copper plated hangers and supports for copper piping.
- N. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.
- O. Prepare pipe, fittings, supports and accessories not pre-finished, ready for finish painting.
- P. Insulate piping and equipment per this section's requirements.
- Q. Locate expansion valve sensing bulb (if required by evap. coil) immediately downstream of evaporator on suction line.
- R. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.
- S. Install flexible connectors at right angles to axial movement of compressor.
- T. Fully charge completed system with refrigerant after testing.

3.4 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed by the equipment supplier.
- B. Test refrigeration system in accordance with ANSI/ASME B31.5.
- C. Pressure test system with dry nitrogen to 200 psig. Perform final tests at 27 inches vacuum and 200 psig using halide torch or electronic leak detector. Test to no leakage.

3.5 APPLICATION

- A. Provide line size liquid indicators in main liquid line leaving condenser, or if receiver is provided, in liquid line leaving receiver.
- B. Provide permanent filter-driers in all systems that are less than 10-Tons.
- C. Provide solenoid valves in liquid line of systems operating with single pump-out or pump-down compressor control, in liquid line of single or multiple evaporator systems, and in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.
- D. In small systems where pre-charged line sets are used charge system if the lines or units have lost their charge. NOTE: soft annealed copper line sets are not approved if refrigeration lines are exposed to view on outside walls or exposed to view in any finished areas.
- E. On systems serving variable air volume units provide hot gas bypass piping.

3.6 PRE-EXAMINATION FOR PIPE INSULATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed and dry.

3.7 PIPE INSULATION INSTALLATION

- A. Install insulation materials in accordance with manufacturer's instructions.
- B. Continue insulation with vapor barrier through penetrations, i.e. through walls.
- C. In exposed piping, locate insulation and cover seams in least visible locations.
- D. Along with piping, also insulate pipe fittings, valves, unions, flanges, strainers, flexible connections and expansion joints.

3.8 PIPE INSULATION TOLERANCE

- A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.9 PIPE INSULATION SCHEDULE

<u>PIPING</u>	<u>TYPE</u>	<u>PIPE SIZE</u>	<u>INSULATION THICKNESS</u>
Refrigerant Suction	A/B	ALL	3/4"
Refrigerant Hot Gas	NONE	N/A	N/A
Refrigerant Hot Gas	A/B	ALL	1/2"

3.10 PIPING JACKETS

- A. Exposed exterior piping insulation shall be covered with 0.020" thick aluminum jackets or wrapped with an Alumaguard type jacket.

3.11 PAINTING

- A. All short pieces of exterior foam insulation exposed at unit connections and fittings (that does not have an aluminum jacket) shall be painted as per manufacturer's direction to protect from damage from the sun and weather. (Similar to Armstrong/Armoflex -WB - Finish)

END OF SECTION

BLANK PAGE

SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Duct materials.
 2. Flexible ducts.
 3. Insulated flexible ducts.
 4. Single wall spiral round ducts.
 5. Transverse duct connection system.
 6. Ductwork fabrication.
 7. Cleaning of new duct surfaces.
- B. Related Sections:
1. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for hangers, supports and sleeves for placement by this section.
 2. Section 23 07 00 - Duct Insulation: Product requirements for duct lining and wrapping.
 3. Section 23 33 00 - Air Duct Accessories: Product requirements for duct accessories for placement by this section.

1.2 REFERENCES

- A. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 2. ASTM A90/A90M - Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 3. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
 4. ASTM A568/A568M - Standard Specification for Steel, Sheet, Carbon and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements.
 5. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. National Fire Protection Association:
1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
- C. Sheet Metal and Air Conditioning Contractors:
1. SMACNA - HVAC Duct Construction standard - Metal and Flexible.
 2. SMACNA - HVAC Air Duct Leakage Test Manual.
- D. Underwriters Laboratories Inc.:
1. UL 181 - Factory-Made Air Ducts and Connectors.
- E. AARST-ANSI (Association of Radon Scientist and Technologists)

1.3 PERFORMANCE REQUIREMENTS

- A. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission. Size round ducts installed in

place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.4 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards -
- B. Construct ductwork to NFPA 90A standards.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 - Product Requirements.
- B. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.
- C. Maintain temperatures during and after installation of duct sealant.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.8 DEFINITIONS

- A. Rectangular Duct Sizes: Metal duct dimensions are indicated on plans and the sizes on the plans have been increased to take any duct liner into account, where the ducts are specified to be lined.
- B. Low Pressure Classification: 2 inch WG positive or negative static pressure and velocities less than 2,500 fpm.

1.9 PAYMENTS

- A. During the construction period ductwork shall not be considered billable on a payment request until it has been fabricated and delivered to the job site.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Galvanized Steel Ducts: ASTM A525 and ASTM A527 galvanized steel sheet, lock-forming quality, having G60 or G90 zinc coating of in conformance with ASTM A90.
 - 1. G90 galvanized used on duct exposed to weather or high moisture areas such as showers, exhaust, kitchen exhaust, etc.
- B. Steel Ducts: ASTM A568 and A653.
 - 1. Used on kitchen hoods, material handling exhaust, etc.
- C. Insulated Flexible Ducts:
 - 1. Manufacturers:
 - a. Anco-Flex
 - b. Norflex
 - c. Wiremold
 - d. Thermafex II

2. Multiple layers of aluminum laminate supported by helically wound spring steel wire; fiberglass insulation; aluminized vapor barrier film.
 - a. Pressure Rating: 10 inches WG positive and 1.0 inches negative.
 - b. Maximum Velocity: 4000 fpm.
 - c. Temperature Range: -20°F to 210°F.
- D. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic tested in accordance with ASTM E-84-80 and to not exceed 25 flame spread and 50 smoke developed.
- E. Joint Sealer: Acceptable Manufacturer - Minnesota Mining and Manufacturing Duct Sealer 900, Foster 30-02 Ductmate Industries 795 Duct Sealer or 5511M if applied at the time of forming.
- F. Fasteners: Rivets, bolts, or sheet metal screws.
- G. Hanger Rod: ASTM A36; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.2 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide air foil turning vanes. Acoustical lining is required for a minimum of the first 15 feet (or more as shown on plans) of all supply and/or return air ductwork. In that length of lined ductwork provide air foil turning vanes of perforated metal with glass fiber insulation.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints. As an option, standard elbows may be used, but all seams must be sealed.
- E. Provide standard rectangular to round efficiency takeoffs at branch duct takeoff. Conical spin-in branch take-offs are acceptable when main duct is tall enough to accommodate the throat of the branch duct plus two inches for the cone.

2.3 TRANSVERSE DUCT CONNECTION SYSTEM

- A. Manufacturers:
 1. Ductmate
 2. Nexus
 3. SMC (R-Angle)
 4. Ward Industries
 5. Transverse Duct Connections (TDC)
 6. Fab Duct
 7. Approved equal prior to bidding.
- B. SMACNA "F" rated class rigidly connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.

- C. All components including sealants and gaskets shall be provided to meet manufacturer's requirements. No substitutions shall be allowed.

2.4 CASINGS AND AHU PLENUMS

- A. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and construct for operating pressures indicated.
- B. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of 18 gauge galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.
- C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.

2.5 ACCEPTABLE MANUFACTURERS - ABOVE GROUND ROUND DUCTS

- A. Midwest Spiro Vinyl-Cote Pipe Co.
- B. Foremost Mfg. Co.
- C. Wesco, Inc.
- D. SMC Sheet Metal Connectors, Inc.
- E. Tangent, Inc.
- F. Norlock
- G. United McGill
- H. Semco
- I. Fab Duct
- J. Approved equal manufacturer prior to bidding.

2.6 G.I. SPIRAL

- A. Above ground duct material shall be galvanized steel spiral duct. All fittings shall be constructed of same material, with all welded seams.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Division 01 - Administration Requirements: Coordination and project conditions.
- B. Verify sizes of equipment connections before fabrication of transitions.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible. Duct supports shall be at duct joints and shall be installed at

maximum of 8 feet or 10 feet dependent on SMACNA duct construction choices.

- C. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- D. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
 - 1. Use double nuts and lock washers on threaded rod supports.
 - 2. Ductwork support from roof decking is not allowed unless specifically approved by the Structural Engineer.
- E. Joint Sealing - All low pressure ductwork to be sealed in accordance with SMACNA.
 - 1. Seal Class 'C': Seal transverse joints only 2" WG and less.
- F. All outside air intake ductwork to be sealed water-tight at inside and outside of all joints before insulation wrap and vapor barrier jacket are installed.
- G. Seal duct cooling coil casing joints as required to eliminate air leakage.
- H. Cross Breaking - Cross break all sheet metal surfaces of rectangular ducts 18 inches through 60 inches. Beaded ductwork may be used in lieu of cross breaking. Cross breaking may be omitted on internally lined ducts and on ducts 24 inches and larger where rigid insulation is applied to the exterior of the ducts.
- I. Connect diffusers, return air grilles to low pressure ducts either directly or with 4 feet maximum length of flexible duct to the collar extension or elbow mounted on the diffuser. Hold in place with strap or clamp. Exhaust registers shall be directly connected without use of flex. Extend flexible duct to the base of the diffuser neck or register collar. Overlap flex duct at insulated rigid branch duct and seal vapor tight. Refer to Code requirements for direct ducting to all devices within a fire-rated area or downstream of a fire barrier penetration.
- J. Connect flexible ducts to metal ducts with liquid adhesive plus tape or draw bands and/or sheet metal screws.
- K. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- L. All ductwork stored on site must be protected from construction dust and dirt with polyethylene sheeting prior to installation. If ductwork is not protected and gets contaminated, it shall be fully cleaned to the Engineer's satisfaction prior to installation.
- M. All in-line duct transitions shall be gradual (20°) taper to minimize pressure loss and noise increase due to turbulent flow.
- N. All rectangular branch duct take-offs shall be installed with a high efficiency fitting as shown on plan. If a round branch duct is shown directly connected to a rectangular duct, either a spin-in conical take-off or rectangular to round transition is acceptable. Round spin-in take-offs are not approved.
- O. Seal all insulation terminations at diffusers, registers, branch ducts and main duct connections with tape such that no insulation is left exposed to ambient air.

3.3 CLEANING (NEW DUCTWORK SURFACES ONLY)

- A. Clean work under provision of Division 01.

- B. External Duct Cleaning: When external surfaces of exposed ducts are to be painted, the Mechanical Contractor shall remove all stickers, labels and excess adhesive from metallic or non-metallic ducts prior to painting whether they were factory, shop or field applied.
- C. If the internal duct surfaces have not been adequately protected by plastic enclosure caps the Mechanical Contractor shall clean duct system by forcing air at high velocity duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning. Equipment fans shall not be used for this duct cleaning. **(Not by a duct cleaning company.)**
- D. If the internal duct surfaces have not been adequately protected by plastic enclosure caps the Mechanical Contractor shall clean duct systems with high power vacuum machines. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

3.4 SCHEDULES

A. DUCTWORK MATERIAL SCHEDULE

<u>AIR SYSTEM</u>	<u>MATERIAL</u>
Low Pressure Supply/Return (Heating and/or A.C. Systems)	Steel
General Exhaust	Steel, Aluminum
Outside Air Intake	Steel
Combustion Air	Steel

B. DUCTWORK PRESSURE CLASS SCHEDULE

<u>AIR SYSTEM</u>	<u>PRESSURE CLASS</u>
Constant Volume Supply (System w/Cooling Coils)	2 inch
Return and Relief	1 inch
General Exhaust	1/2 inch
Outside Air Intake	1 inch
Combustion Air	1/2 inch

3.5 MINIMUM DUCT SEAL LEVELS

<u>Duct Location</u>	<u>Supply Duct Static</u>		Exhaust	Return
	$\leq 2''$ w.c.	$>2''$ w.c.		
Unconditioned Space	B	A	C	B
Conditioned Space	B	B	B	C

B. Duct Seal Levels

1. Type - A: All transverse joints, longitudinal seams and duct wall penetrations. Pressure-sensitive tape shall not be used as the primary sealant, unless it has been certified to comply with UL-181A or UL-181B by an independent testing laboratory and the tape is used in accordance with that certification.
2. Type - B: All transverse joints, longitudinal seams. Pressure-sensitive tape shall not be used as the primary sealant, unless it has been certified to comply with UL 181A or UL-181B by an independent testing laboratory and the tape is used in accordance with that certification.
3. Type - C: Transverse joints only.

3.6 DUCT CONSTRUCTION TABLE

- A. The following table does not constitute all requirements for the construction's compliance. Complete details are provided in the manual entitled HVAC Duct Construction Standards, Metal and Flexible.
1. Use back-up member from Columns 11 or 12. Exception: The drive only requires back-up over 20" length.
 2. Spacing in Column 3 refers to joint-to-joint, joint-to-intermediate or intermediate-to-intermediate.
 3. The same sheet thickness must be used on all sides of duct. Each duct dimension, width or depth, controls the minimum reinforcement requirements for that particular side.
 4. Duct sides 19" wide and larger which have more than ten square feet of unbraced panel shall be beaded or cross broken unless the ducts will have external insulation or internal liner. This applies to ducts of 20 gauge or less.
 5. Duct with 4 feet joint spacing shall conform as if 4' and 2' were given in Column 3 where 5' and 2-1/2' are shown.
- B. Table 1-4 E5, & 1-5 E5

**END OF SECTION (AFTER TABLES)
DUCT CONSTRUCTION TABLE
DUCT TABLES**

NARROWSCOPE DUCT CONSTRUCTION TABLE 1-4 E5

1" w.g. STATIC POS. OR NEG.		TRANSVERSE JOINT REINFORCEMENT				INTERMEDIATE REINFORCEMENT													
DUCT DIM.	DUCT GA. (MIN.)	REINFR. SPACING (MAX.)	REINFR. CODE GRADE	SLIP GAGE		BACKUP	STANDING S (T-10)	STANDING S (T-12)	STANDING S (BAR REINFORCED) (T-13)	STANDING S (WITH GASKET) (T-24)	STANDING S (WITH GASKET) (T-26a)	STANDING S (WITH GASKET) (T-26b)	STANDING S (ANGLE REINFORCED) (T-14)	H x T + HR	H x T	H x T (MIN)	ANGLE	ZEE	
				DRIVE SLIP T-5	Hemmed "S" SLIP T-6														H x T
12" dia	26	None		24	None	None													
13"-30"	26	5'	D	24	*	*	1 1/2 x 20 ga.	1 1/2 x 25 ga.											
31"-36"	24	5'	D	24	*	*	1 1/8 x 20 ga.	1 1/8 x 18 ga.	1 1/2 x 25 ga.										
37"-42"	24	5'	E	24	*	*	1 1/8 x 18 ga.	1 x 18 ga.	1 x 18 ga.										
43"-47"	22	5'	F	24, 1, *	*	*	1 5/8 x 18 ga.	1 1/2 x 18 ga.	NOT USED										
55"-60"	24	2 1/2'	E	24	*	*	1 1/8 x 18 ga.	1 x 18 ga.											
61"-72"	24	2 1/2'	F	24	*	*	1 5/8 x 18 ga.	1 1/2 x 18 ga.											
73"-84"	22	2 1/2'	H	22	*	*	NOT GIVEN	NOT GIVEN	1 5/8 x 18 ga. 1 1/2 x 16 Bar										
85"-96"	20	2 1/2'	H	22	*	*													

NOTES:

- *Means use back-up member from columns 11 or 12. Exception: the drive only requires back-up over 20" length.
- Spacing in column 3 refers to joint-to-joint, joint-to-intermediate, or intermediate-to-intermediate.
- The same sheet thickness must be used on all sides of duct. Each duct dimension, width, or depth, controls the minimum reinforcement requirements for that particular side.
- Duct sides 19" wide and larger which have more than ten square feet of unbraced panel shall be braced or crossbraced unless the ducts will have external insulation or internal liner. This applies to ducts of 20 ga. or less.

COMMENT:
Construction tables are prepared in "narrow scope" for 2" water gauge and 1" water gauge pressure classifications. These tables have been produced for the convenience of those contractors or engineers who wish to have fewer options.

Sheet Metal and Air Conditioning Contractors Association, Chantilly, Va.

2" w.g. STATIC POS. OR NEG.		SMACNA		NARROWSCOPE DUCT CONSTRUCTION TABLE 1-5 E5										INTERMEDIATE REINFORCEMENT	
		TRANSVERSE JOINT REINFORCEMENT													
① DUCT DIM.	② DUCT GA. (MIN.)	③ REINF. SPACING (MAX.)	④ REINF. CODE GRADE	⑤		⑥	⑦	⑧	⑨	⑩	⑪	⑫			
				SLIP GAGE	BACKUP										
10" dia	26	None		24	None	STANDING S T-10	STANDING S T-18	STANDING S (BAR REINFORCED) T-13	H = 1.38" (WITH GASKET) T-24 H = 1.38" (WITH GASKET) T-25b	1/2" (WITH GASKET) T-24a	ANGLE H x T (MIN)	ZEE H x B x T (MIN)	1 x 1/8	1 x 3/4 x 1/8 ga	
11" 30"	26	5"	C	24	*	1 x 22 ga	1 x 22 ga	NOT USED	26 ga	1 x 22 ga	1 1/4 x 1/2 ga or 1 x 1/8				
21" 30"	26	5"	D	24	*	1 1/8 x 20 ga	1 x 20 ga		24 ga						
27" 30"	24	5"	E	24	*	1 1/8 x 18 ga	1 x 18 ga		20 ga	1 1/2 x 20 ga				1 1/2 x 3/4 1/8 ga	
31" 35"	22	5"	F	24	*	1 5/8 x 18 ga	1 1/2 x 18 ga	1 5/8 x 22 ga 1 1/2 x 1/8 Bar							
37" 51"	24	2 1/2"	F	24	*	1 5/8 x 18 ga	1 1/2 x 18 ga	1 5/8 x 20 ga 1 1/2 x 1/8 Bar	20 ga						
55" 60"	24	2 1/2"	G	24	*	NOT GIVEN	1 1/2 x 18 ga	1 5/8 x 22 ga 1 1/2 x 1/8 Bar	22 ga + rods	1 1/2 x 18 ga					
61" 72"	22	2 1/2"	H	24	*			1 5/8 x 18 ga 1 1/2 x 1/8 Angle						1 1/2 x 3/4 x 1/8	
77" 84"	22	2 1/2"	I	22	*	NOT GIVEN	NOT GIVEN							2 x 3/16	
65" 96"	20	2 1/2"	I	22	*				20 ga + rods					2 x 1 1/8 x 1/2 ga	

NOTES:

- *Means use back-up member from columns 11 or 12. Exception: the drive only requires back up over 20" length.
- Spacing in column 3 refers to joint to joint, joint-to-intermediate, or intermediate-to-intermediate.
- The same sheet thickness must be used on all sides of duct. Each duct dimension, width, or depth, controls the minimum reinforcement requirements for that particular side.
- Duct sides 19" wide and larger which have more than ten square feet of unbraced panel shall be braced or crossbraced unless the ducts will have external insulation or internal liner. This applies to ducts of 20 ga. or less.

5. Contents of the narrow scope tables and these notes do not constitute all requirements for the construction's compliance. Complete details are provided in the manual entitled HVAC Duct Construction Standards, Metal and Flexible. The manual is available from local SMACNA chapter offices or the National Association office; inquire for terms.

6. Construction conforming to the standard does not prevent some traditionally acceptable rattle (noise) under sudden pressure change conditions such as start up and shut down of systems.

COMMENT:
Construction tables are prepared in "narrow scope" for 2" water gage and 1" water gage pressure classifications. These tables have been produced for the convenience of those contractors or engineers who wish to have fewer options.

Sheet Metal and Air Conditioning Contractors Association, Chantilly, Va.

ABOVE GROUND LONGITUDINAL SEAM ROUND DUCT

GAUGE

26

SIZE

3" TO 8"

SPIRAL SEAM @ EXPOSED ROUND AND FLAT OVAL DUCT

GAUGE

DUCT DIAMETER

FITTING DIAMETER

24

20" TO 26"

26

16" TO 26"

14" TO 18"

28

4" TO 14"

4" TO 12"

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Volume control dampers.
 - 2. Duct access doors.
 - 3. Flexible duct connections.

1.2 REFERENCES

- A. Air Movement and Control Association International, Inc.:
 - 1. AMCA 500 - Test Methods for Louvers, Dampers and Shutters.
- B. ASTM International:
 - 1. ASTM E1 - Standard Specification for ASTM Thermometers.
- C. National Fire Protection Association:
 - 1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
 - 2. NFPA 92A - Recommended Practice for Smoke-Control Systems.
- D. Sheet Metal and Air Conditioning Contractors:
 - 1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers, duct access doors and duct test holes.
- C. Product Data: Submit data for shop fabricated assemblies and hardware used.
- D. Product Data: Submit for the following. Include where applicable electrical characteristics and connection requirements.
 - 1. Fire dampers including locations and ratings.
 - 2. Backdraft dampers.
 - 3. Flexible duct connections.
 - 4. Volume control dampers.
- E. Product Data: For fire dampers submit the following:
 - 1. Include UL ratings, dynamic ratings, leakage, pressure drop and maximum pressure data.
 - 2. Indicate materials, construction, dimensions, and installation details.
 - 3. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.
- F. Manufacturer's Installation Instructions: Submit for Fire dampers.

1.4 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of access doors and test holes.

1.5 QUALITY ASSURANCE

- A. Dampers tested, rated and labeled in accordance with the latest UL requirements.
- B. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Division 01 - Product Requirements: Product storage and handling requirements.
- B. Protect dampers from damage to operating linkages and blades.
- C. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.
- D. Storage: Store materials in a dry area indoor, protected from damage.
- E. Handling: Handle and lift dampers in accordance with manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.8 COORDINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate Work where appropriate with building control Work.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - VOLUME CONTROL PRODUCTS

- A. Duro Dyne
- B. Farr
- C. Dowco
- D. Cesco
- E. Parker
- F. Nailor
- G. Greenheck
- H. Ruskin

- I. Air Balance
- J. Pottorff
- K. Fab Duct

2.2 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.
- B. Fabricate splitter dampers of material same gauge as duct to 24 inches size in either direction, and two gauges heavier for sizes over 24 inches.
- C. Fabricate splitter dampers of double thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 1/4 inch diameter rod in self aligning, universal joint action flanged bushing with set screw.
- D. Fabricate single blade dampers for duct sizes through 9-1/2 x 30 inches.
- E. Fabricate multi-blade damper of opposed blade pattern with maximum blade from sizes 12 x 30 inch and larger. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- F. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- G. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
- H. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

2.3 ACCEPTABLE MANUFACTURERS - BACKDRAFT DAMPERS

- A. Louvers and Dampers
- B. Safe-Air
- C. Farr
- D. Cesco, Inc.
- E. Ruskin
- F. Arrow United
- G. Creative Metals
- H. American Warming Co.
- I. Air Balance
- J. Nailor
- K. Greenheck, Inc.

- L. Pottorff

2.4 BACKDRAFT DAMPERS

- A. Gravity backdraft dampers, size 18x18 inches or smaller, furnished with air moving equipment, may be air moving equipment manufacturer's standard construction.
- B. Fabricate multi-blade, parallel action gravity balanced backdraft dampers of 18 gauge galvanized steel or aluminum with blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure similar to Model No. ABD-200 (Aluminum) or HDD-150 (Steel) manufactured by Louvers and Dampers.

2.5 ACCEPTABLE MANUFACTURERS - AIR TURNING DEVICES

- A. J & J Register Co.
- B. Cesco, Inc.
- C. Hart & Cooley
- D. Duro-Dyne

2.6 ACCEPTABLE MANUFACTURERS - FLEXIBLE DUCT CONNECTIONS

- A. Ventfabrics
- B. Ventglas
- C. Duro-Dyne

2.7 INSULATED FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.
- B. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 20 oz per sq yd, approximately 6 inches wide, crimped into metal edging strip. Insulate with one inch thick flexible fiberglass insulation and a flame safe jacket. Similar to Duro-Dyne's insulflex connections.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Verify rated walls are ready for fire damper installation.
- C. Verify ducts and equipment installations are ready for accessories.
- D. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry and lighting arrangement.

3.2 INSTALLATION

- A. Install in accordance with NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 3100 for duct construction and pressure class.
- B. Provide balancing dampers at points on low pressure supply return and exhaust systems where branches are taken from larger ducts add additional dampers as required during air balancing. Use splitter dampers only where indicated.
- C. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- D. Provide backdraft dampers in all exhaust ducts nearest to outside wall/roof or where indicated.
 - 1. Backdraft damper at small ceiling and in-line fans is acceptable.
- E. Demonstrate re-setting of fire dampers to Owner's representative.
- F. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment and supported by vibration isolators.
- G. Use splitter dampers only where indicated.
- H. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- I. Provide balancing dampers on all duct take-offs to diffusers, grilles and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.
- J. Provide duct test holes where indicated and required for testing and balancing purposes. Also provide plugs for holes.
- K. Install concealed regulators to operate manual volume dampers located above permanent, inaccessible ceiling. Utilize components of one manufacturer only and install per manufacturer's instructions.

END OF SECTION

BLANK PAGE

SECTION 23 34 05
HVAC FANS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Ceiling Exhaust Fans.
 - 2. Destratification Fans.

- B. Related Sections:
 - 1. Section 23 07 00 - HVAC Insulation: Product requirements for power ventilators for placement by this section.
 - 2. Section 23 31 00 - HVAC Ducts and Casings: Product requirements for hangers for placement by this section.
 - 3. Section 23 33 00 - Air Duct Accessories: Product requirements for duct accessories for placement by this section.
 - 4. Section 26 05 03 - Equipment Wiring Connections: Execution and product requirements for connecting fan equipment and damper actuator specified by this section.

1.2 REFERENCES

- A. American Bearing Manufacturers Association:
 - 1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
 - 2. ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

- B. Air Movement and Control Association International, Inc.:
 - 1. AMCA 99 - Standards Handbook.
 - 2. AMCA 204 - Balance Quality and Vibration Levels for Fans.
 - 3. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
 - 4. AMCA 300 - Reverberant Room Method for Sound Testing of Fans.
 - 5. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

- C. National Electrical Manufacturers Association:
 - 1. NEMA MG 1 - Motors and Generators.
 - 2. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 3. NEMA 3R – Outdoor Disconnect.

- D. Underwriters Laboratories Inc.:
 - 1. UL 705 - Power Ventilators.

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.

- B. Shop Drawings: Indicate size and configuration of fan assembly, mountings, weights, ductwork and accessory connections.

- C. Product Data: Submit data on each type of fan and include accessories, fan curves with specified operating point plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, electrical characteristics and connection requirements.

- D. Manufacturer's Installation Instructions: Submit fan manufacturer's instructions.

1.4 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.5 QUALITY ASSURANCE

- A. Performance Ratings: Conform to AMCA 210.
- B. Sound Ratings: AMCA 301, tested to AMCA 300.
- C. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
- D. Balance Quality: Conform to AMCA 204.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Division 01 - Product Requirements: Product storage and handling requirements.
- B. Protect motors, shafts, and bearings from weather and construction dust.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Greenheck Fan Co.
- B. Carnes, Inc.
- C. Acme Fan Co.
- D. Creative Metals
- E. Penn/Barry Fan

2.2 CEILING EXHAUST FANS

- A. Centrifugal Fan Unit: Direct driven, with galvanized steel housing lined with 1/2 inch acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge. If the Fan Schedule indicates the use of an ECM type motor, no exceptions shall be allowed. ECM speed controller shall be motor mounted unless specifically noted elsewhere as control signal by BAS or by a remote mounted speed controller.
- B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor and housing mounted solid state speed controller.
- C. Grille: aluminum with white baked enamel finish.

2.3 PROPELLER TYPE - DESTRATIFICATION CEILING FANS AND GUARDS

- A. Approved Manufacturers:
 - 1. Leading Edge
 - 2. Air Master Fan Co.
 - 3. Emerson-Chromalox Co.
 - 4. Enviro-Fan
 - 5. Heat Recovery Systems (HRS)

2.4 DESTRATIFICATION CEILING FANS

- A. Ceiling fans shall be Leading Edge Model #4820-1.
- B. Motor shall have heavy duty ball bearing construction. Varnish coated stator laminations and Class "B" insulated copper wire. Standard voltage is 110-115 volt. 60 HZ motor will draw .85 amps at maximum speed of 315 rpm with a power consumption of 86 watts.
- C. Blades shall be fabricated from aluminum, finished with a durable baked enamel coating. Blade support arms are of heavy gauge steel to insure correct blade angle. Overall diameter of blades is 48 in. The blades circulate 21,000 cfm at 315 rpm at 20 feet.
- D. Downrod shall be 1 in. dia. steel tube to provide for up to 30 in. drop from the ceiling. U-shaped mounting bracket provided.
- E. Fans will be started and stopped by a solid-state speed control switch.
- F. Fan color shall be white.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions for support methods, sound control and vibration control.
- B. Provide for speed controllers as scheduled or if an ECM type motor is scheduled, provide and coordinate speed control method with Division 26 or the BAS Sub-Contractor.

3.2 CEILING DESTRATIFICATION FANS

- A. Mount fans as per manufacturer's directions. Provide sufficient mounting brackets and bracing for fans.
- B. Fans will be stopped and started manually.
- C. Wiring by Electrical Contractor. Coordinate rough-in location to accommodate fan cage which may overlap into roof truss web spaces.

3.3 SCHEDULE

- A. See schedule on Drawings.

END OF SECTION

BLANK PAGE

SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Diffusers.
 - 2. Registers.
 - 3. Louvers.
 - 4. Roof curbs.

- B. Related Sections:
 - 1. Section 23 33 00 - Air Duct Accessories: Volume dampers for inlets.

1.2 REFERENCES

- A. Air Movement and Control Association International, Inc.:
 - 1. AMCA 500 - Test Methods for Louvers, Dampers and Shutters.

- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - 1. ASHRAE 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets.

- C. Sheet Metal and Air Conditioning Contractors:
 - 1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.

- B. Product Data: Submit sizes, finish, and type of mounting. Submit schedule of outlets and inlets showing type, size, location, application and noise level.

1.4 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

- B. Project Record Documents: Record actual locations of air outlets and inlets.

1.5 QUALITY ASSURANCE

- A. Test and rate diffuser, register, and grille performance in accordance with ASHRAE 70.

- B. Test and rate louver performance in accordance with AMCA 500.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - CEILING DIFFUSERS AND REGISTERS

- A. Hart & Cooley

- B. Titus Manufacturing Co.

- C. E. H. Price Company
- D. Metal-Aire

2.2 ROUND CEILING DIFFUSERS (ADJUSTABLE TIERS)

- A. Round, fully adjustable discharge pattern, multi-core type diffuser to discharge air in 360° pattern, with sectorizing baffles where indicated on schedule by note or model number. Noise criteria levels shall not exceed NC-25 in vertical discharge position.
- B. Project diffuser collar a maximum of one inch above the ceiling face and connect to duct with duct ring. In plaster ceilings, provide plaster ring and ceiling plaque.
- C. Fabricate of steel or aluminum with baked enamel off-white finish.
- D. Provide damper and multi-louvered equalizing grid with damper adjustable from diffuser face.
- E. Design standard - E.H. Price #RCDA.

2.3 SQUARE CEILING DIFFUSERS

- A. Square, fully adjustable discharge pattern, multi-tier type diffuser to discharge air in 360 degree pattern with air pattern control blades. Noise criteria levels shall not exceed NC-25 in vertical discharge position.
- B. Adjustable air flow shall not be allowed by use of adjustable core position. Individual adjustable vanes shall be provided on all four sides and shall be accessible from the unit face.
- C. Fabricate of steel or aluminum with baked enamel off-white finish.
- D. Provide with damper adjustable from diffuser face.
- E. Surface mount type.
- F. Design standard - E.H. Price #SCDA.

2.4 CEILING GRID CORE EXHAUST AND RETURN REGISTERS

- A. Fixed grilles of 1/2 x 1/2 x 1/2 inch egg crate bars.
- B. Fabricate 7/8 inch margin frame with countersunk screw for surface mounting or no screw holes in lay-in frame for suspended grid ceilings.
- C. Fabricate of aluminum with factory white finish.
- D. At constant volume locations, when a branch duct damper isn't installed, provide an integral, gang-operated opposed blade damper with removable key operator. The Mechanical contractor shall verify these locations and order the dampers as required for balancing.
- E. Design Standard - E.H. Price #Series 80.

2.5 CEILING EXHAUST AND RETURN REGISTERS

- A. Type: Streamlined blades, 3/4" minimum depth, 1/2" maximum spacing, with blades set at 45 degrees.

- B. Frame: 1-1/4" margin with countersunk screw mounting.
- C. Fabrication: Steel or Aluminum with 20 gauge minimum frames and 22 gauge minimum blades, with factory off-white baked enamel finish.
- D. Damper: At constant volume locations, when a branch duct damper isn't installed, provide an integral, gang-operated opposed blade damper with removable key operator. The Mechanical contractor shall verify these locations and order the dampers as required for balancing.
- E. Design Standard - E.H. Price #535.

2.6 WALL SUPPLY REGISTERS

- A. Streamlined and individually adjustable blades, depth of which exceeds 3/4" maximum spacing with spring or other device to set blades, vertical face, double deflection.
- B. Fabricate 1-1/4" margin frame with countersunk screw mounting and gasket.
- C. Fabricate of steel or aluminum with 20 gauge minimum frames and 22 gauge minimum blades, with factory prime coat finish.
- D. Provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.
- E. Design Standard - E.H. Price #520D.

2.7 WALL EXHAUST AND RETURN REGISTERS

- A. Streamlined 40° blades, 3/4" depth minimum. 1/2" maximum blade spacing with spot weld, "U" channel or other device to permanently set blades, horizontal face.
- B. Fabricate 1-1/4" margin frame with countersunk screw mounting.
- C. Fabricate of steel or aluminum with 20 gauge frames and 22 gauge blades, with factory primed coated finish.
- D. Damper: Integral, gang-operated opposed blade dampers with removable key operator, operable from face.
- E. Design Standard - E.H. Price #535.

2.8 ACCEPTABLE MANUFACTURERS - LOUVERS

- A. Greenheck, Inc. - Model ESD-403-Aluminum (45° blades @ 54% free area)
- B. Air Control Products
- C. Ruskin Co.
- D. Creative Metals (Wall Louvers)
- E. Louvers & Dampers, Inc.
- F. Pottorff
- G. Greenheck

2.9 LOUVERS

- A. Provide 4 inch deep louvers with blades on 45 degree slope with concave slope blades, heavy channel frame, inside bird screen with 1/2 inch square mesh. Drainable blades and gutters on intake louvers.
- B. Fabricate of 12 gauge extruded aluminum, welded assembly, with factory prime coat finish.
- C. Mounting: Furnish with exterior angle flange with screw holes in jambs for installation.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install items in accordance with manufacturer's instructions.
- B. Where the grille relates visually to another component of the building construction, the grille must be properly centered or spaced to conform with that element of the building. Where grilles occur in the ceiling which is modular such as tile, etc., the grille must be installed to line up with the normal ceiling lines.
- C. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry and lighting arrangement. Control joints in walls and ceilings shall not be intersected by grille, register or diffuser.
- D. The sheet metal installer shall hold off on his final length of duct where such adjustments must be made in the placement of the grille so that the final location will line up with the rest of the building elements.
- E. All fixed grilles and registers shall be installed with the blades in the position which will be most effective in obscuring the duct beyond from view, and where the duct surface remains visible from any normal viewing angle, the internal surfaces of the duct shall be painted dull black with suitable material.
- F. Install ductwork to ceiling diffusers with air tight connection. Provide either a rigid elbow at the diffuser throat or a minimum 2" sheet metal collar for flexible duct connection.
- G. Division 01 - Administrative Requirements: Coordination and project conditions.
- H. Verify that ceiling and wall systems are ready for installation.
- I. Install balancing dampers on duct take-off to diffusers, grilles, and registers, whether or not dampers are furnished as part of diffuser, grille and register assembly. Refer to Section 23 33 00.

3.2 AIR OUTLET AND INLET SCHEDULE

- A. See Schedule on Plans.

END OF SECTION

SECTION 23 51 00
CHIMNEYS AND STACKS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. High efficiency venting.
- B. Related Sections:
 - 1. Section 23 07 00 - HVAC Insulation: Execution requirements for insulation specified by this section.
 - 2. Section 23 54 00 - Furnaces: Furnaces using breeching and stacks.
 - 3. Section 23 55 00 - Fuel-Fired Heaters: Fuel fired heaters using breeching and stacks.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - 2. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. National Fire Protection Association:
 - 1. NFPA 54 - National Fuel Gas Code.
- C. Sheet Metal and Air Conditioning Contractors:
 - 1. SMACNA - Guide for Steel Stack Construction.
 - 2. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
- D. Underwriters Laboratories Inc.:
 - 1. UL 641 - Type L Low-Temperature Venting Systems.

1.3 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Maintain water integrity of roof during and after installation of chimney or vent.

1.4 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 TYPE B DOUBLE WALL GAS VENTS (WATER HEATERS, UNIT HEATER)

- A. Manufacturers:
 - 1. Selkirk-Metalbestos
 - 2. Hart & Cooley
 - 3. Metal-Fab
 - 4. Amerivent

5. DuraVent
 6. Security Chimney
 7. Substitutions: Section 01 60 00 - Product Requirements.
- B. Double wall gas vent shall run from each appliance outlet to the termination above the roof and shall include: pipe sections, elbows, tees (vertical, horizontal, lateral), draft hood connections, increaser/decreasers, vertical support(s), expansion-contraction sections as required, storm collar, approved termination tops, and roof penetration flashing as detailed or required for building construction. All roof flashings shall be of galvanized steel construction, soldered weather tight.
 - C. All venting material shall have an inner gas carrying pipe of aluminum, Type 1100. Outer structural jacket of galvanized steel. Metal gauge shall be the manufacturer's standard and comply with their listing. Insulating air space for diameters 3" - 8" I.D. is 1/4". For 10" - 48", 1/2" space.

2.2 HIGH EFFICIENCY FURNACE FLUES OF PVC

- A. PVC combustion air and flue exhaust pipe primer and solvent cement: ASTM D2466. Schedule 40 pipe and fittings.
- B. Mufflers, intakes and exhaust outlets provided with furnace units.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with recommendations of ASHRAE -Handbook, Equipment Volume, Chapter "Chimney, Gas, Vent, and Fireplace Systems", and ANSI Z223.1 (NFPA 54).
- C. Install breechings with minimum of joints. Align accurately at connections, with internal surfaces smooth.
- D. Support breechings from building structure, rigidly with suitable ties, braces, hangers and anchors to hold to shape and prevent buckling. Support vertical breechings, chimneys, and stacks at 12 foot spacing, to adjacent structural surfaces, or at floor penetrations. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for equivalent duct support configuration and size.
- E. For Type B double wall gas vents, maintain UL listed minimum clearances from combustibles. Assemble pipe and accessories as required for complete installation.
- F. Provide a minimum of 1 foot and a maximum of 2 feet of breeching to connect appliance to chimney or vent. Provide Type B or other specified chimney continuously from appliances where possible.

3.2 HIGH EFFICIENCY FURNACE VENT AND INTAKE

- A. Intake and exhaust piping.
 1. Use schedule 40 High Temperature PVC pipe for both intake and exhaust piping.
 2. Secure all joints, including drain leg, gas tight using approved PVC solvent.
 3. Locate intake piping upwind (prevailing wind) from exhaust piping. To avoid recirculation of exhaust gas on roof terminations, end of exhaust pipe shall be higher than intake pipe. Exhaust and intake exits shall be in the same pressure zone. Do not exit one through the roof and one on the side. Also, do not exit the intake on one

- side and the exhaust on another side of the building.
4. Intake and exhaust pipes should be placed as close together as possible at termination end (refer to illustrations). Maximum separation is 3 in. on roof terminations and 6 in. on side wall terminations.
 5. Exhaust piping shall terminate straight out or up as shown. On roof terminations, the intake piping should terminate straight down using two 90 degrees elbows. Intake piping on side wall terminations should point straight out. A 2" x 1-1/2" reducer shall be used on the exhaust piping at the point where it exits the structure to improve velocity of exhaust away from intake piping. When exhaust and intake piping shall be run up an outside wall, the exhaust piping is reduced to 1-1/2 inches after the final elbow.
 6. Exhaust piping shall be insulated with 3/4" Armaflex or equivalent when run through unheated space. Do not leave any surface area of exhaust pipe open to outside air.
 7. Minimum separation distance between the end of the exhaust pipe and the end of the intake pipe is 8".
 8. Position termination ends so they are free from obstructions and above the level of snow accumulation. Termination ends shall be a minimum of 12 in. above grade level. Do not point into window wells, stairwells, alcoves, courtyard areas or other recessed areas.
 9. Suspend piping at a minimum of every 5 ft. using isolation hangers. A suitable hanger can be fabricated by putting a sleeve of Armaflex refrigeration piping insulation around the pipe and suspending it using a metal strapping. Place a small sheet metal strip between the Armaflex and the metal strapping to prevent crimping. Do not secure piping directly to joist or flooring.
 10. In areas where piping penetrates joists or interior walls, hole shall be large enough to allow clearance on all sides of pipe. Suspend pipe through center of hole using an isolating hanger.
 11. Isolate piping at the point where it exits the outside wall or roof (termination kit).

3.3 SCHEDULE

<u>EQUIPMENT</u>	(2 FT. LONG MAX.) <u>BREECHING</u>	<u>CHIMNEY/STACK</u>
Unit Heater	Galvanized	Type B

END OF SECTION

BLANK PAGE

SECTION 23 54 00
FURNACES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Gas Fired Furnaces.
 - 2. Evaporator Coil Units.
 - 3. Thermostats.

- B. Related Sections:
 - 1. Section 22 11 23 - Facility Natural-Gas Piping: Execution requirements for natural gas piping specified in this section.
 - 2. Section 23 31 00 - HVAC Ducts and Casings: Execution requirements for ductwork and duct liner specified by this section.
 - 3. Section 23 33 00 - Air Duct Accessories: Execution requirements for flexible duct connections specified by this section.
 - 4. Section 26 05 03 - Equipment Wiring Connections: Execution requirements for electric connections specified by this section.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI Z21.47 - Gas-Fired Central Furnaces.
 - 2. ANSI Z83.8 - Gas Unit Heaters.
 - 3. ANSI Z83.9 - Gas-Fired Duct Furnaces.

- B. Air-Conditioning and Refrigeration Institute:
 - 1. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
 - 2. ARI 270 - Sound Rating of Outdoor Unitary Equipment.
 - 3. ARI 520 - Positive Displacement Condensing Units.
 - 4. ARI 610 - Central System Humidifiers for Residential Applications.

- C. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - 1. ASHRAE 15 - Safety Code for Mechanical Refrigeration.
 - 2. ASHRAE 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
 - 3. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
 - 4. ASHRAE 103 - Methods of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers.

- D. National Electrical Manufacturers Association:
 - 1. NEMA MG 1 - Motors and Generators.

- E. National Fire Protection Association:
 - 1. NEPA 31 - Standard for the Installation of Oil-Burning Equipment.
 - 2. NFPA 54 - National Fuel Gas Code.
 - 3. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
 - 4. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
 - 5. NFPA 211 - Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances.

- F. Underwriters Laboratories Inc.:
 - 1. UL 207 - Refrigerant-Containing Components and Accessories, Nonelectrical.
 - 2. UL 726 - UL Standard for Safety for Oil-Fired Boiler Assemblies.
 - 3. UL 727 - Oil-Fired Central Furnaces.
 - 4. UL 729 - UL Standard for Safety for Oil-Fired Floor Furnaces.
- G. United States Department of Energy:
 - 1. DOE 10 CFR - Uniform Test Method for Measuring the Energy Consumption of Furnaces.

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittals procedures.
- B. Product Data: Submit rated capacities, efficiencies, weights, required clearances, and location and size of field connections, accessories, electrical nameplate data and wiring diagrams.
- C. Design Data: Indicate refrigerant pipe sizing.
- D. Manufacturer's Installation Instructions: Submit rigging, assembly and installation instructions.

1.4 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of components and connections.
- C. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, service instructions, installation instructions, maintenance and repair data, and parts listing.

1.5 QUALITY ASSURANCE

- A. Furnace Performance Requirements: Conform to minimum efficiency prescribed by ASHRAE 90.1 when tested in accordance with DOE 10 CFR, ANSI Z21.47 and UL 727.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Division 01 - Product Requirements: Product storage and handling requirements.
- B. Accept furnaces, humidifiers, electronic air cleaners, condensing units and thermostats on site in factory packaging. Inspect for damage.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 - Product Requirements.
- B. Do not install condensing unit foundation pad when ground is frozen or muddy.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.9 WARRANTY

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish ten year manufacturers warranty for heat exchangers.
- C. Furnish five year manufacturers warranty for solid state ignition modules.

1.10 MAINTENANCE SERVICE

- A. Division 01 - Execution and Closeout Requirements: Maintenance service.
- B. Furnish service and maintenance of furnace and accessories for one year from Date of Substantial Completion.
- C. Include systematic examination, adjustment, and lubrication. Repair or replace parts whenever required. Use parts produced by manufacturer of original equipment.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Carrier, Inc.
- B. Trane Co.
- C. Lennox, Inc.
- D. Bryant, Inc.
- E. Approved equal manufacturer prior to bidding. Refer to Division 01.

2.2 MANUFACTURED UNITS

- A. Configuration: Upflow type with gas burner.
- B. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heat exchanger, burner or heater, controls, air filter, air filtering housing, refrigerant cooling coil and outdoor package containing compressor, condenser coil and condenser fan.
- C. Construction and Ratings: In accordance with ARI 210/240. Testing: ASHRAE 14.
- D. Performance Ratings: Energy Efficiency Rating (EER) not less than requirements of ANSI/ASHRAE 90A; seasonal efficiency to (SEER) ANSI/ASHRAE 103. (As noted on plans.)
- E. See schedule on plans for heating/cooling and air delivery capacities.
- F. Refer to Furnace Schedule. Gas heating capacities are sea level ratings. Cooling performance is based on ARI 210/240 test conditions.

2.3 FABRICATION

- A. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors, glass fiber insulation and reflective liner and welded steel base.
- B. Heat Exchanger: Aluminized Steel welded construction.
- C. Supply Fan: Centrifugal type rubber mounted with multi-speed or variable volume direct drive ECM motor.
- D. Air Filters: Four inch thick, disposable type arranged for easy replacement in factory-provided side access filter housing with hinges, latches and gasketed seal.

2.4 BURNER

- A. Gas Burner: Modulating type with combustion air supply, combination gas valve and pressure regulator incorporation manual shut-off, automatic 100 percent shut-off and pilot safety device, electronic pilot ignition.
- B. Gas Burner Safety Controls: Flame sensor prevents opening of solenoid gas valve until flame is proven and stops gas flow on ignition failure.

2.5 BURNER OPERATING CONTROLS

- A. Room Thermostat: Cycles burner to maintain room temperature setting.
- B. High Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature and re-energizes when temperature drops to lower safe value.
- C. Control Supply Fan: Bonnet temperatures and independent of burner controls, manual switch for continuous fan operation.

2.6 EVAPORATOR COIL

- A. Coil: Copper tube aluminum fin assembly, galvanized drain pan, drain connection, overflow connection, refrigerant piping connections and factory installed thermostatic expansion valve.

2.7 REFRIGERATION PACKAGE

- A. Refer to Section 23 63 13.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Verify building is ready for installation of units and openings are as indicated on Drawings.

3.2 INSTALLATION

- A. Install gas fired furnaces in accordance with NFPA 54.
- B. Install refrigeration systems in accordance with ASHRAE 15.

- C. Installation - Natural Gas Piping:
 - 1. Connect natural gas piping in accordance with NFPA 54.
 - 2. Connect natural gas piping to unit, full size of unit gas train inlet. Arrange piping with clearances for burner service.
 - 3. Install the following piping accessories on natural gas piping connections. Refer to Section 22 11 23.
 - a. Strainer.
 - b. Pressure gauge.
 - c. Shutoff valve.
 - d. Pressure reducing valve.
- D. Pipe drain from cooling coils Category III and IV gas-fired furnaces, heat exchanger and vent condensate disposal to nearest floor drain. If required by manufacturer, provide an overflow drain pipe to a conspicuous location.
- E. Connect units to electric supply and connect controls remote from units.
- F. Install control components supplied with equipment and provide control wiring.
- G. Install control wiring between thermostat, indoor unit and outdoor unit.
- H. Install evaporator unit in section of lined ductwork fastened to furnace. Refer to Plan detail. Connect return air and evaporator unit duct to system ductwork with flexible duct connection. Refer to Section 23 33 00.
- I. Install filters inside access housing. Provide adequate space for filter slide area. Use of filter rack within the furnace cabinet is not acceptable. Adjust hinges and latches as required to eliminate leakage of filter housing. Refer to plan details for filter size and location dependent on air flow direction and whether side and bottom inlets are both utilized.
- J. All gas fired unit must be started by factory authorized representative before equipment is used for any purpose. An approved start-up report must be forwarded to Engineer for approval before continued use of equipment.
- K. Owner training to be provided by factory authorized representative. Document training method and date in O & M manuals.

3.3 FILTERS

- A. At Substantial Completion the unit shall have new disposable filters in place.
- B. A second set of filters shall also be provided and stored nearby for the Owner's first filter change. The filters shall be labeled with an equipment served number.

END OF SECTION

BLANK PAGE

SECTION 23 55 00
GAS FUEL-FIRED UNIT HEATERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Gas-fired propeller unit heaters

- B. Related Sections:
 - 1. Section 22 11 23 – Facility Natural-Gas Piping: Product requirements for natural gas piping connected to gas-fired heaters.
 - 2. Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment: Product requirements for hangers for placement by this section.
 - 3. Section 23 33 00 – Air Duct Accessories: Product requirements for flexible duct connections.
 - 4. Section 23 51 00 –Chimneys and Stacks: Product requirements for vents for placement by this section.
 - 5. Section 26 05 03 – Equipment Wiring Connections: Execution requirements for electrical connections specified by this Section.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI Z83.8 – Gas Unit Heaters.

- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - 1. ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings.

- C. National Fire Protection Association:
 - 1. NFPA 54 – National Fuel Gas Code.
 - 2. NFPA 90A – Standard for the Installation of Air Conditioning and Ventilating Systems.

1.3 SUBMITTALS

- A. Division 01 – Submittal Procedures.

- B. Shop Drawings: Indicate assembly, required clearances and locations and sizes of field connections.

- C. Product Data: Submit manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data and wiring diagrams.

- D. Manufacturer's Installation Instructions: Submit/Indicate rigging and assembly.

1.4 CLOSEOUT SUBMITTALS

- A. Division 01 – Execution and Closeout Requirements: Closeout procedures.

- B. Project Record Documents: Record actual locations of thermostats or other products not mounted on unit.

- C. Operations and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, maintenance and repair data and parts listing.

1.5 QUALITY ASSURANCE

- A. Gas-Fired Unit Heater Performance Requirements: Conform to minimum efficiency prescribed by ASHRAE 90.1 when tested in accordance with ANSI Z83.8.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Division 01- Product Requirements: Product storage and handling requirements.
- B. Accept heaters and controls on site in factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.1 GAS-FIRED PROPELLER UNIT HEATERS

- A. Manufacturers:
 - 1. Modine, Inc.
 - 2. Reznor, Inc.
 - 3. Sterling, Inc.
 - 4. Trane Co.
 - 5. Substitutions: Division 01 – Product Requirements
- B. Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heat exchanger, burner, controls and accessories:
 - 1. Heating Fuel: Natural gas fired.
 - 2. Discharge Louvers: Individually adjustable horizontal and vertical louvers to match cabinet finish.
 - 3. Downturn Nozzle: 30 degree nozzle to match outlet and cabinet finish.
 - 4. Gas Control: Single stage.
 - 5. Ignition System: Electric direct ignition.
 - 6. Control Voltage: 24 volt, 60 hertz.
 - 7. Location: Suspended overhead.
- C. Cabinet: Galvanized steel, easily removed and secured access panels, insulated or double panel construction.
- D. Supply Fan: Propeller type with direct drive motor.
- E. Heat Exchanger: Type 321 stainless steel welded construction.
- F. Gas Burner: Induced Draft.
- G. Gas Burner Safety Controls:
 - 1. Thermo-Coupler Sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
 - 2. Flame Rollout Switch: Installed on burner box and prevents operation.
 - 3. Vent Safety Shutoff Sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
 - 4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic reset.
- H. Controls:
 - 1. Room Thermostat: Adjustable, low voltage, to control burner operation and supply fan to maintain temperature setting.

2. Supply Fan Control: Energize either from discharge temperature independent of burner controls or with timed off delay and timed on delay. Furnish manual switch for continuous fan operation.
- I. Schedule: Refer to Plan Sheets.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Division 01 – Administrative Requirements: Coordination and project conditions.
- B. Verify space is ready for installation of units and openings are as indicated on Shop Drawings.

3.2 INSTALLATION

- A. Install units in accordance with NFPA 90A.
- B. Installation – Natural Gas Piping:
 1. Connect natural gas piping in accordance with NFPA 54.
 2. Connect natural gas piping to unit, full size of unit gas train inlet. Arrange piping with clearances for burner service.
 3. Install the following piping accessories on natural gas piping connections.
 - a. Strainer
 - b. Pressure gauge
 - c. Shut off valve
 - d. Pressure reducing valve
- C. Install vent connections in accordance with NFPA 211. Install vents and stacks. Refer to Section 23 51 00.
- D. Install equipment in this section with vibration isolation.
- E. Provide hangers and supports for suspended units. Refer to Section 23 05 29.
- F. Provide connection to electrical power systems. Refer to Section 26 05 03.

3.3 SCHEDULES

- A. Refer to Plan Sheets.

3.4 START-UP

- A. All gas-fired units must be started by factory-authorized representative before equipment is used for any purpose. An approved Start-Up Report must be forwarded to Engineer for approval before continued use of equipment.
- B. Owner training to be provided by factory-authorized representative. Document training method and date in O & M manuals.

END OF SECTION

BLANK PAGE

SECTION 23 63 13
AIR-COOLED REFRIGERANT CONDENSERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes refrigerant condenser package, charge of refrigerant and oil, controls and control connections, refrigerant piping and connections, motor starters, electrical power connections.
- B. Related Sections:
 - 1. Section 23 23 00 - Refrigerant Piping: Execution requirements for connection to refrigerant piping specified by this section.
 - 2. Section 26 05 03 - Equipment Wiring Connections: Execution requirements for connection to electrical service specified by this section.

1.2 REFERENCES

- A. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - 1. ASHRAE 15 - Safety Code for Mechanical Refrigeration.
 - 2. ASHRAE 20 - Method of Testing for Rating Remote Mechanical-Draft Air-Cooled Refrigerant Condensers.
 - 3. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- B. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- C. Underwriters Laboratories Inc.:
 - 1. UL 207 - Refrigerant-Containing Components and Accessories, Non-electrical.
 - 2. UL 236 - Safety Standards for Heating/Cooling Equipment.

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate components, assembly, dimensions, weights and loading, required clearances, and location and size of field connections. Include schematic layouts showing condenser, refrigeration compressors, cooling coils, refrigerant piping and accessories required for complete system.
- C. Product Data: Submit rated capacities, weights, accessories, electrical requirements and wiring diagrams.
- D. Manufacturer's Field Reports: Submit start-up report for each unit to the Owner. Each report shall be inserted in the Owner's manual by the Contractor.

1.4 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit start-up instructions, maintenance instructions, parts lists, controls and accessories.

1.5 QUALITY ASSURANCE

- A. Construction and Ratings: In accordance with ARI 210/240, ARI 365, ARI 460 and UL 207. Testing in accordance with ASHRAE 20.
- B. Performance Ratings: Energy Efficiency Ratio (EER or SEER), not less than prescribed by ASHRAE 90.1 when tested in accordance with ARI 365 and ARI 460.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Division 01 - Product Requirements: Product storage and handling requirements.
- B. Comply with manufacturer's installation instruction for rigging, unloading and transporting units.
- C. Protect units on site from physical damage.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.8 WARRANTY

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for compressors.

1.9 MAINTENANCE SERVICE

- A. Division 01 - Execution and Closeout Requirements: Requirements for maintenance service.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. The units shall be manufactured by the same manufacturer providing the furnace units.

2.2 MANUFACTURED UNITS

- A. Units: Self-contained, packaged, factory assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressors, condensing coil and fans, integral sub-cooling coil, controls, liquid receiver and screens.
- B. Construction and Ratings: In accordance with ANSI/UL 207 and ANSI/UL303. Testing shall be in accordance with ASHRAE 14.
- C. Performance Ratings: Energy Efficiency Rating EER not less than as noted on Plans and as prescribed by ANSI/ASHRAE 90A.
- D. Variable capacity compressor with 10% - 100% capacity.

2.3 CASING

- A. House components in welded steel frame with galvanized steel panels with weather resistant, baked enamel finish.
- B. Mount starters and controls in weatherproof panel provided with full opening access doors. (Disconnects by Electrical Contractor.)
- C. Provide removable access doors or panels with piano hinges and quick fasteners.

2.4 CONDENSER COILS

- A. Coils: Aluminum fins mechanically bonded to seamless copper tubing. Seal with holding charge of refrigerant.
- B. Provide unit with hail guards over coils.

2.5 FANS AND MOTORS

- A. Vertical discharge direct driven propeller type condenser fans with fan guard on discharge.
- B. Weatherproof motors suitable for outdoor use, single phase permanent split capacitor or 3 phase, with permanent lubricated ball bearings and built in thermal overload protection.

2.6 COMPRESSORS

- A. Construction: Two-speed scroll type compressor.
- B. Mounting: Statically and dynamically balance rotating parts and mount on spring or rubber-in-shear vibration isolators. Internally isolate units on springs.
- C. Lubrication System: Positive displacement oil pump with oil charging valve, oil level sight glass and filter.
- E. Motor: Two-speed suction gas cooled with electronic sensor and winding over temperature protection, designed for across-the-line starting. Furnish with starter.
- F. Crankcase Heater: Evaporates refrigerant returning to crankcase during shut down. Energize heater continuously.
- G. Unit shall include a factory-holding charge of R-410A refrigerant and oil.

2.7 REFRIGERANT CIRCUIT

- A. Provide each unit with one refrigerant circuit, factory supplied and internally piped. Refer to Section 23 23 00.
- B. Solenoid Valves:
 - 1. When solenoid valves are necessary within the refrigeration piping circuit, but are not factory installed, the Mechanical Contractor shall be responsible for their installation and wiring. Coordinate wiring and control wiring with BAS and Division 26 Sub-Contractors on site.
 - 2. Solenoid valves shall be included when:
 - a. The liquid line(s) exceed 70 feet in length.
 - b. The condensing unit is located above the evaporator coil location.
 - c. In all hot gas bypass installations.

- d. The unit manufacturer recommends their use for any isolation reason.

2.8 CONTROLS

- A. On unit, mount weatherproof steel control panel, NEMA 250, containing power and control wiring, factory wired with single point power connection. Disconnect shall be provided by the Division 26 contractor.
- B. For each compressor, provide across-the-line or part winding starter, non-recycling compressor overload, starter relay, and control power transformer or terminal for controls power. Provide manual reset current overload protection. For each condenser fan, provide across-the-line starter with starter relay.
- C. Provide the following safety controls arranged so that operating any one will shut down machine and require manual reset:
 - 1. High discharge pressure switch (manual reset) for each compressor.
 - 2. Low suction pressure switch (automatic reset) for each compressor.
 - 3. Oil Pressure switch (Manual reset for single comp. units.)(Automatic reset for double comp. units.)
- D. Provide the following operating controls:
 - 1. Five minute off timer prevents compressor from short cycling.
 - 2. Low ambient thermostat to lock out compressor at low ambient temperatures (35°F).
 - 3. Provide all required interconnect wiring between evaporator fan, condenser fan and compressor to ensure that they operate in unison.
- E. Provide the following equipment with unit:
 - 1. Oil pressure switch.
 - 2. Compressor unit isolation.
 - 3. Pressure gauge taps.
 - 4. Hot gas bypass.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with ASHRAE 15.
- B. Install refrigerant piping from unit to condensing unit. Install refrigerant specialties furnished with unit and as specified in Section 23 23 00.
- C. Install connection to electrical power wiring in accordance with Section 26 05 03.
- D. Install and wire the solenoid valves if required in the refrigerant piping system by the unit manufacturer.

3.2 INTERFACE WITH OTHER PRODUCTS

- A. Install units on isolators at curb. Install per manufacturers recommendations to avoid any vibration noise through the structure to the occupied space.

3.3 MANUFACTURER'S FIELD SERVICES

- A. Division 01 - Quality Requirements: Manufacturer's Field services.

- B. Furnish cooling season start-up and winter season shutdown service, for first year of operation. If initial start-up and testing takes place in winter and machines are to remain inoperative. Repeat start-up and testing operation at beginning of first cooling season. Start-up report shall include refrigerant type and record of pressure applied in field testing.
- C. Piping sizes shown on plan are specified unit connection sizes and are provided for estimating and bidding purposes only. Verify all sizing with manufacturer's installation instructions.

3.4 ADJUSTING

- A. Division 01 - Execution and Closeout Requirements: Testing, adjusting and balancing.

3.5 DEMONSTRATION AND TRAINING

- A. Division 01 - Execution and Closeout Requirements: Requirements for demonstration and training.
- B. Demonstrate starting, maintenance and operation of unit.
- C. Demonstrate low ambient operation during winter testing or service specified above.
- D. Piping sizes shown on plan are specified unit connection sizes and are provided for estimating and bidding purposes only. Verify all sizing with manufacturer's installation instructions.
- E. Provide for connection to electrical service.
- F. Provide connection to refrigeration piping system and evaporator.

END OF SECTION

BLANK PAGE

SECTION 26 00 00
ELECTRICAL SPECIFICATION INDEX

26 05 00	Basic Electrical Requirements
26 05 01	Temporary Light and Power
26 05 02	Cutting and Patching
26 05 03	Equipment Wiring Systems
26 05 04	Firestopping
26 05 19	Building Wire and Cable
26 05 26	Grounding and Bonding
26 05 29	Supporting Devices
26 05 32	Conduit
26 05 34	Boxes
26 05 35	Mounting Heights
26 05 53	Electrical Identification
26 09 42	Time Clocks
26 24 16	Panelboards
26 27 16	Cabinets and Enclosures
26 27 26	Wiring Devices
26 28 13	Fuses
26 28 19	Enclosed Disconnect Switches
26 29 13	Enclosed Motor Controllers
26 29 16	Enclosed Contactors and Relays
26 51 00	Interior Luminaires – L.E.D.
26 58 00	Occupancy Sensors and Low-Voltage Lighting Controls

END OF SECTION

BLANK PAGE

SECTION 26 05 00
BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Basic Electrical Requirements specifically applicable to Divisions 26 and 33 Sections, in addition to Division 01 - General Requirements.

1.2 SCOPE OF WORK

- A. The work to be done under this section of the contract includes the furnishing of all labor, materials, equipment and services necessary for the proper completion of all electrical work as shown on the drawings and herein specified. In general, this consists of wiring for power, conduit for public telephone, lighting fixtures, and other special equipment as hereinafter specified, complete with all wiring, conduit, fittings, equipment and connections as specified or required.
- B. The omission of express reference to any parts necessary or reasonably incidental to the complete installation shall not be construed as releasing the contractor from furnishing such parts or doing such work.
- C. Furnish all labor, materials and equipment necessary to complete the electrical installation as shown on the drawings and/or herein specified.
- D. The General Conditions, the Supplementary Conditions and the General Requirements (Division 01) shall be and are hereby made a part of this section. Also refer to these specifications for temporary service and wiring requirements.
- E. The outline of "Scope" items above have been listed solely for the convenience of the Contractor who shall be responsible for all items reasonably required under this classification.

1.3 WORK INCLUDED

- A. General - All electrical work shown on the drawings and as hereinafter specified in the electrical specifications shall be furnished and installed by this contractor.

1.4 CODES AND STANDARDS

- A. Scope - This installation shall in every respect conform to the Code of the National Board of Fire Underwriters and all state and local regulations. This, however, shall not be construed as relieving this contractor from complying with any requirements of the drawings and specifications that may be in excess of the rules and not contrary to the same.
- B. Permits - This contractor shall obtain and pay for any and all permits, inspection fees, licenses, etc., necessary for the performance of the work included in this contract.

1.5 SUBMITTALS

- A. Submit under provisions of Division 01 and/or where noted in specific sections of the Specification.

- B. Proposed Products List: Include information on products specified in the following Sections for Engineer's review, approval and for inclusion in the Owner's Manuals:
1. 26 05 33 Surface Raceways
 2. 26 12 00 Pad Mounted Distribution Transformers
 3. 26 24 16 Panelboards
 4. 26 27 16 Cabinets and Enclosures
 5. 26 27 26 Wiring Devices
 6. 26 28 13 Fuses
 7. 26 28 19 Enclosed Switches
 8. 26 29 13 Enclosed Motor Controllers
 9. 26 29 16 Enclosed Contactors
 10. 26 51 00 Interior Luminaries
 11. 26 58 00 Dual Technology Occupancy Sensors
 12. 33 71 73 Utility Service Entrance
- C. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittals, as well as layout drawings for Divisions 27 and 28.
- D. Mark dimensions and values in units to match those specified.
- E. Electronic Submittals:
1. If shop drawings are being submitted electronically they shall be submitted in the same format as described above and shall bear the contractors dated review stamp.
 2. All shop drawings shall include a transmittal cover sheet from the contractor that shall be attached to the same shop drawing file so the Engineer or Construction Manager do not have to electronically merge files. If there are multiple transmittals involved due to construction management or sub-contracting, all of the transmittals shall be attached within the same shop drawing file.
 3. Multiple shop drawings in a book format with one transmittal shall not be acceptable as each specification section requires its own transmittal and review stamp.
- F. **NOTICE:** Before release of the shop drawing is acceptable, the Contractor's stamp, initialed or signed, must be provided certifying their review of the submittal, verification of products, verification of field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work and the Contract Documents. **If shop drawings are not stamped by the Contractor and marked as "Reviewed", "Approved" or "Approved as Noted", they may not be processed by the Engineer. If the Engineer does review them in this instance, the contractor is still responsible for reviewing them and stamping them before release to their supplier.**
- G. It is the contractor's responsibility to provide submittals that are fully-compliant with the requirements of the construction documents. The engineer will review the equipment submittals for compliance with the requirements of the plans and specifications. After the submittals have been reviewed, they will be marked "Approved", "Approved as Noted" or "Rejected – Re-Submit". The engineer will make every effort to identify non-compliant equipment in the submittal process, but the engineer will not be responsible for any costs that may be required to correct non-compliant conditions (up to and including replacement of installed non-compliant equipment with the correct equipment), regardless of the fact that the submittal may be marked "Approved" or "Approved as Noted".

1.6 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 Architect/Engineer before proceeding.

1.7 PRE-CONSTRUCTION COORDINATION AND VERIFICATION

- A. This Contractor shall coordinate his work with other Contractors on this job. Any conflict which cannot be resolved shall be settled by the Architect/Engineer.
- B. Field verification of scale dimensions on plans is directed since actual locations, distances and levels will be governed by actual field conditions.
- C. The Contractors shall check architectural, structural, plumbing, heating, ventilating and electrical conditions plans to avert possible installation conflicts. Should drastic changes from original plans be necessary to resolve such conflicts this Contractor shall notify the Architect/Engineer and secure written approval and agreement on necessary adjustments before the installation is started. No extra credits will be allowed due to the Contractor's failure to review and coordinate with all other disciplines.
- D. Discrepancies shown on different plans or between plans and actual field conditions or between plans and specifications shall promptly be brought to the attention of the Architect/Engineer for a decision. Contractor shall not scale drawings for final locations. All dimensions shall be taken from Architectural Drawings.
- E. The Contractor shall consider and review the complete set of documents, etc., Architectural, Structural, Mechanical, Electrical, etc., (Drawings and Specifications) and the existing site conditions as his complete set. He will be responsible for any and all electrical work shown or stated (to be by him), to include this work in his bid and install such items even though they are not specifically shown or stated on the Electrical Sections of the plans and specifications.

1.8 INTERPRETATIONS OF DOCUMENTS

- A. Contractors shall promptly notify the Engineer of inconsistencies, errors and omissions found in the plans and specifications prior to bid date.
- B. Questions regarding the bidding and requests for interpretation of the plans and specifications shall be submitted to the Engineer in writing in duplicate in sufficient time to be received prior to the date for receipt of bids.
- C. Interpretation and correction of the plans and specifications will be made by addendum. Interpretations and corrections made by any other method shall not be binding on the owner or the Engineer.
- D. The drawings and specifications are complementary to one another. This defines a relationship such that any item which is called for in one document is to be considered called for in both sets of documents. Where conflicts exist between the specifications and/or drawings, the more stringent requirement shall apply.

1.9 SEQUENCING AND SCHEDULING

- A. Construct Work in sequence under provisions of Division 01.

1.10 CUTTING, PATCHING AND FIRESTOPPING

- A. This Electrical Contractor shall set all sleeves in construction for his work. Where cutting is required, it shall be done by this Contractor. All patching shall be done by the Electrical Contractor. Electrical Contractor shall provide and install firestopping materials as specified in Division 26 05 04 for electrical penetrations.

1.11 OWNER'S MANUALS AND OPERATING INSTRUCTIONS

- A. Under this contractor the Electrical Contractor shall furnish the owner with two, 3-ring binders of all pertinent systems information and related documents. Submit these manuals to the Engineer for this review. The Engineer will then return the books to the contractor for distribution to the owner. The books shall contain the following items:
 - 1. Shop drawings on all major equipment.
 - 2. Operating Instructions for all major equipment
 - 3. Maintenance Instructions for all major equipment.
 - 4. Wiring diagrams for all equipment.
- B. Using the owner's manuals, the electrical contractor shall instruct the owner/owner's representative on the proper operation of all equipment installation as part of this contract. These instructions shall include, but not be limited to preventive maintenance, safety instructions and normal operating procedures.
- C. After the owner has been instructed, the contractor shall submit a letter to the Electrical Engineer documenting that the information was given to the owner and that he has signed off on this part of the contract.

END OF SECTION

SECTION 26 05 01
TEMPORARY LIGHT AND POWER

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Temporary electrical service.
- B. Lighting.
- C. Receptacles.

1.2 RELATED SECTIONS

- A. Division 01 - Temporary Facilities.

1.3 REGULATORY REQUIREMENTS

- A. Installation shall conform to OSHA standards.

PART 2 PRODUCTS

2.1 LIGHTING

- A. Provide minimum one 2600 lumen LED lamp for each 200 square foot of floor area for general illumination.

2.2 RECEPTACLES

- A. Provide 120 volt grounded outlets as required to provide power to all points within reach of a 50 foot extension cord.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Make arrangements with owner to obtain temporary electric service to the project.
- B. Temporary service to be installed in accordance with the plans and specifications.

3.2 REMOVAL

- A. The temporary electrical service shall be removed when the new permanent service has been installed and energized.

END OF SECTION

BLANK PAGE

**SECTION 26 05 02
CUTTING AND PATCHING**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements and limitations for cutting and patching of Work.

1.2 RELATED SECTIONS

- A. Individual Product Specification Sections:
 - 1. Cutting and patching incidental to work of the Section.
 - 2. Advance notification to other Sections of openings required in work of those Sections.
 - 3. Limitations on cutting structural members.

1.3 SUBMITTALS

- A. Submit written request in advance of cutting or alteration which affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather-exposed or moisture-resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate contractor.
- B. Include in request:
 - 1. Identification of Project.
 - 2. Location and description of affected work.
 - 3. Necessity for cutting or alteration.
 - 4. Description of proposed work and products to be used.
 - 5. Alternatives to cutting and patching.
 - 6. Effect on work of Owner or separate contractor.
 - 7. Written permission of affected separate contractor.
 - 8. Date and time work will be executed.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Primary Products: Those required for original installation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Inspect existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
- B. After uncovering existing work, inspect conditions affecting performance of work.
- C. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

- A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- B. Provide protection from elements for areas which may be exposed by uncovering work.
- C. Maintain excavations free of water.

3.3 CUTTING AND PATCHING

- A. Execute cutting, fitting, and patching including excavation and fill to complete work.
- B. Fit products together, to integrate with other work.
- C. Uncover work to install ill-timed work.
- D. Remove and replace defective or non-conforming work.
- E. Remove samples of installed work for testing when requested.
- F. Provide openings in the work for penetration of electrical work.

3.4 PERFORMANCE

- A. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
- B. Employ skilled people to perform cutting and patching for weather exposed and moisture resistant elements and sight-exposed surfaces.
- C. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- D. Restore work with new products in accordance with requirements of Contract Documents.
- E. Fit work air tight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- F. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 26 05 04, to full thickness of the penetrated element.
- G. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
- H. Prepare surfaces ready for paint.

END OF SECTION

SECTION 26 05 03
EQUIPMENT WIRING SYSTEMS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Electrical connections to equipment specified under other sections furnished by Owner.

1.2 RELATED WORK

- A. Division 01 - Administrative Provisions, Summary of Work, Summary of Project, Owner-furnished equipment.
- B. Division 01 - Signage.
- C. Division 08 - Overhead Coiling Doors.
- D. Division 22 - Plumbing Equipment - Pumps and Hot Water Heaters.
- E. Division 23 - HVAC Equipment.
- F. Section 23 05 13 - Motors.
- G. Section 26 05 19 - Wire and Cable.
- H. Section 26 05 32 - Conduit.
- I. Section 26 05 34 - Boxes.

1.3 REFERENCES

- A. NEMA WD 1 - General Purpose Wiring Devices.
- B. NEMA WD 5 - Specific-Purpose Wiring Devices.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - CORDS AND CAPS

- A. Leviton.
- B. Hubbell.
- C. Arrow Hart.

2.2 CORDS AND CAPS

- A. Straight-blade Attachment Plug: NEMA WD 1.
- B. Locking-blade Attachment Plug: NEMA WD 5.
- C. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.

- D. Cord Construction: Oil-resistant thermoset insulated Type SO multi-conductor flexible cord with identified equipment grounding conductor, suitable for extra hard usage in damp locations.
- E. Cord Size: Suitable for connected load of equipment and rating of branch circuit overcurrent protection.

2.3 SWITCHED FUSESTAT

- A. Littlefuse Cat. No. LSSY, Edison-Base fuse holder with single pole 15A, 125V AC switch or equal.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 PREPARATION

- A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.3 INSTALLATION

- A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.
- B. Make conduit connections to equipment using flexible conduit. Use liquid-tight flexible conduit in damp or wet locations.
- C. Install pre-finished cord set where connection with attachment plug is indicated or specified, or use attachment plug with suitable strain-relief clamps.
- D. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.
- E. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.
- F. Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as indicated. Connect with conduit and wiring as indicated.
- G. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

END OF SECTION

SECTION 26 05 04
FIRESTOPPING

PART 1 GENERAL

1.1 DESCRIPTION

- A. Related work specified elsewhere:
 - 1. Electrical: Divisions 26 and 33 (Penetrations).

1.2 REFERENCES

- A. ASTM E-814: Fire Tests of Through-Penetration Firestops.
- B. UL 1479: Fire Test of Through-Penetration Firestops.
- C. UL Building Materials Directory: Through-Penetration Firestops Systems (XHEZ), Fill, Void or Cavity Materials (XHHW) and Through-Penetration Firestop Devices (XHCR).
- D. Basic/National Building Code (BOCA).
- E. Uniform Building Code (ICBO).
- F. Standard Building Code (SSBCCI).
- G. NFPS 101 Life Safety Code.

1.3 QUALITY ASSURANCE FIRESTOPPING

- A. Performance:
 - 1. Materials shall have been tested to provide fire rating equal to that of the construction.
- B. Regulatory Requirements:
 - 1. Firestopping materials and installation shall be subject to the interpretation and approval of the authority having jurisdiction.

1.4 QUALITY ASSURANCE FOR PLUMBING CAULKING AND SEALING

- A. S.T.I.
- B. Metacaulk
- C. 3-M
- D. Nelson

1.5 SUBMITTALS

- A. Shop Drawings:
 - 1. Submit shop drawings indicating each condition requiring penetration seals in dictating proposed UL systems materials, anchorage, methods of installation and actual adjacent construction.
 - 2. Submit a copy of UL illustration of each proposed system indicating manufacturer approved modifications.
 - 3. Submit shop drawing for plumbing caulking and sealing.

- B. Manufacturer's Data:
 - 1. Submit copies of manufacturer's specifications, storage data, recommendations, installation instructions and maintenance data for each type of material required. Include letter indicating that each material complies with the requirements of regulatory agencies listed in Article 1.02 of this section of the specification.
 - 2. Submit Material Safety Data Sheets with product delivered to job site.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in original unopened containers or bags bearing the name of the manufacturer, product name, type, grade and U.L. Classification Mark (or other acceptable approval or listing mark) where applicable.
- B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job site.
- C. Storage of products shall comply with manufacturer's requirements for each product.
- D. Comply with recommended procedures, precautions or remedies described in Material Safety Data sheets as applicable.
- E. Do not use damaged materials.

1.7 DEFINITIONS

- A. Fire Rated: Having the ability to withstand the effects of fire for a specified time period as determined by qualified testing.
- B. Fire Rated Assembly: A floor, wall or other partition able to withstand a design fire and hose stream test without failure.
- C. Fire Resistance Rating: The time, in hours, for which the rated assembly can withstand the effects of fire without burn-through or structural failure.
- D. Firestop: A means of sealing openings in fire rated assemblies to preserve or restore the fire resistance rating.
- E. Firestop System: The combination of materials and/or devices, including the penetrating items, required to make up a complete firestop.
- F. Penetrating Item: Pipe penetrations duct, penetrations or other mechanical elements passing through an opening in a fire rated assembly.

1.8 GUARANTEE

- A. Submit copies of written guarantee agreeing to repair or replace joint sealers which fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance or general durability or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. The guarantee period shall be one (1) year from date of substantial completion.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Firestopping material shall be asbestos free, having code approvals as listed in Article 1.02 of this specification.
- B. Firestopping material shall have a flame spread of 25 or less.
- C. Fire Resistance and Hose Stream Tests:
 - 1. Firestopping materials shall be rated "F" and "T" in accordance with ASTM E814 or UL 1479.
 - 2. Firestopping materials shall be classified by UL to provide fire barrier equal to time rating of construction to be penetrated.

PART 3 EXECUTION

3.1 SEQUENCING AND SCHEDULING

- A. Firestopping requirements will be created by other subcontractors under related sections of the project specification. Contractor shall:
 - 1. Identify all locations requiring firestopping.
 - 2. Schedule installation of firestopping after completion of duct, piping, electrical runs, but prior to covering or concealing of openings or eliminating access thereto.

3.2 PROJECT CONDITIONS

- A. Existing Conditions:
 - 1. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
 - 2. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.
- B. Environmental Requirements:
 - 1. Furnish adequate ventilation if using solvent.
 - 2. Furnish forced air ventilation during installation if required by manufacturer.
 - 3. Keep flammable materials away from sparks or flame.
 - 4. Provide masking and drop cloths to prevent contamination of adjacent surfaces for firestopping materials.

3.3 PREPARATION

- A. Clean surfaces to be in contact with penetration seal materials, of dirt, grease, oil, loose materials, rust or other substances that may affect proper fitting, adhesion or the required fire resistance.

3.4 INSTALLATION

- A. Install firestopping materials in all openings in fire rated construction to comply with the fire rating of the construction.
- B. Install firestopping materials in accordance with printed instructions of the UL building Materials Directory and in accordance with manufacturer's written instructions.
- C. Seal holes or voids may be penetrations to ensure an effective barrier.

- D. Where floor openings without penetrating items are more than four (4") in width and subject to traffic or loading, install firestopping materials capable of supporting same loading as floor.
- E. Protect materials from damage on surfaces subject to traffic.
- F. Follow manufacturer's written instructions to obtain a smooth, professional finish to surrounding surfaces.
- G. Remove any temporary materials used during installation of firestopping materials.

3.5 REPAIRS AND MODIFICATIONS

- A. Identify damages or re-entered seals requiring repair or modification.
- B. Remove loose or damaged materials.
- C. If penetrating elements are to be added, remove enough material to insert being careful not to cause damage to the balance of the seal.
- D. Insure that surfaces to be sealed are clean and dry.
- E. Provide firestopping materials and installation identical to original manufacturer for repair of original seal.

3.6 FIELD QUALITY CONTROL

- A. Examine penetration seals for proper installation, adhesion and curing as appropriate for the respective seal materials.
- B. Keep areas of work accessible and notify code authorities or designated work released for inspection.
- C. Document completion and inspection.
- D. Perform under with section patching and repairing of firestopping caused by cutting or penetration by other trades.

3.7 ADJUSTING AND CLEANING

- A. Clean up spills of liquid components.
- B. Neatly cut and trim materials as required.
- C. Remove equipment, materials and debris leaving area in undamaged, clean condition.

END OF SECTION

SECTION 26 05 19
BUILDING WIRE AND CABLE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Building wire and cable.
- B. Wiring connectors and connections.

1.2 RELATED SECTIONS

- A. Section 26 05 32 - Conduit.
- B. Section 26 05 34 - Boxes.
- C. Section 26 05 53 - Identification.

1.3 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Product Data: Provide for each cable assembly type.
- C. Test Reports: Indicate procedures and values obtained.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years experience.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.7 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Conductor sizes are based on copper unless indicated as aluminum or "AL".
- C. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.

- D. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.8 COORDINATION

- A. Coordinate Work under provisions of Division 1.
- B. Determine required separation between cable and other work.
- C. Determine cable routing to avoid interference with other work.

PART 2 PRODUCTS

2.1 BUILDING WIRE AND CABLE

- A. Description: Single conductor insulated wire.
- B. Conductor: Copper.
- C. Insulation Voltage Rating: 600 or 300 volts.
- D. Insulation: ANSI/NFPA 70, Type THW, TW, or THHN/THWN.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that mechanical work likely to damage wire and cable has been completed.

3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.

3.3 WIRING METHODS

- A. All building wire to be THHN/THWN unless noted otherwise.
- B. Use wiring methods indicated on Drawings.

3.4 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Use solid conductor for feeders and branch circuits 10 AWG and smaller.
- C. Use stranded conductors for control circuits.
- D. Use conductor not smaller than 12 AWG for power and lighting circuits.
- E. Use conductor not smaller than 14 AWG for control circuits.

- F. Use 12 AWG conductors for 20A, 120V branch circuits less than 45 feet. Use 10 AWG conductors for 20A, 120V branch circuits less than 70 feet. For 20A, 120V branch circuits greater than 70 feet, conductors shall be sized as required by N.E.C. for voltage drop compensation.
- G. Pull all conductors into raceway at same time.
- H. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- I. Protect exposed cable from damage.
- J. Support cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure. Do not rest cable on ceiling panels.
- K. Use suitable cable fittings and connectors.
- L. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- M. Clean conductor surfaces before installing lugs and connectors.
- N. Use suitable reducing connectors or mechanical connector adaptors for connecting aluminum conductors to copper conductors.
- O. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape un-insulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
- P. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
- Q. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

3.5 WIRE AND CABLE INSTALLATION SCHEDULE (LOW VOLTAGE)

- A. Concealed Interior Locations: In raceways.
- B. Exposed Interior Locations: In raceways.
- C. Above Accessible Ceilings: In cable tray or supports per code.
- D. Wet or Damp Interior Locations: In raceway.
- E. Exterior Locations: In raceways.
- F. Underground Locations: In raceways.

3.6 INTERFACE WITH OTHER PRODUCTS

- A. Identify wire and cable under provisions of Section 26 05 53.
- B. Identify each conductor with its circuit number or other designation indicated on Drawings.

3.7 FIELD QUALITY CONTROL

- A. Perform field inspection and testing as specified.

- B. Inspect wire and cable for physical damage and proper connection.
- C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
- D. Verify continuity of each branch circuit conductor.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING

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. Division 26 Section 26 05 00 - Basic Electrical Requirements shall apply to work specified in this section.
- C. Requirements of this section apply to electrical grounding and bonding work specified elsewhere in these specifications.

1.2 SUMMARY

- A. This section includes:
 - 1. Grounding of electrical systems and equipment and basic requirements for grounding for protection of life, equipment, circuits and systems.
 - 2. Building Ground Rings (counterpoise systems).
- B. Provide grounding of the entire electrical installation as shown on the Drawings and specified herein, and in accordance with Article 250 of the National Electrical Code (NEC).
- C. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for grounding rods, connectors and connection materials and grounding fittings.
- C. Field tests and observation reports certified by the testing organization and indicating and interpreting the test reports for compliance with performance requirements.
- D. Manufacturer's instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of national Electrical Testing Association (NETA) and that is acceptable to authorities having jurisdiction.
- B. Comply with UL 467.
- C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
- D. Comply with NECA's "Standard of Installation."

PART 2 PRODUCTS

2.1 GROUNDING CONDUCTORS

- A. Governing Requirements: Where types, sizes, ratings, and quantities indicated are in excess of National Electrical Code (NEC) requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.
- B. Wire and Cable Grounding Conductors:
 - 1. Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.
 - 2. Use only copper wire for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone and similar materials.
 - 3. Equipment Grounding Conductors: Insulated with green color insulation.
 - 4. Grounding-Electrode Conductors: Bare stranded copper.
 - 5. Underground Conductors: Bare, Tinned, Stranded, except as otherwise indicated.
 - 6. Bare Copper Conductors: Conform to the following:
 - a. Solid Conductors: ASTM B3.
 - b. Assembly of Stranded Conductors: ASTM B8.
 - c. Tinned Conductors: ASTM B33.
 - 7. Copper Bonding Conductors: As follows:
 - a. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4" in diameter.
 - b. Bonding Conductor: No. 4 or No. 6 AWG stranded copper conductor.
 - c. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8" wide and 1/16" thick.
 - d. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8" wide and 1/16" thick.
 - 8. Grounding Bus: Bare, annealed-copper bars of rectangular cross section, with insulators.
 - 9. Braided Bonding Jumpers: Copper tape, braided No. 30 AWG bare copper wire, terminated with copper ferrules.
 - 10. Bonding Straps: Soft copper, 0.05 inch thick and 2 inches wide, except as indicated.
- C. Connector Products
 - 1. Products shall be listed and labeled as grounding connectors for the materials used. No aluminum materials shall be utilized within 18" of the earth where used for the purpose of grounding.
 - 2. Compression connectors shall be type CRA.
 - 3. Mechanical connectors shall be type SLUH.
 - 4. Provide exothermic welding system for use in making electrical grounding connections of copper-to-copper or copper-to-steel. Exothermically welded connections are required on all grounding electrode conductors, all connections to building steel, (connections to structural member), all grounding conductors run under the earth, connection to ground rods and in any case where grounding conductors are subject to a hostile environment.
 - a. The exothermic welding system furnished under these specifications shall meet the applicable requirements of IEEE-80, Chapter 9, Section of conductors and joints.
 - b. Molds shall be made from graphite or other material that is so designed to provide an average life of not less than 50 exothermic welds under normal conditions. Molds shall bear permanent marking, indicating the name of the manufacturer, the mold model, the type and size of welding mixture compatible with the welding process, and the size of the conductor. Instructions detailing general safety information, and welding procedures shall be provided with each mold.

- c. Starting material, if used, shall consist of aluminum and copper/copper oxide and iron oxides. It shall not contain phosphorous or any caustic, toxic or explosive substance. Weld metal used for grounding connections shall contain copper oxide, aluminum. Where welding is done in enclosed structures, the Erico Exolon smokeless system shall be used.
- D. Grounding Electrodes and Test Wells
 1. Grounding Rods: Copper-clad steel, Size: 3/4" by 10'.
 2. Test wells shall be T416C as manufactured by Erico. Where multiple connections are made, an Erico bus bar system, compression connectors and ground inspection well Type T416A shall be used.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examination areas and conditions under which electrical grounding and bonding connections are to be made and notify the Engineer in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.

3.2 APPLICATION

- A. In raceways, use insulated equipment grounding conductors.
- B. Exothermic-Welded Connections only: Shall be used for connections to structural steel, ground rods, signal reference grid, counterpoise conductors and for all underground connections, except those at test wells.
- C. Equipment Grounding Conductor Terminations: Use IlSCO Type CRA compression connectors.
- D. Underground Grounding Conductors: Use copper conductor, No. 2/0 AWG minimum. Bury at least 30" below grade or bury 12" above duct bank when installed as part of the duct bank.
- E. Equipment Grounding Conductors: Comply with NEC Article 250 for types, sizes and quantities of equipment grounding conductors, except where specific types, larger sizes, or more conductors than required by NEC are indicated.
 1. Install equipment grounding conductor with circuit conductors for the items below in addition to those required by Code:
 - a. Feeders and branch circuits.
 - b. Lighting circuits.
 - c. Receptacle circuits.
 - d. Single-phase motor or appliance branch circuits.
 - e. Three-phase motor or appliance branch circuits.
 - f. Flexible raceway runs.
 - g. Armored and metal-clad cable runs.
 2. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120V and above, including air cleaners and heaters. Bond conductor to each unit and to air duct.
 3. Water Heater, Heat-Tracing and Anti-Frost Heater Circuits: Install a separate equipment grounding conductor to each electric water heater, heat tracing assembly, and anti-frost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

- 4. Separately Derived Systems: Where NEC requires grounding, ground according to NEC Paragraph 250-30.
- F. Connections to Lightning Protection System: Bond grounding conductors, including grounding-conductor conduits to lightning protection down conductors or lightning protection grounding conductors in compliance with NFPA 780.
- G. Common Ground Bonding with Lightning Protection System: Bond electric power system, grounding electrode system directly to lightning protection system earth connection at closest point to electric service grounding electrode. Use bonding conductor sized same as system grounding conductor and install in conduit.

3.3 INSTALLATION

- A. General: Ground electrical systems and equipment according to NEC requirements, except where Drawings or Specifications exceed NEC requirements.
- B. Ground Rods for Service Entrance Earth Connection: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
 - 1. Drive ground rods until tops are 6" below finished floor or final grade, unless otherwise indicated.
 - 2. Interconnect ground rods with grounding-electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.
 - 3. Where soil conditions make driving ground rods impossible, a 6" hole shall be augured into the earth and filled with Erico Gem after the ground rod connection is made, or a trench no less than 24" deep shall be utilized for horizontal placement of the rod and backfilled with Erico Gem.
- C. Grounding Conductors: Route along the shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- D. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- E. Metal Water Service Pipe: Provide insulated copper grounding conductors, sized as indicated, 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 by grounding-clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Do not install a grounding jumper across dielectric fittings. Bond grounding-conductor conduit to conductor at each end.
- F. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding-clamp connectors.
- G. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters and air cleaners. Use braided-type bonding straps.

- H. Bond each above ground portion of gas piping system upstream from equipment shutoff valve.

3.4 CONNECTIONS

- A. General: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to assure high conductivity and to make contact points closer in order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded (CADWELD) Connections: Use for connections to structural steel and for underground connections, except those at test wells. Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding-Wire Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs, SLUH type, No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Non-contact Metal Raceway Terminations: Where metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bon electrically non-continuous conduits at both entrances and exits with grounding bushings and bare grounding conductors, except as otherwise indicated.
- E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Where these requirements are not available, use those specified in UL 486A and UL 486B.
- F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by manufacturer of connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- G. Moisture Protection: Where insulated grounding conductors are connected to grounding rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 OVERHEAD LINE GROUNDING

- A. Comply with IEEE C2 requirements. Use two or more parallel ground rods if a single ground rod electrode resistance to ground exceeds 25 ohms.
- B. Drive ground rods to a depth of 12 inches below finished grade in undisturbed earth.

- C. Ground Rod Connections: Use clamp-type connectors listed for the purpose for underground connections and connections to rods.
- D. Lightning Arresters: Separate arrester grounds from other grounding conductors.
- E. Secondary Neutral and Tank of Transformer: Interconnect and connect to grounding conductor.

3.6 FIELD QUALITY CONTROL

- A. Tests: Subject the completed grounding system to a megger test at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2-point method according to IEEE81.
- B. Excessive Ground Resistance: Where resistance to ground exceeds specified values, notify owner promptly and include recommendations to reduce ground resistance and to accomplish recommended work.

END OF SECTION

SECTION 26 05 29
SUPPORTING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

1.2 REFERENCES

- A. NECA - National Contractors Association.
- B. ANSI/NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Product Data: Provide manufacturer's catalog data for fastening systems.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. Materials and Finishes: Provide adequate corrosion resistance.
- B. Provide materials, sizes and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
- C. Anchors and Fasteners
 - 1. Concrete Structural Elements: Use pre-cast insert system, expansion anchors, powder actuated anchors and preset inserts.
 - 2. Steel Structural Elements: Use beam clamps, spring steel clips, steel ramset fasteners and welded fasteners.
 - 3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
 - 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.
 - 5. Solid Masonry Walls: Use expansion anchors and preset inserts.
 - 6. Sheet Metal: Use sheet metal screws.
 - 7. Wood Elements: Use wood screws.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
- C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- D. Do not use spring steel clips and clamps.
- E. Obtain permission from Architect/Engineer before using powder-actuated anchors.
- F. Obtain permission from Architect/Engineer before drilling or cutting structural members.
- G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- H. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- I. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.
- J. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

SECTION 26 05 32
CONDUIT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal conduit.
- B. Flexible metal conduit.
- C. Liquid-tight flexible metal conduit.
- D. Electrical metallic tubing.
- E. Nonmetal conduit.
- F. Electrical nonmetallic tubing.
- G. Flexible nonmetallic conduit.
- H. Fittings and conduit bodies.

1.2 RELATED SECTIONS

- A. Division 01 - Fire Stopping.
- B. Division 01 - Roofing Penetrations.
- C. Section 26 05 26 - Grounding and Bonding.
- D. Section 26 05 29 - Supporting Devices.
- E. Section 26 05 34 - Boxes.
- F. Section 26 05 53 - Electrical Identification.

1.3 REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
- B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
- C. ANSI C80.5 - Rigid Aluminum Conduit.
- D. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes and Conduit Bodies for Conduit and Cable Assemblies.
- E. ANSI/NFPA 70 - National Electrical Code.
- F. NECA "Standard of Installation."
- G. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
- H. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

- I. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.4 DESIGN REQUIREMENTS

- A. Conduit Size: ANSI/NFPA 70.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect, and handle Products to site under provisions of Division 01.
- B. Accept conduit on site. Inspect for damage.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- D. Protect PVC conduit from sunlight.

1.6 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

PART 2 PRODUCTS

2.1 CONDUIT REQUIREMENTS

- A. Size:
 - 1. Minimum - 1/2 inch unless otherwise specified.
 - 2. Homerun - 3/4 inch unless otherwise specified.
 - 3. As per N.E.C.
- B. Underground Installations:
 - 1. Use Thickwall Non-metallic conduit
 - 2. From underground to above grade in exposed locations use rigid steel conduit.
 - 3. In or under slab use non-metallic conduit.
 - 4. Minimum size - 3/4 inch.
 - 5. Any conduit which rises up through a slab to be rigid steel conduit.
 - 6. For floor boxes minimum of 1-1/4".
- C. Outdoor Locations:
 - 1. Not exposed to damage: Use thickwall non-metallic tubing.
 - 2. Exposed to damage: Use rigid steel conduit.
- D. Motor, Appliance and Equipment Connections:
 - 1. Dry locations: Use flexible metal conduit.
 - 2. Wet and damp locations: Use liquid-tight flexible metal conduit or flexible non-metallic conduit.
- E. Wet and Damp Locations: Use rigid steel and thickwall non-metallic conduit.
- F. Dry Locations:
 - 1. Concealed: Use rigid steel, intermediate metal conduit, electrical metallic tubing.
 - 2. Exposed: Use rigid steel, intermediate metal conduit, electrical metallic tubing.

- G. Connectors and Fittings
1. Where EMT conduit is exposed to moisture, couplings and connectors shall be the rain-tight steel compression type equal to Thomas and Betts Series 5120 couplings, Series 5121 connectors in sizes 1 inch and smaller and Series 5123 insulated throat connectors in sizes larger than 1 inch. Couplings and connectors for EMT conduit in concrete or in dry locations shall be the concrete tight steel set-screw type equal to Thomas and Betts Series 5030 couplings. Series 5051 connectors in sizes 1 inch and smaller and Series 5031 insulated throat connectors in sizes larger than 1 inch.
 2. No "indenters" type fittings or white metal "die cast" fittings shall be used.
 3. Couplings for rigid conduit shall be the rigid threaded type. Where rigid conduit is exposed to moisture, connections and enclosures shall be made with liquid tight steel or iron hub fittings with insulated throats equal to Thomas and Betts Series 370. Rigid conduit connectors at outlet boxes in concrete or in dry locations shall be the concrete tight setscrew type with insulated throats equal to Thomas and Betts Series 8125. Rigid conduit connections at cabinets, junction boxes, pull boxes or auxiliary gutters in dry locations shall be made with locknuts equal to Thomas and Betts. Series 222 shall be provided on the ends of the conduit inside enclosures for conductor protection.
 4. Connectors for liquid-tight flexible conduit shall be equal to Thomas and Betts Series 5332, or 5352 or 5362 with insulated throats. Do not couple liquid-tight flexible steel conduit to liquid-tight flexible steel conduit.
 5. Connectors for flexible steel conduit shall be the angled wedge "Tight-Bite" equal to Thomas and Betts Series 302 and 323 sizes 1 inch and smaller and Series 3112 and 3132 in sizes larger than 1 inch.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install conduit in accordance with NECA "Standard of Installation."
- B. Install nonmetallic conduit in accordance with manufacturer's instructions.
- C. Arrange supports to prevent misalignment during wiring installation.
- D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- E. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- F. Fasten conduit supports to building structure and surfaces under provisions of Section 26 05 29.
- G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- H. Do not attach conduit to ceiling support wires.
- I. Arrange conduit to maintain headroom and present neat appearance.
- J. Route exposed conduit parallel and perpendicular to walls.
- K. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- L. Route conduit in and under slab from point-to-point.

- M. Do not cross conduits in slab.
- N. Maintain adequate clearance between conduit and piping.
- O. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104°F.
- P. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- Q. Bring conduit to shoulder of fittings; fasten securely.
- R. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe non-metallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- S. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- T. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams.
- U. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- V. Provide suitable fittings to accommodate expansion and deflection where conduit crosses control and expansion joints.
- W. Provide suitable pull string in each empty conduit except sleeves and nipples.
- X. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- Y. Ground and bond conduit under provisions of Section 26 05 26.
- Z. Identify conduit under provisions of Section 26 05 53.

3.2 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions of Division 01.
- B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation.

END OF SECTION

SECTION 26 05 34
BOXES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall and ceiling outlet boxes.
- B. Pull and junction boxes.

1.2 RELATED SECTIONS

- A. Section 26 05 04 - Firestopping.
- B. Division 08 - Access Doors.
- C. Section 26 27 16 - Cabinets and Enclosures.
- D. Section 26 27 26 - Wiring Devices: Wall plates in finished areas.

1.3 REFERENCES

- A. NECA - Standard of Installation.
- B. NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- C. NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- D. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- F. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS FOR CLOSEOUT

- A. Division 01 - Contract Closeout, Operation and Maintenance Data, Submittals for Project closeout.
- B. Record actual locations and mounting heights of outlet, pull and junction boxes on project record documents.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Provide Products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
 - 2. Concrete Ceiling Boxes: Concrete type.
- B. Nonmetallic Outlet Boxes: NEMA OS 2.
- C. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.
- D. Wall Plates for Finished Areas: As specified in Section 26 27 26.

2.2 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Hinged Enclosures: As specified in Section 26 27 16.
- C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
 - 1. Material: Cast aluminum.
 - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- D. In-grade enclosures shall be COMPOSOLITE as manufactured by Quazite or approved equal.
 - 1. Boxes and covers shall be green and sustain a minimum vertical test load of 12,000# a 10" square.
 - 2. All covers will have a minimum coefficient friction of .50.
 - 3. Plastic and fiberglass boxes will not be accepted.
 - 4. Boxes shall be stackable for extra depth.
 - 5. Boxes shall have no bottoms.
 - 6. Size as required.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify locations of floor boxes and outlets prior to rough-in.

3.2 INSTALLATION

- A. Install boxes in accordance with NECA "Standard of Installation."
- B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- C. Set wall mounted boxes at elevations to accommodate mounting heights as indicated on drawings and specified in Section 26 05 35.
- D. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Adjust box location if required to accommodate intended purpose.

- E. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.
- F. Maintain headroom and present neat mechanical appearance.
- G. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- H. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- I. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 26 05 04.
- J. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- K. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
- L. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- M. Use flush mounting outlet box in finished areas.
- N. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- O. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.
- P. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- Q. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- R. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- S. Use adjustable steel channel fasteners for hung ceiling outlet box.
- T. Do not fasten boxes to ceiling support wires.
- U. Support boxes independently of conduit.
- V. Use multi gang box where more than one device is mounted together. Do not use sectional box.
- W. Use 2-gang box with plaster ring for single device outlets.
- X. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- Y. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.
- Z. Set floor boxes level.
- AA. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate installation of outlet box for equipment connected under Section 26 05 03.

3.4 ADJUSTING

- A. Division 01 - Contract Closeout; Division 01 Testing, Adjusting, and Balancing: Adjusting installed work.
- B. Adjust floor box flush with finish flooring material.
- C. Adjust flush-mounting outlets to make front flush with finished wall material.
- D. Install knockout closures in unused box openings.

3.5 CLEANING

- A. Division 01 - Contract Closeout: Cleaning installed work.
- B. Clean interior of boxes to remove dust, debris and other material.
- C. Clean exposed surfaces and restore finish.

END OF SECTION

**SECTION 26 05 35
MOUNTING HEIGHTS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Mounting heights of electrical equipment.

1.2 RELATED SECTIONS

- A. Section 26 05 34 - Boxes
- B. Section 26 24 16 - Panelboards
- C. Section 26 27 16 - Cabinets and Enclosures
- D. Section 26 27 26 - Wiring Devices
- E. Section 26 28 19 - Disconnect Switches

1.3 PROJECT CONDITIONS

- A. Verify location of floor boxes and outlets prior to rough-in.
- B. Electrical boxes are shown on drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose.

PART 2 PRODUCTS

2.1 OUTLET MOUNTING HEIGHTS

- A. All dimensions indicated hereafter and on plan are from above finished floor (AFF) to centerline of outlet unless noted otherwise.
- B. Align adjacent wall-mounted outlet boxes for wall switches, fire alarm pull stations and other similar devices with each other.
- C. Align outlets for receptacles, data/video, telephone and fire alarm devices vertically to provide neat appearance.
- D. Mounting heights indicated herein after are for typical mounting height. Specific mounting height may be required. These heights are to be as indicated on plan.
- E. Refer to Architectural plans for additional information in regards to outlet alignment.
- F. Mounting heights for miscellaneous devices outlets to be as follows:
 - 1. Receptacles - 18" AFF.
 - 2. Desk Telephone/Intercom - 18" AFF.
 - 3. Data/Video - 18" AFF.
 - 4. Misc. devices at counters, benches or hydronic radiation - 4" above backsplash, unless noted otherwise.
 - 5. Wall switches - 46" AFF.
 - 6. Wall telephone/intercom and thermostats - 52" AFF.

7. Exit signs (back mounted) - Bottom of exit sign to be 4" above top of door frame. If ceiling height does not allow this, sign to be centered between door frame and finished ceiling.
 8. Clocks to be mounted at heights as indicated on plan.
 9. Emergency Battery Units - Approximately 96" AFF. Verify exact mounting heights with Architect, unless otherwise noted on plan.
- G. Mounting Height of Receptacles and Communication devices to be coordinated with mechanical equipment and built-in furniture on Architectural Plans.
- H. Panelboards and Disconnect Switches - 6 feet to top of back box.
- I. Cabinets and Enclosure - As indicated on plan.
- J. Fire Alarm Panel - Five (5) feet to top of back box.

END OF SECTION

SECTION 26 05 53
ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Nameplates.
- B. Wire and cable markers.
- C. Conduit color coding.

1.2 RELATED WORK

- A. Division 09 - Painting.

1.3 SUBMITTALS

- A. Submit shop drawings under provisions of Division 01.
- B. Include schedule for nameplates.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Nameplates: Engraved three-layer laminated plastic, white letters on a black background.
- B. Wire and Cable Markers: Cloth markers, split sleeve or tubing type.

PART 3 EXECUTION

3.1 INSTALLATION

- A. De-grease and clean surfaces to receive nameplates and tape labels.
- B. Install nameplates and tape labels parallel to equipment lines.
- C. Secure nameplates to equipment fronts using screws, rivets, or adhesive. Secure nameplate to inside face of recessed panelboard doors in finished locations.
- D. Provide custom engraved wall plates for wall switches and outlets as indicated on plan.

3.2 WIRE IDENTIFICATION

- A. Provide wire markers on each control conductor with control wire number as indicated on equipment manufacturer's shop drawings for control wiring.

3.3 NAMEPLATE ENGRAVING SCHEDULE

- A. Provide nameplates to identify all electrical distribution and control equipment, and loads served. Letter Height: 1/8 inch for individual switches and loads served, 1/4 inch for distribution and control equipment identification.

- B. Provide nameplates of minimum letter height as scheduled below.
- C. Panelboards, Switchboards and Motor Control Centers: 1/4 inch; identify equipment designation. 1/8 inch; identify voltage rating and source.
- D. Individual Circuit Breakers, Switches, and Motor Starters in Switchboards, and Motor Control Centers: 1/8 inch; identify circuit and load served, including location.
- E. Individual Circuit Breakers, Enclosed Switches, and Motor Starters: 1/8 inch; identify load served.
- F. Transformers: 1/4 inch; identify equipment designation. 1/8 inch; identify primary and secondary voltages, primary source, and secondary load and location.
- G. Variable Frequency Controllers: 1/4 inch; identify equipment designation. 1/8 inch; identify source and load served.

3.4 HIGH VOLTAGE SIGNAGE

- A. Provide high voltage signs and labels on electrical system components and building doors and access as required by N.E.C.

END OF SECTION

SECTION 26 09 42
TIME CLOCKS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Exterior Lighting Time Clock (T-2).

1.2 REFERENCES

- A. NEMA ICS 1 - General Standards for Industrial Control and Systems.
- B. NEMA ICS 3 - Industrial Systems.
- B. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
- C. NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Shop Drawings: Indicate electrical characteristics and connection requirements, including layout of completed assemblies, interconnecting cabling, dimensions, weights, and external power requirements.
- C. Product Data: Provide data for each component specified showing electrical characteristics and connection requirements.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 01.
- B. Record actual locations of controller cabinets and input and output devices connected to system. Include interconnection wiring and cabling information, and terminal block layouts in controller cabinets.

1.5 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division 01.
- B. Operation Data: Include bound copies of operating and programming instructions.
- C. Maintenance Data: Include card replacement, adjustments, and preventative maintenance procedures and materials.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish Products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 01.
- B. Accept products on site in factory containers. Inspect for damage.
- C. Store products in clean, dry area; maintain temperature to NEMA ICS 1.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Tork.
- B. Paragon.

2.2 EXTERIOR LIGHTING TIME CLOCK (T-2)

- A. Description: Tork Cat. No. Z400.
 - 1. 7 day/256 set point, digital control, holiday scheduling, astronomic, 4 channel.
 - 2. Automatically adjust for daylight savings time.
 - 3. Automatic leap year correction.
 - 4. Battery backup.
 - 5. Manual override.
 - 6. Any or all channels may be set for astronomic and multiple on/off scheduling between astro settings from sunset to sunrise.
- B. Enclosure: Surface mounted NEMA 1 with lockable hasp.
- C. Location: Install in common enclosure with lighting contactors. See plan.
- D. Schedule:
 - 1. Channel 1 - Building mounted.
 - 2. Channel 2 - Future rink lights.
 - 3. Channel 3 - Future rink lights.
 - 4. Channel 4 - Space.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Do not install products until major construction is complete and building interior is enclosed and heated.
- C. Connect input and output devices as indicated.

3.2 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Division 01.
- B. Perform operational testing on control systems to verify proper operation and field wiring connections.

3.3 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems under provisions of Division 01.

3.4 DEMONSTRATION

- A. Provide systems demonstration under provisions of Division 01.
- B. Demonstrate operation and programming of controller.

END OF SECTION

BLANK PAGE

SECTION 26 24 16
PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Branch circuit panelboards.

1.2 RELATED SECTIONS

- A. Section 26 05 26 - Grounding and Bonding.
- B. Section 26 05 53 - Electrical Identification.
- C. Section 26 28 13 - Fuses.

1.3 REFERENCES

- A. NECA Standard of Installation (published by the National Electrical Contractors Association).
- B. NEMA AB1 - Molded Case Circuit Breakers.
- C. NEMA ICS 2 - Industrial Control Devices, Controllers and Assemblies.
- B. NEMA KS1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- C. NEMA PB 1 - Panelboards.
- D. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- E. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment (published by the International Electrical Testing Association).
- F. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS FOR REVIEW

- A. Division 01 - Submittals: Procedures for submittals.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

1.5 SUBMITTALS FOR INFORMATION

- A. Division 01 - Submittals: Submittals for information.
- B. Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.6 SUBMITTALS FOR CLOSEOUT

- A. Division 01 - Contract Closeout; Operation and Maintenance Data; Submittals for Project Closeout.
- B. Record actual locations of panelboards and record actual circuiting arrangements in project record documents.
- C. Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.8 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.9 MAINTENANCE MATERIALS

- A. Division 01 - Contract Closeout.
- B. Furnish two of each panelboard key.

PART 2 PRODUCTS

2.1 BRANCH CIRCUIT PANELBOARDS

- A. Division 01 - Material and Equipment: Product Options
- B. Manufacturers:
 - 1. Square 'D'
 - 2. ITE
- C. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.
- D. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.
- E. Minimum Integrated Short Circuit Rating or as indicated.
- F. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers.
- G. Enclosure: NEMA PB 1, Type 1.
- H. Cabinet Box: 6 inches deep, 20 inches wide for 240 volt and less panelboards.

- I. Cabinet Front: Flush cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install panelboards in accordance with NEMA PB 1.1 and the NECA "Standard of Installation."
- B. Install panelboards plumb. Install recessed panelboards flush with wall finishes.
- C. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.
- D. Provide filler plates for unused spaces in panelboards.
- E. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- F. Provide engraved plastic nameplates under the provisions of Section 26 05 53.
- G. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling or below floor. Minimum spare conduits: five (5) 1" empty. Identify each as SPARE.
- H. Ground and bond panelboard enclosure according to Section 26 05 26.

3.2 FIELD QUALITY CONTROL

- A. Division 01 - Quality Control; Starting of Systems: Field inspection, testing, adjusting.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.4 for switches, Section 7.5 for circuit breakers.

3.3 ADJUSTING

- A. Division 01 - Contract Closeout; - Testing, Adjusting, and Balancing; Adjusting installed work.
- B. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

3.4 SCHEDULES

- A. As indicated on plan.

END OF SECTION

BLANK PAGE

SECTION 26 27 16
CABINETS AND ENCLOSURES

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Hinged cover enclosures.
- B. Cabinets.
- C. Terminal blocks and accessories.

1.2 REFERENCES

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. ANSI/NEMA ICS 1 - Industrial Control and Systems.
- C. ANSI/NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems.
- D. ANSI/NEMA ICS 6 - Enclosures for Industrial Control Equipment and Systems.

1.3 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Shop Drawings for Equipment Panels: Include wiring schematic diagram, wiring diagram, outline drawing and construction diagram as described in ANSI/NEMA ICS 1.

PART 2 PRODUCTS

2.1 HINGED COVER ENCLOSURES

- A. Construction: NEMA 250; Type 1, steel.
- B. Finish: Manufacturer's standard enamel finish.
- C. Covers: Continuous hinge, held closed by flush latch operable by key.
- D. Panel for Mounting Terminal Blocks or Electrical Components: 14 gauge steel, white enamel finish.

2.2 CABINETS

- A. Cabinet Boxes: Galvanized steel with removable endwalls, 24 inches wide, 36 inches high. Provide 3/4 inch thick plywood backboard painted matte white, for mounting terminal blocks.
- B. Cabinet Fronts: Steel, flush or surface type with screw cover front, concealed hinge and flush lock keyed to match branch circuit panelboard; finish in gray baked enamel.

2.3 TERMINAL BLOCKS AND ACCESSORIES

- A. Terminal Blocks: ANSI/NEMA ICS 4; UL listed.
- B. Power Terminals: Unit construction type, closed-back type, with tubular pressure screw connectors, rated 600 volts.
- C. Signal and Control Terminals: Modular construction type, channel mounted; tubular pressure screw connectors, rated 300 volts.

2.4 FABRICATION

- A. Shop assemble enclosures and cabinets housing terminal blocks or electrical components in accordance with ANSI/NEMA ICS 6.
- B. Provide knockouts on enclosures.
- C. Provide protective pocket inside front cover with schematic diagram, connection diagram, and layout drawing of control wiring and components within enclosure.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install cabinets and enclosures plumb; anchor securely to wall and structural supports at each corner, minimum.
- B. Provide accessory feet for free-standing equipment enclosures.
- C. Install trim plumb.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Device plates and decorative box covers.

1.2 RELATED SECTIONS

- A. Section 26 05 34 - Boxes.

1.3 REFERENCES

- A. NECA - Standard of Installation.
- B. NEMA WD 1 - General Requirements for Wiring Devices.
- C. NEMA WD 6 - Wiring Device -- Dimensional Requirements.
- D. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS FOR REVIEW

- A. Division 01 - Submittals: Procedures for submittals.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.5 SUBMITTALS FOR INFORMATION

- A. Division 01 - Submittals: Submittals for information.
- B. Submit manufacturer's installation instructions.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Provide Products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 WALL SWITCHES

- A. Manufacturers:
 - 1. Leviton - 1221-2
 - 2. Pass & Seymour - 20ACI
 - 3. Hubbell - 1221
 - 4. Cooper - 1991
- B. Description: NEMA WD 1, Commercial Specification Grade, AC only general-use snap switch.
- C. Body and Handle: White plastic with toggle handle.
- D. Indicator Light: Lighted handle type switch; red color lens.
- E. Locator Light: Lighted handle type switch; red color handle.
- F. Ratings:
 - 1. Voltage: 120 volts, AC.
 - 2. Current: 20 amperes.

2.2 SWITCH WITH TIMER

- A. Digital time switch to automatically turn lighting load or motor load off after a preset time.
- B. LCD display.
- C. For installation into standard wall box.
- D. Watt Stopper Inteliswitch Cat. No. TS-400 or equal. 0-800 watt rating.
- E. Finish: White.

2.3 WALL DIMMERS

- A See Specification Section 26 58 00 Occupancy Sensors and Low-Voltage Lighting Controls

2.4 RECEPTACLES

- A. Manufacturers:
 - 1. Leviton - 5352 - 20 AMP
 - 2. Pass & Seymour - 5352 - 20 AMP
 - 3. Hubbell - 5352 - 20 AMP
 - 4. Cooper - 5352 - 20 AMP
- B. Description: NEMA WD 1, Commercial Specification Grade, general use receptacle.
- C. Device Body: White plastic.
- D. Configuration: NEMA WD 6, type as specified and indicated.
- E. Convenience Receptacle: Type 5-20.

- F. GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.
- G. Tamper Resistant Duplex Receptacles - For installation in areas as per NEC 2017, section 406.12. Receptacle to have mechanical shutter to prevent improper access to energized contacts and to be capable of accepting (2) prong plugs.
- H. Weather Resistant Duplex Receptacles – For installation in damp and wet locations per NEC 2011, section 406.8.

2.5 WALL PLATES

- A. Decorative Cover Plate: Smooth stainless steel.
- B. Jumbo Cover Plate: Smooth stainless steel.
- C. Weatherproof While in Use Cover Plate:
 1. Mounting Base - Gray Die Cast With Cord Outlets
 2. Inserts - Black UV Stabilized Polycarbonate
 3. Gasket - Neoprene 1/8" thick with slits for mounting screws.
 4. Cover – Grey die cast metal.
 - a. Intermatic WP1010MC
 - b. Red Dot Cat. No. CKSGV.
 - c. Taymac Cat. No. MX3200
- D. Damp location receptacles are to have weatherproof covers when the receptacles are not in use.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Division 01 - Coordination and Meetings: Verification of existing conditions prior to beginning work.
- B. Verify that outlet boxes are installed at proper height.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean debris from outlet boxes.

3.3 INSTALLATION

- A. Install in accordance with NECA "Standard of Installation."
- B. Install devices plumb and level.
- C. Install switches with OFF position down.

- D. Install wall dimmers to achieve full rating specified and indicated after de-rating for ganging as instructed by manufacturer.
- E. Do not share neutral conductor on load side of dimmers.
- F. Install receptacles with grounding pole on top.
- G. Connect wiring device grounding terminal to outlet box with bonding jumper, branch circuit equipment grounding conductor.
- H. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
- I. Connect wiring devices by wrapping conductor around screw terminal.
- J. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3.4 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate locations of outlet boxes provided under Section 26 05 34 to obtain mounting heights specified in Section 26 05 35 and indicated on drawings.

3.5 FIELD QUALITY CONTROL

- A. Division 01 - Quality Control; Starting of Systems; field inspection, testing, adjusting and balancing.
- B. Inspect each wiring device for defects.
- C. Operate each wall switch with circuit energized and verify proper operation.
- D. Verify that each receptacle device is energized.
- E. Test each receptacle device for proper polarity.
- F. Test each GFCI receptacle device for proper operation.

END OF SECTION

SECTION 26 28 13
FUSES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fuses.
- B. Spare fuse cabinet.

1.2 REFERENCES

- A. NFPA 70 - National Electric Code.
- B. NEMA FU 1 - Low Voltage Cartridge Fuses.

1.3 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

1.5 MAINTENANCE MATERIALS

- A. Provide maintenance materials under provisions of Division 01.
- B. Provide one fuse puller.

1.6 EXTRA MATERIALS

- A. Furnish under provisions of Division 01.
- B. Provide three of each size and type fuse. Provided by this contractor.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Littell Fuse
- B. Buss
- C. Ferraz/Shawmut
- D. Substitutions: Under provisions of Division 01.

2.2 FUSE REQUIREMENTS

- A. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.
- B. Voltage: Provide fuses with voltage rating suitable for circuit phase-to-phase voltage.
- C. Main Service Switches Larger than 600 amperes: Class L time delay.
- D. Power Load Feeder Switches: Class time delay. RK5.
- E. Motor Load Feeder Switches: Class time delay. RK5.
- F. Lighting Load Feeder Switches: Class time delay.
- G. Other Feeder Switches Larger than 600 amperes: Class L time delay.
- H. Other Feeder Switches: Class time delay RK5.
- I. Power Branch Circuits: Class time delay RK5.
- J. Motor Branch Circuits: Class time delay RK5.
- K. Variable Frequency Controller Circuits: Class J.

2.3 SPARE FUSE CABINET

- A. Description: Wall-mounted sheet metal cabinet, suitably sized to store spare fuses and Fuse pullers specified.
- B. Doors: Hinged, with hasp for Owner's padlock.
- C. Finish: Factory gray.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install fuses in accordance with manufacturer's instructions.
- B. Install fuse with label oriented such that manufacturer, type, and size are easily read.
- C. Install spare fuse cabinet where indicated.

END OF SECTION

SECTION 26 28 19
ENCLOSED DISCONNECT SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fusible switches.
- B. Non-fusible switches.

1.2 RELATED SECTIONS

- A. Section 26 28 13 - Fuses.

1.3 REFERENCES

- A. NECA - Standard of Installation (published by the National Electrical Contractors Association).
- B. NEMA FU1 - Low Voltage Cartridge Fuses.
- C. NEMA KS1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (published by the International Electrical Testing Association).
- E. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS FOR REVIEW

- A. Division 01 - Submittals: Procedures for submittals.
- B. Product Data: Provide switch ratings and enclosure dimensions.

1.5 SUBMITTALS FOR CLOSEOUT

- A. Division 01: Contract Closeout; Operation and Maintenance Data; Submittals for project closeout.
- B. Record actual locations of enclosed switches in project record documents.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Division 01 - Material and Equipment: Product options and substitutions.
- B. Square 'D'
- C. ITE
- D. Substitutions: Permitted.

2.2 FUSIBLE SWITCH ASSEMBLIES

- A. Description: NEMA KS 1, Type GD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position.
- B. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses.

2.3 NON-FUSIBLE SWITCH ASSEMBLIES

- A. Description: NEMA KS 1, Type GD with externally operable handle interlocked to prevent opening front cover with switch in ON position enclosed load interrupter knife switch. Handle lockable in OFF position.

2.4 ENCLOSURES

- A. Fabrication: NEMA KS 1.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with NECA "Standard of Installation."
- B. Install fuses in fusible disconnect switches.
- C. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.2 FIELD QUALITY CONTROL

- A. Division 01 - Quality Control; Starting of Systems; Field inspection, testing, adjusting.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.

END OF SECTION

SECTION 26 29 13
ENCLOSED MOTOR CONTROLLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Manual motor starters.
- B. Magnetic motor starters.
- C. Combination magnetic motor starters.

1.2 RELATED SECTIONS

- A. Section 26 05 29 - Supporting Devices.
- B. Section 26 05 53 - Electrical Identification: Engraved nameplates.

1.3 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. UL 198C - High-Interrupting Capacity Fuses; Current Limiting Type.
- C. UL 198E - Class R Fuses.
- D. NECA "Standard of Installation," published by National Electrical Contractors Association.
- E. NEMA AB 1 - Molded Case Circuit Breakers.
- F. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.
- G. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
- H. NEMA KS 1 - Enclosed Switches.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.
- C. Test Reports: Indicate field test and inspection procedures and test results.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with NECA Standard of Installation.

- B. Maintain one copy of document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

1.8 EXTRA MATERIALS

- A. Furnish under provisions of Division 01.
- B. Provide three of each size and type fuse and overload device installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Square D
- B. ITE
- C. Allen Bradley
- D. Cutler-Hammer
- E. Substitutions: Under provisions of Division 01.

2.2 MANUAL CONTROLLERS

- A. Manual Motor Controller: NEMA ICS 2, AC general-purpose Class A manually operated, full-voltage controller with overload element, red pilot light and toggle operator.
- B. Fractional Horsepower Manual Controller: NEMA ICS 2, AC general-purpose Class A manually operated, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light and toggle operator.
- C. Motor Starting Switch: NEMA ICS 2, AC general-purpose Class A manually operated, full-voltage controller for fractional horsepower induction motors, without thermal overload unit, with red pilot light and toggle operator.
- D. Enclosure: NEMA ICS 6; Type 1.

2.3 AUTOMATIC CONTROLLERS

- A. Magnetic Motor Controllers: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower.

- B. Two Speed Controllers: Include integral time delay transition between FAST and SLOW speeds.
- C. Coil operating voltage: 120 volts, 60 Hertz.
- D. Overload Relay: NEMA ICS; solid state with features as follows:
 - 1. Self-Powered
 - 2. 3.2:1 Adjustment Range
 - 3. Visible Trip Indicator
 - 4. Phase Loss Protection
- E. Enclosure: NEMA ICS 6, Type 1.

2.4 PRODUCT OPTIONS AND FEATURES TO BE PROVIDED

- A. Auxiliary Contacts: NEMA ICS 2, 2 each field convertible contacts in addition to seal-in contact.
- B. Cover Mounted Pilot Devices: NEMA ICS 2, standard 30.5mm duty type.
- C. Pilot Device Contacts: NEMA ICS 2, Form Z.
- D. Pushbuttons: Unguarded, 30.5mm type.
- E. Indicating Lights: 30.5mm red run LED type.
- F. Selector Switches: 3 position rotary type with Hand-Off-Auto legend plate 30.5mm.
- G. Relays: NEMA ICS 2.
- H. Control Power Transformers: 120 volt secondary, 75 va minimum, in each motor starter. Provide fused primary and secondary, and bond unfused leg of secondary to enclosure.
- I. Remote Mounted Pilot Devices Where Shown on Plans:
 - 1. Type PD-1 Wall Switch: NEMA WD1, heavy-duty, AC only general use snap switch. Finish and cover plates as indicated in Section 26 27 26.
 - 2. Type PD-2 Wall Switch W/Pilot (Indicator Light): Lighted handle type switch; red color lens finish and coverplate as indicated in Section 26 27 26.
 - 3. Type PD-3 Mechanically Interlocked Maintained Pushbutton Units: 1 N.O. and 1 N.C. contacts, green top flush. Button and red lower extended button.
 - a. Provide 'Run' and 'Stop' legend plates.
 - b. Provide red run pilot light.
 - c. Provide surface enclosure and cover plate; NEMA 1.
 - 4. Note: Label pilot devices as indicated in Section 26 05 53.

2.5 DISCONNECTS

- A. Combination Controllers: Combine motor controllers with fusible switch disconnect in common enclosure.
- B. Fusible Switch Assemblies: NEMA KS 1, enclosed knife switch with externally operable handle. Fuse clips: Designed to accommodate Class R fuses.

2.6 FUSES

- A. Manufacturers:
 - 1. Gould Shawmut
 - 2. Buss
 - 3. Littel
- B. Description: Dual element, current limiting, time delay, one-time fuse, 600 volt, UL 198E, Class RK 5.
- C. Interrupting Rating: 200,000 rms amperes.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install enclosed controllers where indicated, in accordance with manufacturer's instructions.
- B. Install enclosed controllers plumb. Provide supports in accordance with Section 26 05 29.
- C. Height: 5 ft to operating handle.
- D. Install fuses in fusible switches.
- E. Select and install overload heater elements in motor controllers to match installed motor characteristics.
- F. Provide engraved plastic nameplates under the provisions of Section 26 05 53.
- G. Provide neatly typed label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

3.2 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Division 01.
- B. Inspect and test each enclosed controller to NEMA ICS 2.

3.3 SCHEDULES - REFER TO DRAWINGS

END OF SECTION

SECTION 26 29 16
ENCLOSED CONTACTORS AND RELAYS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General purpose contactors.
- B. Lighting contactors.

1.2 REFERENCES

- A. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
- B. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.
- C. NFPA 70 - National Electrical Code.

1.3 SUBMITTALS FOR REVIEW

- A. Division 01 - Submittals: Procedures for submittals.
- B. Product Data: Provide dimensions, size, voltage ratings and current ratings.

1.4 SUBMITTALS FOR INFORMATION

- A. Division 01 - Submittals: Submittals for information.
- B. Submit manufacturer's installation instructions.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Provide Products listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 GENERAL PURPOSE CONTACTORS

- A. Manufacturers:
 - 1. Asco
 - 2. Square D
 - 3. I.T.E.
 - 4. Substitutions: Refer to Division 01.
- B. Description: NEMA ICS 2, AC general purpose magnetic contactor.
- C. Coil Voltage: 120 volts, 60 Hertz as scheduled.
- D. Poles: As scheduled.
 - 1. Size: As scheduled.

- E. Enclosure: ANSI/NEMA ICS 6, as required to meet conditions of installation.
- F. Accessories: As scheduled.
- G. Shop Panel Controls - ASCO #173A20 mushroom type stop station and ASCO #173B`17 key operated start station. See plans for locations.

2.2 LIGHTING CONTACTORS

- A. Manufacturers:
 - 1. Asco
 - 2. Square D
 - 3. I.T.E.
- B. Description: NEMA ICS 2, magnetic lighting contactor.
 - 1. Configuration: Mechanically held, 3 wire control.
 - 2. Coil Voltage: 120 volts, 60 Hertz.
 - 3. Poles: As scheduled.
 - 4. Contact Rating: Match branch circuit overcurrent protection, considering de-rating for continuous loads.
 - 5. Enclosure: ANSI/NEMA ICS 6, Type as required to meet conditions of installation.
 - 6. Accessories: As scheduled.

2.3 LIGHTING RELAYS (EMERGENCY AND NORMAL)

- A. Manufacturers
 - 1. Square D
 - 2. Westinghouse
 - 3. I.T.E.
 - 4. Allen Bradley
- B. Description: Screw terminals, 10 amp.
- C. Coil Voltage: As shown on plans.
- D. Contacts: 1 normally open and 1 normally closed.
- E. Enclosure: NEMA 1 with relay socket.

PART 3 EXECUTION

3.1 SCHEDULE - SEE PLANS

END OF SECTION

SECTION 26 51 00
INTERIOR LUMINAIRES - L.E.D.
(Interior Solid State Luminaires)

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Specification Section 26 58 00 – Occupancy Sensors and Low-Voltage Lighting Controls.

1.2 SUMMARY

- A. This specification is for the purchase of solid state lighting (SSL) luminaires (herein referred to as Luminaires) applied to the illumination of interior spaces. Luminaires shall be listed in accordance with national recognized testing laboratories (NRTLs) approved by the United States Department of Labor, Occupational Safety and Health Administration (OSHA) under the requirements of 29CFR1910.7.
- B. The system shall be capable of turning lighting loads on/off as well as dimming lights (if lighting load is required to be dimmed).
- C. The system architecture shall be capable of enabling stand-alone groups (rooms) of devices to function in some default capacity shall the network connectivity to the greater system be lost.
- D. The system shall not require any centrally hard-wired switching equipment.

1.3 DEFINITIONS

- A. CALiPER Commercially Available LED Product Evaluation and Reporting 'A' US DOE program for the testing and monitoring of commercially available LED Luminaires and lights.
- B. CCT Correlated Color Temperature: Visible light characteristic of comparing a light source to a theoretical, heated black body radiator; measured in Kelvin.
- C. Cd Candela: Unit of measurement of light intensity.
- D. CIE International Commission on Illumination.
- E. Chromaticity The property of color of light.
- F. Fc Foot-candle. Unit of illuminance.
- G. IES-LM-79-08 Illuminating Engineering Society – Approved Methods: Electrical and Photometric Measurements of Solid-State Lighting Products.
- H. IES-LM-80-08 Illuminating Engineering Society – Approved Methods: Measuring Lumen Maintenance of LED Light Sources.
- I. L80 The extrapolated life in hours of the luminaire when the luminous output depreciates 20 percent from initial values.
- J. LED Light Emitting Diode

K.	METS	Material Engineering and Testing Services of the Translab
L.	NEMA	National Electrical Manufacturers Association
M.	NVLAP	National Voluntary Laboratory Accreditation Program. A program under the US DOE to accredit independent testing laboratories to qualify.
N.	Power Factor	The ratio of the real power component to the total (complex) power component.
O.	Rated Power	Power consumption that the luminaire was designed and tested for an ambient temperature (70°F or 21°C).
P.	SPD	Surge Protection Device: A subsystem or component(s) that can protect the unit against short duration voltage and current surges.
Q.	SSL	Solid-State Lighting.
R.	THD	Total Harmonic Distortion. The amount of higher frequency power on the power line.

1.4 SUBMITTALS

- A. Product Datasheets (general device descriptions, dimensions, wiring details, nomenclature).
- B. Other Diagrams – as needed for special operation or interaction with other system(s).
- C. Other operational descriptions as needed.

1.5 WARRANTY

- A. The manufacturer shall provide a warranty against loss of performance and defects in materials and workmanship for the luminaires for a period of 60 months after acceptance of the luminaires. Replacement luminaires shall be provided promptly after receipt of luminaires that have failed at no cost to the customer. All warranty documentation shall be provided to customer prior to random sample testing.

PART 2 PRODUCT REQUIREMENTS

2.1 MANUFACTURERS

- A. Approved Manufacturers: Provide products of firms regularly engaged in the manufacture of recessed lighting fixtures of types and ratings required, whose products have been in satisfactory use in similar service for not less than five (5) years. The manufacturer of the lighting fixtures shall comply with the provisions of the appropriate code and standards. All fixtures shall be pre-tested before shipping.
- B. Conformance: Fixtures shall be manufactured in strict accordance with the Contract Drawings and Specifications.
- C. Codes: Materials and installation shall be in accordance with the latest revision of the National Electrical Code and any applicable Federal, State and local codes and regulations.

- D. UL or CSA US Listing: All fixtures shall be manufactured in strict accordance with the appropriate and current requirements of the "Standards for Safety" to UL 8750 or others as they may be applicable. A listing shall be provided for each fixture type and the appropriate label or labels shall be affixed to each fixture in a position concealing it from normal view.
- E. Specifications and scale drawings are intended to convey the salient features, function and character of the fixtures only, and do not undertake to illustrate or set forth every item or detail necessary for the work.
- F. Base Bid Manufacturers: Are listed on fixture schedule and specification. Manufacturers listed without accompanying catalog numbers are responsible for meeting the quality standards and photometric distribution set by the specified product.
- G. Alternate Manufacturers: Identification by means of manufacturers names and catalog numbers is to establish basic features, quality and performance standards. Any substitutions must meet or exceed these standards.

2.2 LUMINAIRES TYPE

- A. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array and electronic driver (power supply) and integral controls as per this specification.
- B. Each luminaire shall be designed to operate at an average operating temperature of 25°C.
- C. The operating temperature range shall be 0°C to +25°C.
- D. Each luminaire shall meet all parameters of this specification throughout the minimum operational life when operated at the average operating temperature.
- E. Luminaire Construction:
 1. Luminaire housing to have no visible welding, screws, springs, hooks, rivets, bare LED's or plastic supports.
 2. The luminaire shall be a single, self-contained device, not requiring on-site assembly for installation. The power supply and circuit board for the luminaire shall be integral to the unit.
 3. Luminaires shall be fabricated from post painted cold rolled steel and shall be a rigid structure with integral T-bar clips.
 4. Finish: Polyester powder coat painted with 92% high-reflective paint after fabrication.
 5. Reflector: Rugged, one-piece cold rolled steel with embossed multi-facets, echoing the frequency of the refractor prisms to distribute soft light at multiple angles, without flashing, thus reducing high luminance contrast.
 6. End caps shall be sloped at 70 degrees to create depth.
 7. Luminaire to have smooth transition between t-bar and reflector arch. No door frame or exposed hardware.
 8. Polymeric materials (if used) of enclosures containing either the power supply or electronic components of the luminaire shall be made of UL94VO flame retardant materials. Luminaire lenses are excluded from this requirement.
 9. Integral Grid Clips required on recessed mounted luminaires, along with integral tie wire mounting points.
 10. Luminaire to have air removal capability as specified.
 11. The assembly and manufacturing process for the SSL luminaire shall be designed to assure all internal components are adequately supported to withstand mechanical shock and vibration.

F. LED Sources

1. LED's shall be manufactured by Nichia, Samsung or Osram.
2. Lumen Output – minimum initial lumen output of the luminaire shall be as follows for the lumens exiting the luminaire in the 0-90 degree zone – as measured by IESNA Standard LM-79-08 in an accredited lab. Exact tested lumen output shall be clearly noted on the Shop Drawings.
3. Lumen output shall not decrease by more than 20 percent over the minimum operational life of 50,000 hours.
4. Individual LEDs shall be connected such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
5. LED Boards shall be suitable for field maintenance or service from below the ceiling with plug-in connectors. LED boards shall be upgradable.
6. Light Color/Quality:
 - a. Correlated Color Temperature (CCT) range as per specification, between 3500K, 4100K and 5000K shall be correlated to chromaticity as defined by the absolute (X,Y) coordinates on the 2-D CIE chromaticity chart.
 - b. The color rendition index (CRI) shall be 80 or greater.
 - c. Color shift over 6,000 hours shall be <0.007 change in u', v' as demonstrated in IES LM80 report.

G. Power Supply and Drive

1. Driver: eldoLED, 120 – 277 volt, UL Listed, CSA Certified, Sound Rated A+. Driver shall be > 80% efficient at full load across all input voltages. Input wires shall be 18AWG solid copper minimum.
2. Driver shall be suitable for full-range dimming. The luminaire shall be capable of continuous dimming without perceivable flicker over a range of 100% to 1% of rated lumen output with a smooth shut off function. Dimming shall be controlled by a 0-10V signal.
3. Driver shall be UL listed.
4. Maximum stand-by power shall be 1 Watt.
5. Driver disconnect shall be provided where required to comply with codes.
6. The electronics/power supply enclosure shall be internal to the SSL luminaire and be accessible per UL requirements.
7. The surge protection which resides within the driver shall protect the luminaire from damage and failure for transient voltages and currents as defined in ANSI/IEEE C64.41 2002 for Location Category A, where failure does not mean a momentary loss of light during the transient event.

H. Electrical

1. Power Consumption: Maximum power consumption, +/- 5% when operating between 120 – 277V (or 346V).
2. Operation Voltage: The luminaire shall operate from a 50 or 60 HZ \pm 3 HZ AC line over a voltage ranging from 120 VAC to 277 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output. The standard operating voltages are 120 VAC, 277 VAC, 347 VAC.
3. Power Factor: The luminaire shall have a power factor of 90% or greater at all standard operating voltages and full luminaire output.
4. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent at any standard input voltage.
5. Surge Suppression: The luminaire shall include surge protection to withstand high repetition noise and other interference.
6. RF Interference: The luminaire and associated on-board circuitry must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 Non-Consumer requirements for EMI/RFI emissions.
7. Electrical connections between normal power and driver must be modular utilizing a snap fit connector. All electrical components must be easily accessible after installation and be replaceable without removing the fixture from the ceiling.

8. All electrical components shall be RoHS compliant.
- I. Emergency Battery Pack
 1. Shall be factory installed and provide 1400 1m of light output for 90 minutes.
 - J. Photometric Requirements
 1. Luminaire performance shall be tested as described herein.
 - a. Luminaire performance shall be tested as described herein.
 - b. Luminaire lighting performance shall be adjusted (depreciated) for the minimum life expectancy (Section 2.2.5).
 - c. The performance shall be adjusted (depreciated) by using the LED manufacturer's data or the data from the IESBNA Standard TM-21 test report, which ever one results in a higher level of lumen depreciation.
 2. The luminaire may be determined to be compliant photo-metrically, if:
 - a. The initial minimum illuminance level is achieved in 100% of the area of the specified lighting pattern.
 3. The measurements shall be calibrated to standard photo-pic calibrations.
 4. Add specific project requirements.
 - K. Thermal Management
 1. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life (Section 1.2.9 c).
 2. The LED manufacturer's maximum junction temperature for the expected life (Section 1.2.9 c) shall not be exceeded at the average operating ambient (Section 1.2.4).
 3. The LED manufacturer's maximum junction temperature for the catastrophic failure shall not be exceeded at the maximum operating ambient (Section 1.2.5).
 4. The luminaire shall have a UL IC rating.
 5. The Driver manufacturer's maximum case temperature shall not be exceeded at the maximum operating ambient. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.
 - L. Optics
 1. The optical assembly shall provide volumetric distribution to eliminate cave effect and provide uniform illumination in the space and increased luminance on vertical surfaces.
 2. Optics shall consist of a ribbed metal reflector system and extruded refracting optical lens with high-transmission internal optical film applied to the inside of the refracting lens. No individual LED images shall be visible to the occupant of the space.
 3. Refractor or lens shall be composed of impact-resistant (20%) DR acrylic with a polymer optical film.
 - M. Luminaire Identification
 1. Each luminaire shall have the manufacturer's name, trademark, model number, serial number, date of manufacture (month-year), and lot number as identification permanently marked inside each unit and the outside of each packaging box.
 2. The following operating characteristics shall be permanently parked inside each unit: rated voltage and rated power in Watts and Volt-Ampere.
 - N. Quality Assurance
 1. The luminaires shall be manufactured in accordance with a manufacturer quality assurance (QA) program. The QA program shall include two types of quality assurance: (1) design quality assurance and (2) production quality assurance. The production quality assurance shall include statistically controlled routine tests to ensure minimum performance levels of the modules built to meet this specification. These tests shall include: CCT, CRI, Lumen output and wattage.

- Tests shall be recorded, analyzed and maintained for future reference.
2. QA process and test results documentation shall be kept on file for a minimum period of seven years.
 3. LED luminaire designs not satisfying design qualification testing and the production quality assurance testing performance requirements described below shall not be labeled, advertised or sold as conforming to this specification.
- O. Design Qualification Testing
1. Design Qualification Testing shall be performed by a National Voluntary Laboratory Accreditation Program (NVLAP) testing facility. Such testing may be performed by the manufacturer or an independent testing lab hired by the manufacturer on new luminaire designs and when a major design change has been implemented on an existing design. A major design change is defined as a design change (electrical or physical) which changes any of the performance characteristics of the luminaire, results in a different circuit configuration for the power supply, or changes the layout of the individual LED's in the module.
 2. A quantity of two units for each design shall be submitted for Design Qualification Testing.
 3. Product submittals shall be accompanied by product specification sheets or other documentation that includes the designed parameters as detailed in this specification. These parameters include (but not limited to):
 - a. Maximum power in Watts.
 - b. L80 in hours, when extrapolated for the worse case operating temperature (section 2.2.6). TM21 report shall be submitted to demonstrate this.
 - c. Product submittals shall be accompanied by performance data that is derived in accordance with appropriate IESNA testing standards and tested in a laboratory that is NVLAP accredited for Energy Efficient Lighting Product.
 4. Luminaire shall be tested per IESNA LM 79-08.

PART 3 NOT USED

END OF SECTION

SECTION 26 58 00
OCCUPANCY SENSORS AND LOW-VOLTAGE LIGHTING CONTROLS

PART 1 GENERAL REQUIREMENTS

1.1 SCOPE

- A. Contractor's work to include all labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational occupancy sensor lighting control system, as described herein.
- B. Contractor/supplier shall examine all general specification provisions and drawings for related electrical work required as work under Division 26.
- C. Contractor must submit data sheets on sensors, control units and all junction boxes and mounting accessories, including all wiring diagrams.
- D. The Electrical Contractor must also submit layout drawings indicating the placement of the sensors for review purposes only. **Light fixture shop drawings will not be approved until occupancy sensor drawings are submitted.**

1.2 RELATED SECTIONS

- A. Sections 26 27 26 – Wiring Devices

1.3 SUBMITTALS

- A. Division 01 - Submittals: Procedures for Submittals.
- B. Submit shop drawings, including sensor layout drawings, product data and manufacturer's installation instructions.

1.4 EQUIPMENT QUALIFICATION

- A. All components shall be U.L. listed and provide a five (5) year warranty.

1.5 OBJECTIVE DESCRIPTION

- A. The objective of this section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area.
- B. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits.

1.6 WARRANTY

- A. Contractor shall warrant all equipment furnished in accordance to this specification to be undamaged, free of defects in materials and workmanship and in conformance with the specifications. The supplier's obligation shall include repair or replacement and testing without charge to the owner, all or any parts of equipment which are found to be damaged, defective or non-conforming and returned to the supplier. Warranty on sensors and controls units will be for a period of five (5) years. The warranty shall commence upon the owner's acceptance of the project. Warranty on labor shall be for a period of one (1) year.

1.7 TRAINING

- A. The contractor shall provide, at the owner's facility, the training necessary to familiarize the owner's personnel with the operation, use, adjustment and problem solving diagnosis of the occupancy sensing devices and systems.

PART 2 SPECIFIC REQUIREMENTS

2.1 OCCUPANCY SENSORS

- A. Ceiling mount sensors shall provide a minor motion coverage range of 150 to 1300 square feet with an overall 1/2 step coverage range from 300 to 2000 square feet.
- B. Occupancy sensors shall provide coverage of 90 to 100 percent of the controlled area.
- C. All sensors shall be capable of operating normally with electronic ballast and PL lamp systems.
- D. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.
- E. All sensors shall have readily accessible, user adjustable controls for time delay and sensitivity. Controls shall be recessed to limit tampering.
- F. In the event of failure, a bypass manual "override on" feature shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is replaced. The override feature shall be designed for use by building maintenance personnel and shall not be readily achieved by building occupants.
- G. Ultrasonic operating frequency shall be crystal controlled to within plus or minus 0.005 percent tolerance to assure reliable performance.
- H. Ultrasonic microphone receiver frequency shall be 25 KHz or greater and shall be temperature and humidity resistant.
- I. All sensors shall provide an LED indication light to verify that motion is being detected and that the unit is working.
 - 1. All sensors/parts/wall controls to be Sensor Switch/nLight or approved equal. Approved equals are:
 - a. Leviton
 - b. Watt Stopper
 - c. Hubbell
- J. Decibel levels for ultrasonic sensors shall comply with the following criteria:

Mid frequency of Sound Pressure Third Octave Band (KHz)	Maximum dB level within Third Octave Band in dB reference 20 micropascals
---	---

Less than 20	80
20 or more to less than 25	105
25 or more to less than 31.5	110
31.5 or more	115

The contractor shall certify in writing that installed sensors comply with the specified criteria for ultrasonic sound.

- K. All sensors shall have no leakage current in OFF mode and shall have voltage drop protection.
- L. All sensors shall have UL rated, 94V-0 plastic enclosures.
- M. All sensors shall be California Energy Commission Title 24 approved and certified.
- N. Sensors shall be suitable for N.E.C. 725 Class 2 wiring and use cable installed in conduit.
- O. Wall mounted sensors will not be approved.
- P. All occupancy sensors shall have two dry contacts for control and building automation.

2.2 PRODUCTS: ALL SENSOR SWITCH/LIGHT PART NUMBERS

- A. Ceiling Mount Daylight Controls:
 - 1. CM PC ADC – ON/OFF and Dimming, Low-Voltage
- B. Ceiling Mount Occupancy Sensor:
 - 1. CM SERIE-Dual Technology, Low-Voltage
- C. Wall Switch Occupancy Sensors/Control:
 - 1. WSX PDT D SA – Dual Technology with Dimming and Manual ON/OFF
 - 2. WSX PDT SA – Dual Technology with Manual ON/OFF
- D. Wall Controls:
 - 1. SPODM SA D – Low-Voltage with Manual ON/OFF and Dimming
 - 2. SPODM SA 3X D – Low-Voltage with Manual ON/OFF and Dimming, 3-Way
 - 3. SPODM SA – Low Voltage with Manual ON/OFF
 - 4. SPODM SA 3X – Low-Voltage with Manual ON/OFF, 3-Way Control
- E. Power Packs:
 - 1. PP20 – 120/277 VAC to Class 2 15 VDC, 1 Pole
 - 2. PP20 2P- 120/277 VAC to Class 2 15 VDC, 2 Pole
- F. Approved Equals:
 - 1. Leviton
 - 2. Watt Stopper
 - 3. Hubbell

2.3 CIRCUIT CONTROL HARDWARE - CU

- A. Control Units - For ease of mounting, installation and future service, control unit(s) shall be able to mount on external J boxes and be integrated self-contained unit consisting internally of load switching control relay and a transformer to provide low-voltage power to a minimum of two (2) sensors. Mount where shown on manufacturer's drawings.
- B. Relay contacts shall have rating of: 20A - 120 VAC Ballast
- C. Relay contacts shall be isolated.
- D. Control units shall be U.L. listed.

2.4 CONDUCTORS

- A. Between sensors and controls units shall be three (3) conductors, 18 AWG, stranded U.L. Classified, PVC insulated installed in conduit.

PART 3 EXECUTION

3.1 INSTALLATION

- A. It shall be the contractor's responsibility with the manufacturer's assistance to locate and aim sensory in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas. Rooms shall have ninety (90) to one hundred (100) percent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only rooms which are to be provided with sensors. Proper judgment must be exercised in executing the work so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components. The contractor shall coordinate this installation with manufacturer's representative.
- B. For rooms with occupancy sensor lighting control, see Plans.

END OF SECTION

SECTION 33 00 00
UTILITIES SPECIFICATION INDEX

33 71 73

Utility Service Entrance

END OF SECTION

BLANK PAGE

SECTION 33 71 73
UTILITY SERVICE ENTRANCE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Arrangement with Utility Company for permanent electric service, including payment of Utility Company charges for service. Electrical Contractor is responsible for contacting the Utility Company prior to bidding to verify all requirements and include these costs in their bid.
- B. Underground service entrance.
- C. Metering equipment.

1.2 RELATED SECTIONS

- A. Division 03 - Cast-in-Place Concrete: Transformer pads
- B. Section 26 05 26 - Grounding and Bonding
- C. Section 26 05 32 - Conduit
- D. Division 31 - Excavating
- E. Division 31 - Trenching
- F. Division 31 - Backfilling

1.3 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

1.4 SYSTEM DESCRIPTION

- A. Utility Company: Xcel Energy
Steve Sandey 507-387-9671
210 Lime Street
Mankato, MN 56001
- B. System Characteristics: 120/208 volts, three phase, four- wire, 60 Hertz.
- C. Service Entrance: Underground

1.5 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Submit Utility Company prepared drawings.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with Utility Company written requirements.

- B. Maintain one copy of each document on site.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.8 PRE-INSTALLATION CONFERENCE

- A. Convene one week prior to commencing work of this Section, under provisions of Division 01.

1.9 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on Utility Company drawings.

PART 2 PRODUCTS

2.1 UTILITY METERS

- A. Meters will be furnished by Utility Company.

2.2 UTILITY METER BASE

- A. Meter base will be furnished by Electrical Contractor per utility requirements.

2.3 METERING TRANSFORMER CABINET

- A. If required, cabinet will be furnished by Electrical Contractor per utility requirements.

2.4 TRANSFORMER PAD

- A. Transformer pad will be furnished by Electrical Contractor per utility requirements. Transformer pad shall be constructed per Xcel Energy Drawing CC-50A.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify conditions under provisions of Division 01.
- B. Verify that service equipment is ready to be connected and energized.

3.2 PREPARATION

- A. Make arrangements with Utility Company to obtain permanent electric service to the Project.
- B. Coordinate location of Utility Company's facilities to ensure proper access is available.

3.3 INSTALLATION

- A. Install service entrance conduit from Utility Company's pad-mounted transformer to building service entrance equipment. Utility Company will connect service lateral conductors to utility transformer. The primary cable is supplied by Xcel, but is required to be in conduit. This conduit is by Electrical Contractor. Coordinate exact routing with Xcel.
- B. Provide cast-in-place concrete pad for Utility Company transformer, under the provisions of Division 03.

END OF SECTION

BLANK PAGE

TECHNICAL SPECIFICATIONS

for

Hickory Park Ice Rinks

City of Belle Plaine

Belle Plaine, MN



Real People. Real Solutions.

Bolton-Menk.com

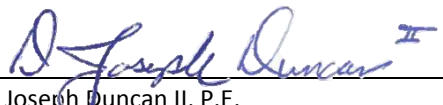
SECTION 00005 – CERTIFICATION

TECHNICAL SPECIFICATIONS

for

Hickory Park Ice Rinks
City of Belle Plaine
Belle Plaine, MN

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.

By: 
D. Joseph Duncan II, P.E.
License No. 26100

Date: July 19, 2019

SECTION 00010 - TABLE OF CONTENTS

Hickory Park Ice Rinks
City of Belle Plaine

This Project Manual incorporates, either in full or in part, various EJCDC copyrighted documents. Documents incorporated in full are subject to the copyright notice in the EJCDC document footnotes. For those EJCDC documents excerpted, modified or incorporated in part, those portions of the text that originated in copyrighted EJCDC documents remain subject to the EJCDC license and copyright. Copyright © 2011-2015 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

TECHNICAL SPECIFICATIONS:

00005 - CERTIFICATION PAGE

00010 - TABLE OF CONTENTS

Specifications

02210 - SUBSURFACE INVESTIGATION

02220 - REMOVING PAVEMENT AND MISCELLANEOUS STRUCTURES

02310 - EXCAVATION & EMBANKMENT - SITE GRADING

02315 - APPLICATION OF WATER

02335 - SUBGRADE PREPARATION

02370 - EROSION & SEDIMENT CONTROL (LESS THAN ONE ACRE DISTURBANCE)

02510 - DOMESTIC WATER SYSTEM

02720 - AGGREGATE BASE

02751 - CONCRETE PAVEMENT

02770 - CONCRETE CURBING AND DRIVEWAY PAVEMENT

02775 - WALKS - CONCRETE

02920 - TURF RESTORATION

DRAWINGS (UNDER SEPARATE COVER):

7 Sheets, dated July 19, 2019, and with each sheet bearing the following general title:

Hickory Park Ice Rinks
City of Belle Plaine, MN

****END OF SECTION****

SECTION 02210 - SUBSURFACE INVESTIGATION

PART 1 -- GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to conducting subsurface investigation as shown on the drawings, as specified herein, and/or as specified by the Engineer.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
 - 1. The UNIT PRICE bid for EXPLORATORY EXCAVATION shall include all costs of labor, equipment and ultimate disposal required to complete the work, as specified.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances shall not be individually paid in the absence of a specific bid item for the work. The costs shall be included in the unit price bid for the associated removal and excavation items. Such items of work include but are not limited to:
 - 1. Exploratory excavation without prior authorization and approval by the Engineer.
 - 2. Exploratory excavation to locate and connect to existing pipes unless the Engineer agrees that excavation beyond what could be considered reasonable is required.
 - 3. Materials for re-grouting of inverts.
 - 4. All costs of off-site disposal of excess excavated material and debris including but not limited to hauling, fees, and permits for such disposal.

1.3 SPECIFICATION REFERENCES

- A. MnDOT 2123 shall apply, except as modified herein.
- B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS

- A. No exception to the referenced specification is made.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. The Contractor shall:
 - 1. Perform underground utility exploration as directed by the Engineer which involves excavation to locate pipelines for location and elevation verification.
 - 2. Clean debris and gravel which is present before the Project, out of existing manholes and catch basins along the Project and to regrout the inverts, as directed by the Engineer.
 - 3. Other work associated with the Project, as directed by the Engineer.
- B. Where exploratory excavation is performed in a location that will not be disturbed later, the backfill shall be placed and compacted to the density specified elsewhere in these Specifications for the type of utility located.

****END OF SECTION****

SECTION 02220 - REMOVING PAVEMENT AND MISCELLANEOUS STRUCTURES

PART 1 -- GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the removal of pavement and miscellaneous structures as indicated on the drawings or as specified herein.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
1. The UNIT PRICE bid for removing pavement and miscellaneous structures shall include all costs of labor, materials, equipment and ultimate disposal required to complete the work, as specified.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances shall not be individually paid in the absence of a specific bid item for the work. The costs shall be included in the unit price bid for the associated removal and excavation items. Such items of work include but are not limited to:
1. Saw cutting - bituminous and/or concrete, driveways, sidewalks, pavements, curb & gutter, and other impervious surfaces.
 2. Removing storing and reinstalling mail boxes, street/traffic signs or similar structures which must be moved to construct the project.
 3. Off-site disposal of excess excavated material and debris.
 4. Removal and off-site disposal of bituminous or concrete, unless designated for salvaging.
 5. Removing, salvaging and storing, or disposing of manhole and catch basin castings.
 6. Loading, hauling, stockpiling and placing as directed (i.e., leveling) designated salvage items to a location directed by the Owner.
 7. Fees and permits for the disposal of materials.
 8. Removal and disposal of existing sanitary sewer pipe, storm sewer pipe, watermain, and service pipes.
 9. Bulkheading the ends of existing pipes designated by the Engineer to be abandoned in place.
 10. Protection from damage of structures or other surface improvements that are not to be removed, and subsequent repair and/or replacement if damaged by Contractor operations.

1.3 SPECIFICATION REFERENCES

- A. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.
- B. MnDOT 2104 shall apply to the removal of pavement and miscellaneous structures, except as modified herein.

1.4 SUBMITTALS

- A. No exception to the referenced specification is made.

PART 2 -- PRODUCTS

2.1 NO EXCEPTION TO THE REFERENCED SPECIFICATION IS MADE.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. Remove existing bituminous, curb and gutter, walks, drives, steps and other specified items where shown on the plans and/or required for the construction of the project.
- B. Saw cut bituminous and concrete surfaces prior to excavation, to produce a clean-cut breakage joint.
- C. Dispose of all concrete and bituminous removal items, rubbish and debris outside of the construction zone. It shall be the Contractor's responsibility to secure all required permits and pay all fees associated with the disposal of the material and to secure the disposal site.
- D. Remove existing mailboxes, street/traffic signs and similar structures that must be removed to construct the project. Restore these facilities to the original location or a location designated by the Owner, when work has progressed past the location of the structure.
- E. The Contractor shall take full responsibility to protect structures or other surface improvements from damage that are not to be removed. If damage to these facilities occurs due to the construction of the project, the Contractor shall replace or repair them.
- F. The Owner will designate which existing hydrants, valves and boxes, manhole castings and other items removed as part of the construction, are to be salvaged. All other items shall be disposed by the Contractor.
- G. All existing watermain, sanitary sewer and storm sewer pipe being removed and replaced by new improvements shall be considered as debris and removed during the construction process.
- H. Where existing pipes are to be abandoned in place, the pipe shall be filled with sand or flowable fill as noted on the plans. The exposed pipe ends shall be bulkheaded shut with a watertight non-shrink concrete grout at a thickness of not less than one pipe diameter.

******END OF SECTION******

SECTION 02310 - EXCAVATION & EMBANKMENT - SITE GRADING

PART 1 -- GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the excavation and embankment of the site improvements as indicated on the drawings or as specified herein.

1.2 DEFINITIONS

- A. Building Pad - The area under any proposed building, or an area delineated on the plans as the site for a future building.
- B. Building Pad Hold-Down - The elevation that the proposed building pad is to be constructed to. This elevation does not represent the finished grade elevation of the proposed building.
- C. Compacted Volume (CV) – The volume of material actually placed as determined by computing the difference between original and final cross-sections by the average end area method.
- D. Excavated Volume (EV) – The volume of material actually excavated as determined by computing the difference between original and final cross-sections by the average end area method.
- E. Excess Material - Material that is not needed to complete the earthwork balance.
- F. Structural Improvements - For the purposes of this specification, structural improvements shall refer to any roadway, sidewalk, trail, building, sign, or other improvements requiring suitable soil to support the anticipated loadings.
- G. Subcut - Excavation performed below the proposed subgrade or building pad hold-down elevation shown on the plans for the purposes of removing unsuitable material.
- H. Subgrade - The top surface of a roadbed upon which the pavement structure (including aggregate base and/or granular subbase) is to be constructed. This is also a general term denoting the soil foundation upon which a proposed improvement is to be placed.
- I. Suitable Material - Sand, silty sand or low plasticity clay soils with no organic content. The Engineer shall make the final determination as to what material will be considered suitable.
- J. Topsoil - Any soil, generally black in color, containing organic material.
- K. Unsuitable Material - Soil with organic content including topsoil, swamp deposits, peat, muck, or other material deemed by the Engineer to be unsuitable for fill or embankment construction.

1.3 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
 - 1. Measurement and payment for Site Grading shall be based upon a LUMP SUM (LS), included in the Proposal. The Contractor shall make his own determination as to the earthwork balance on the site and shall include removal of any excess material or hauling in of any borrow material in his bid. No additional compensation shall be made for removal of excess material or the hauling in of borrow material.
 - 2. Measurement and payment for Topsoil Strip and Re-Spread shall be based upon the LUMP SUM (LS), included in the Proposal.
 - 3. Measurement and payment for Topsoil Subcut shall be incidental to Site Grading.
 - 4. Measurement and payment for Granular Borrow shall be based upon the CUBIC YARD – COMPACTED VOLUME INPLACE QUANTITY - CY (CV), included in the Proposal.

- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances shall not be individually paid in the absence of a specific bid item for the work. The costs shall be included in the unit price bid for the associated excavation items. Such items of work include but are not limited to:
1. Unless itemized in the Schedule of Prices, separating, salvaging, stockpiling, and spreading of topsoil, include in the price bid for common excavation.
 2. Unless itemized in the Schedule of Prices, subcutting the existing topsoil prior to placing embankment in all areas with proposed structural improvements, include in the price bid for common excavation.
 3. Salvaging and separately stockpiling suitable aggregate base material, as determined by the Engineer, include in the price bid for common excavation.
 4. Separating, salvaging, stockpiling and placing suitable material for use in embankment areas, include in the price bid for common excavation.
 5. Obtaining suitable material from areas with no proposed structural improvements to provide enough suitable material for embankments being constructed under proposed structural improvements, include in the price bid for common excavation.
 6. Restoring the borrow site by grading the area to drain properly to slopes not-to-exceed 6:1 and by restoring the topsoil to a minimum thickness of 6 inches, include in the contract unit price for common borrow.
 7. Subgrade excavation, furnishing stabilizing aggregate, geotextile fabric installation, compaction, regrading and/or other efforts necessary to repair the subgrade after satisfying the roll test and failing to protect the integrity of the subgrade, include in the price bid for common excavation.
 8. Over-excavation in cut areas to provide room for placement of topsoil, include in the price bid for common excavation.
 9. Earthwork balancing including adjustments for shrinkage loss, and excess materials resulting from the additional volume created from pipe bedding, utility pipe, and/or underground structures shall be included in the unit price bid for common excavation.
 10. The avoidance and protection of wetlands include in the price bid for common excavation.
 11. Protecting existing improvements and previously accepted in-process improvements from damage include in the price bid for common excavation.
 12. Test rolling, include in the price bid for common excavation.
 13. Gradation and compaction testing, and geotechnical inspection services to meet requirements of Source and Field Quality Control, if required, include in the price bid for common excavation.
 14. Farming, disking and/or drying suitable wet materials, include in the price bid for common excavation.
 15. Excavation required for construction of any retaining wall shall be included in the unit price bid for retaining wall.

1.4 SPECIFICATION REFERENCES

- A. MnDOT 2105 shall apply to the excavation and embankment for the site improvements, except as modified herein.
- B. MnDOT 2574 shall apply to the excavation and embankment for the site improvements, except as modified herein.
- C. Section 01270 "Measurement and Payment" of this Project Manual.
- D. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS

- A. All suitable excess excavated material shall remain the property of the Owner and shall be loaded, hauled, placed as directed (i.e. leveling) and compacted at a site chosen by the Owner within 2 miles of the project site. If the Owner requires the suitable excess material to be stockpiled, the Contractor shall load, haul and shape the material to produce uniform stockpile(s).
- B. All excess excavated material shall become the property of the Contractor and shall be removed from the site and disposed of at a location secured by the Contractor.
- C. Stabilizing aggregates for use in backfilling subgrade excavations shall be material generally produced and referred to as "1½-inch dust free aggregate", 4.0 to 6.0-inch rubble aggregate" or other coarse aggregate found to be in general compliance by the Engineer. Aggregate base may also be used at the direction of the Engineer.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Excavated topsoil and suitable material for reuse in the project shall be segregated and stockpiled at a site selected by the Contractor.
- B. Frozen material will not be allowed for roadway or building pad construction. The Engineer shall approve locations for placement of frozen material.
- C. All excavations shall be kept free of water during the placement of fill.
- D. The Contractor shall utilize methods and equipment for excavating that will minimize the disturbance to the subgrade. The use of backhoes rather than scrapers or front-end loaders may be required to minimize repeated passes of equipment over wet subgrade soils.
- E. At the end of each day the Contractor shall eliminate surface indentations, including those caused by sheepsfoot rollers, tractor tires and tracked equipment, and roll the surface with a steel wheel or rubber tired roller.
- F. Sufficient common excavation shall be utilized by the Contractor to replace the soil shrinkage from excavation which occurs through the course of construction handling and compaction. The Contractor shall make his own estimate of the amount of shrinkage that will occur.
- G. Topsoil
 - 1. Topsoil shall be salvaged and stockpiled in locations requiring final turf establishment, as approved by the Engineer.
 - 2. In areas requiring final turf establishment with no proposed or anticipated structural improvements (building pads, etc.), topsoil shall be spread uniformly to a minimum depth of 6.0-inches, unless otherwise indicated in the plans.
 - 3. In areas not requiring final turf establishment with proposed or anticipated structural improvements, no topsoil shall be placed.
- H. Material suitable for curb backfill shall be segregated and stockpiled at a site selected by the Contractor. Following curb construction, the material shall be placed behind the curb, allowing for a minimum of 6-inches of topsoil, unless otherwise indicated in the plans.
- I. In areas where filling above the existing grade is necessary to establish the final designed elevation, the Contractor shall fully remove the topsoil and organic material to the level of stable underlying sand or clay prior to backfilling with suitable embankment material.
- J. The Contractor shall make his own determination as to whether the proposed grading has been completed according to the plans. When the Contractor determines that the grading has been completed, he will notify the Engineer. Neither the Owner nor the Engineer will provide any intermediate acceptance of the grading improvements until all of the grading has been completed and all topsoil has been spread.

3.2 EXCAVATION AND EMBANKMENT IN AREAS WITH PROPOSED STRUCTURAL IMPROVEMENTS.

- A. All vegetation, topsoil, organic, or other unsuitable materials shall be excavated from the area below the structural improvement. Due to the variability of soils, the depth of the excavation in these areas is expected to vary significantly throughout the site. The excavated area shall be inspected by the geotechnical engineer as specified in Field Quality Control.
- B. Subcut excavations shall be laterally oversized a distance of 1.0-foot beyond the edges of the proposed structural improvement for each foot of excavation depth (1:1 oversizing). The extents of the structural improvement areas shown on the plans do not necessarily show this 1:1 oversizing.
- C. Fill placed from the bottom of the subcut to the subgrade or building pad hold down elevation shall be selected material from the excavation or borrow material. Such material shall consist of suitable material as defined above. Clay fill shall be moisture-conditioned to within 2 percent above or below the optimum moisture content determined from the Standard Proctor compaction test.
- D. The embankment material shall be spread in 6.0 to 8.0-inch loose lifts.
- E. In all roadway and pavement areas, the Contractor shall perform a roll test on the subgrade prior to placing any portion of the pavement structure. The roll test shall be performed with a fully-loaded tandem axle truck. Soils which rut or deflect 1.0-inch or more shall be corrected by scarifying, drying, and recompacting the soils. Subgrade excavation shall only be performed as directed by the Engineer.
- F. Subgrade excavation shall be performed only when the Engineer and the Contractor both agree that the in-place soil cannot be made suitable by scarifying, drying, and recompacting. Such excavation shall be backfilled with suitable excess common excavation material, stabilizing aggregate, granular borrow or select granular borrow, as directed by the Engineer. If the Contractor proceeds without approval from the Engineer, all work and material to restore the roadbed to the proper grade shall be at the Contractor's expense.

3.3 EXCAVATION AND EMBANKMENT IN AREAS WITH NO PROPOSED STRUCTURAL IMPROVEMENTS

- A. Topsoil or unsuitable material may be used to construct embankments in areas with no structural improvements.

3.4 COMPACTION

- A. All embankment grading shall be compacted using the Quality Compaction Method.

3.5 SOURCE QUALITY CONTROL

- A. The Owner may The Contractor shall arrange for having the following testing performed:
 - 1. One gradation test per each 500 tons or 275 cubic yards (CV) of select granular borrow.
 - 2. One gradation test per each 500 tons or 275 cubic yards (CV) of stabilizing aggregate.
- B. All testing shall be performed by an independent testing laboratory approved by the Engineer.

3.6 FIELD QUALITY CONTROL

- A. Required Inspections:
 - 1. Areas with Proposed Structural Improvements:
 - (a) Inspection following the removal of unsuitable material and prior to placement of embankment material to insure that all topsoil and unsuitable material has been removed, and that the exposed subgrade has sufficient bearing capacity for the anticipated structural improvement.
- B. The Contractor shall notify the Engineer 24-hours prior to completing the removal of topsoil and unsuitable material in areas with proposed structural improvements to insure that appropriate inspection may be performed.
- C. Samples for testing shall be taken from material at locations approved by the Engineer. All sampling methods shall be approved by the Engineer.

- D. The Contractor shall coordinate the site grading and inform the Engineer when the roadway subgrade is ready for test rolling, prior to installing any aggregate base. The Engineer may order some subgrade correction prior to allowing the installation of aggregate base.
- E. Should any of the specified tests or inspections fail, the Contractor may arrange and pay for additional tests or inspections as may be necessary to satisfy the Engineer that the specified requirements have been met.

*****END OF SECTION*****

SECTION 02315 - APPLICATION OF WATER

PART 1 -- GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the application of water as indicated on the drawings or as specified herein.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
 - 1. No direct payment is made for water required.

1.3 SPECIFICATION REFERENCES

- A. MnDOT 2130 shall apply to the application of water, except as modified herein.
- B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 NO EXCEPTION TO THE REFERENCED SPECIFICATION IS MADE.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. The Contractor shall secure his own source of water.
- B. The Contractor shall apply water as may be required to obtain proper compaction for all dust control, street construction, and embankment construction.
- C. The Contractor shall NOT apply water in quantity or rate sufficient to cause erosion.

******END OF SECTION******

SECTION 02335 - SUBGRADE PREPARATION

PART 1 -- GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performance of all work and services necessary or incidental to the subgrade preparation as indicated on the drawings or as specified herein.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
 - 1. No direct payment shall be made for subgrade preparation. Costs shall be included in the unit prices bid for the various excavation items.
 - 2. No exception to the referenced specification is made.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances shall not be individually paid in the absence of a specific bid item for the work. The costs shall be included in the unit price bid for the various excavation items. Such items of work include but are not limited to:
 - 1. Drying and adding water to the subgrade.
 - 2. Subgrade excavation, furnishing stabilizing aggregate, geotextile fabric installation, compaction, regrading and/or other efforts necessary to repair the subgrade after satisfying the rolling test and failing to protect the integrity of the subgrade.

1.3 SPECIFICATION REFERENCES

- A. MnDOT 2112 shall apply to the subgrade preparation, except as modified herein.
- B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 NO EXCEPTION TO THE REFERENCED SPECIFICATION IS MADE.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. At the end of each day, and prior to the placement of aggregate base, the Contractor shall eliminate surface indentations, including those caused by sheeps foot rollers and tractor cletes, and roll the surface with a steel wheel or rubber tired roller.
- B. The Contractor shall disc, scarify, shape and compact the street subgrade or existing base, adding water or drying as may be necessary to give uniform and desired density.
- C. If the subgrade is unstable and the instability is due to excessive moisture, the subgrade shall be scarified and dried over a reasonable time period. When the material has reached acceptable moisture limits, the material shall be returned to the roadbed and compacted into place to the proper elevation. The roadbed will once again be test rolled. If the material continues to be unstable, the Engineer may authorize the removal of the undesirable material as subgrade excavation.
- D. Once the subgrade has been test rolled and accepted by the Engineer, no traffic or construction equipment shall be permitted to operate directly on the subgrade without the prior approval of the Engineer. All equipment shall be restricted to operating only in areas where the aggregate base has been installed to its full design depth. In the event that inclement weather occurs after a test roll, and prior to placement of the aggregate base or first course of bituminous, the test roll shall be voided and a new test roll shall be performed.

E. The subgrade shall be compacted in accordance with the Quality Compaction Method.

3.2 FIELD QUALITY CONTROL

- A. "Blue Top" stakes shall be provided by the Contractor at 50-foot intervals to confirm that the subgrade is constructed to the required grades and elevations. Methods other than "Blue Top" staking may be allowed, if approved by the Engineer.
- B. The compacted subgrade shall be test rolled using a fully loaded aggregate truck (tandem) in a pattern approved by the Engineer. The subgrade stability shall be considered adequate when the surface shows less than 1.0-inch of yielding or rutting after one pass, or as otherwise approved by the Engineer.

******END OF SECTION******

SECTION 02370 - EROSION & SEDIMENT CONTROL (LESS THAN ONE ACRE DISTURBANCE)

PART 1 -- GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to storm water management as indicated on the plans, as specified herein or as directed by the Engineer.
- B. The Contractor and Owner shall identify a person(s) knowledgeable and experienced in the application of erosion and sediment control BMP's who will oversee the site erosion and sediment control.
- C. Minnesota Pollution Control Agency (MPCA) - General Storm Water Permit for Construction Activity (MN R100001)
 - 1. This site as designed will disturb less than 1.0 acres, therefore a NPDES permit is not required.
 - 2. The Contractor shall contact the Owner if it is determined that additional work is required which will increase the total disturbance area to 1.0 acres or more.
 - (a) The Contractor applies for a NPDES permit from the MPCA.
 - (b) A copy of the active permit has been posted on the site.
 - (c) The Contractor shall be responsible for all costs associated with increasing the total disturbance area to 1.0 acres or more except where the change is due to a work change that is directed by the Owner and not a result of recommendations made by the Contractor to accommodate changed work means or methods.
 - (d) The Contractor shall phase construction to minimize erosion and sediment potential during the project.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for erosion and sediment control shall be paid according to the referenced specification or as modified below:
 - 1. Payment for all work associated with Erosion and Sediment Control shall be at the contract price bid and shall be considered full compensation for furnishing, installing, maintaining and utilizing storm water best management practices and any work specified in conjunction therewith as well as removing temporary sediment control devices when no longer necessary, except for storm water management devices identified for individual payment in the bidding schedule.
 - 2. Eighty percent of payment shall be made upon installation. The remaining 20 percent shall be made upon complete removal of the control measure, removal of any accumulated sediment and surface restoration.
- B. The furnishing and installing specific items and/or the performance of work under certain circumstances shall not be individually paid in the absence of a specific bid item for the work. The costs shall be included in the unit price bid for the associated erosion control and excavation items. Such items of work include but are not limited to:
 - 1. Maintaining clean exit areas or roads from the site.
 - 2. Sweeping adjacent streets clean of excess soil.
 - 3. Cleaning storm sewers, drain tiles and culverts that have been partially or completely obstructed by sediment that originated from the site.
 - 4. Geotextile fabric for rock installation.
 - 5. Geotextile fabric to wrap prefabricated inlet protection devices.

6. Aggregate to anchor and act as a filter for prefabricated inlet protection devices.
 7. Aggregate associated with the construction of temporary sediment traps.
 8. Emergency erosion control mobilization.
 9. Construction, maintenance and removal of rock construction entrance.
 10. Changing the type of inlet protection for different phases of construction.
- C. No additional payment shall be made for Erosion Control BMP's necessary to accommodate Contractor phasing or work methods including increased quantities, alternative methods, and turf restoration impacts.

1.3 SPECIFICATION REFERENCES

- A. MnDOT 2573 – Stormwater Management.
- B. MnDOT 2574 – Soil Preparation
- C. MnDOT 2575 – Establishing Turf and Controlling Erosion
- D. MnDOT 1717 – Air, Land and Water Pollution
- E. Section 02920 - Turf Restoration of this Project Manual shall apply to Rapid Stabilization. In the absence of Section 02920, MnDOT 2575, method 3 shall apply.
- F. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS

- A. Bale checks shall not be used.
- B. Where type and rate of seed, fertilizer, and mulch are not designated on the plans or elsewhere in the specifications, the MnDOT Seed Mix and Turf Establishment recommendations for the district where the project is located shall apply except that the seeding rate shall be 1.5 times the MnDOT indicated rate.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Construction and/or installation of all appropriate erosion & sediment control devices shall be completed prior to any soil disturbing activities.
- B. Prior to construction, the Contractor shall observe and document the existing storm water outfall system and discharge area. Sediment deposits not documented prior to the construction may be assumed to have originated from the project site and shall be required to remove and dispose of by the Contractor.
- C. Exit areas and connected roads shall be kept clean of tracking and sediment release from the site. All material shall be cleaned up the sooner of within 24 hours of discovery or the end of each business day. Washing or sweeping of material into the storm sewer system shall not be allowed.

3.2 CONSTRUCTION REQUIREMENTS

- A. The Contractor shall control drainage, erosion, and sediment on the project including: haul roads, temporary construction, waste disposal sites, plant and storage locations, and borrow pits, other than commercially operated sources.
- B. If Contractor fails to install, maintain, and/or perform the appropriate erosion and sediment control practices, as determined by the Engineer, the Engineer may issue a written notice to the Contractor. Contractor shall correct the cause and alleviate all sediment deposition to the fullest extent possible within the timeframe in the written notice.

- C. Contractor shall be responsible for removing all sediment deposits including, but not limited to, drainage ways, stormwater basins, or catch basins and re-stabilize the areas where sediment removal results in exposed soil. The removal and stabilization shall take place within 7 calendar days of discovery unless precluded by legal, regulatory, or physical access restraints, regardless if a written notice has been issued by the Engineer. If precluded, removal and stabilization must take place within 7 calendar days of obtaining access. The Contractor is responsible for contacting all local, regional, State, and Federal authorities and property owners and obtaining applicable rights of entry, approvals, and/or permits.
- D. **A contract deduction shall be made equal to the total of all costs incurred by the Owner due to failure of the Contractor to take corrective action within the required timeframe(s). Such costs include but are not limited to: labor, materials, equipment and administrative costs.**

****END OF SECTION****

SECTION 02510 - DOMESTIC WATER SYSTEM

PART 1 -- GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to watermain and service line construction as indicated on the drawings or as specified herein.

1.2 METHODS

- A. Trench excavation, bedding and backfill, see Section 02320 "Trench Excavation, Bedding and Backfill" of this Project Manual.

1.3 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
 - 1. Watermain
 - (a) No exception to the referenced specification is made.
 - 2. Hydrants
 - (a) No exception to the referenced specification is made.
 - 3. Hydrant Extensions
 - (a) Hydrant extensions shall be measured and paid per each of the length as specified in the Schedule of Unit Prices, complete and in place, at the appropriate unit price bid.
 - 4. Valves and Valve Boxes
 - (a) No exception to the referenced specification is made.
 - 5. Fittings
 - (a) Unless otherwise noted on the plans, watermain fittings will be measured by the pound without joint accessories. The standard weight of watermain fittings, for payment purposes, shall be as published in AWWA C-153, as follows:

Bends, Caps, Plugs & Sleeves							
Size	Fitting Weights, lbs. (AWWA C153)						
	Bends – MJ x MJ, (degrees)				Caps MJ x MJ	Plugs MJ x MJ	Sleeves¹ MJ x MJ
	90	45	22.5	11.25			
3	19	16	15	14	8	8	18
4	25	22	18	16	9	10	20
6	39	32	31	30	15	16	33
8	57	46	46	42	22	26	46
10	89	70	64	58	32	36	62
12	108	86	80	67	42	46	76
14	210	160	136	93	66	75	140
16	264	202	172	148	92	95	170
18	335	250	255	205	114	121	200
20	400	305	310	245	125	135	255
24	565	405	412	315	166	175	335

¹Weights are based on the use of long sleeves.

Tees, Crosses & Reducers									
		Fitting Weights, lbs. (AWWA C153)					Fitting Weights, lbs. (AWWA C153)		
Run	Branch	Tee	Cross	Reducers	Run	Branch	Tee	Cross	Reducers
Large	Small	MJ x MJ	MJ x MJ	MJ x MJ	Large	Small	MJ x MJ	MJ x MJ	MJ x MJ
4	4	32	40	-	18	6	275	-	-
6	4	46	62	24	18	8	295	-	190
6	6	56	75	-	18	10	315	-	195
8	4	60	84	32	18	12	335	-	180
8	6	72	98	36	18	14	380	-	190
8	8	86	105	-	18	16	405	-	195
10	4	78	98	46	18	18	435	-	-
10	6	90	121	47	20	6	315	-	-
10	8	105	135	50	20	8	345	-	-
10	10	120	145	-	20	10	370	-	220
12	4	94	119	58	20	12	395	-	205
12	6	110	138	58	20	14	440	-	200
12	8	125	149	57	20	16	465	-	200
12	10	140	187	61	20	18	505	-	225
12	12	160	213	-	20	20	535	-	-
14	4	172		-	24	6	415	-	-
14	6	182	210	100	24	8	445	-	-
14	8	206	231	100	24	10	470	-	-
14	10	228	255	100	24	12	500	-	305
14	12	234	269	100	24	14	550	-	310
14	14	280	299		24	16	580	-	320
16	6	228	250	124	24	18	625	-	305
16	8	248	264	124	24	20	660	-	300
16	10	264	286	124	24	24	720	-	-
16	12	280	312	112					
16	14	316	-	140					
16	16	322	385	-					

(b) The weight for fittings not listed in the tables above shall be in accordance with AWWA C153. The weight for fittings not listed in the tables above or in AWWA C153 shall be the actual weight of the fitting(s) furnished and installed based on acceptable documentation provided by the Contractor.

6. Corporation Stops & Curb Stops

(a) No exception to the referenced specification is made.

7. Water Service Lines

(a) The quantities for water service line items shown in the proposal are approximate. Since the extent of service line work that will be required is unknown, the Owner reserves the right to increase or decrease the quantities by any amount with no adjustment in unit price.

8. Cut in Tee
 - (a) Payment for cutting in a new tee in an existing watermain, under pressure, shall be measured and paid per each of the size tee specified in the Schedule of Unit Prices, complete and in place, at the appropriate unit price bid.
9. Polystyrene Insulation (1 1/2 inch thickness)
 - (a) Polystyrene insulation shall be measured by the SQUARE YARD in place and shall be paid at the unit price bid.
 - (b) Since the extent of insulation work that will be required is unknown, the Owner reserves the right to increase or decrease the quantities by any amount with no adjustment in unit price.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances shall not be individually paid in the absence of a specific bid item for the work. The costs shall be included in the unit price bid for the water system items, as indicated. Such items of work include but are not limited to:
 1. Furnishing and installing underground utility location system.
 2. The furnishing and installing polyethylene encasement material, include in the price bid for watermain.
 3. Concrete blocking or metal ties, include in the price bid for watermain.
 4. Valve umbrella anchorage assembly, include in the unit price bid for valves.
 5. Locating and connecting to an existing watermain or a hydrant, include in the price bid for watermain.
 6. Locating and connecting to an existing water service line, include in the price bid for watermain.
 7. Compaction, hydrostatic, leakage, disinfecting, coliform bacteria and conductivity testing, include in the price bid for watermain.
 8. Furnishing and installing thrust block, tie rods, joint restraints and sacrificial zinc anode caps as shown on the plans and as specified.
 9. Turning hydrant heads to a location as directed by the Engineer, include in the price bid for hydrants.
 10. If a separate bid item for temporary water service is NOT included in the Schedule of Unit Prices, providing continuous temporary water service to affected users, include in the price bid for watermain.
 11. The wood and/or metal parts necessary to identify the ends of the unattached service lines and curb stops are included in the price bid for water services.
 12. If a separate bid item for bypass pumping is NOT included in the Schedule of Unit Prices, providing temporary bypass pumping / control of storm water flows around the construction zone, include in the price bid for watermain.
 13. The painting or re-painting of hydrants with scratches and/or abrasions, include in the price bid for hydrants.
 14. Providing temporary corporations, copper pipe, plugs, etc. for hydrostatic watermain testing, include in the unit price bid for watermain.
 15. The cost to furnish and install copper water service couplings, include in the unit price bid for water service pipe.
 16. If the watermain is to be installed inside a casing pipe, furnishing and placing the carrier pipe, carrier pipe support materials, sand fill and grout seals, include in the unit price bid for watermain.

1.4 SPECIFICATION REFERENCES

- A. Trench excavation, bedding and backfill, reference Section 02320 "Trench Excavation, Bedding and Backfill" of this Project Manual, except as modified herein.
 - 1. CEAM 2611 shall apply to the water main and service line construction, except as modified herein.
 - 2. AWWA C-651 shall apply to the disinfecting of water mains, except as modified herein.
 - 3. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.5 SUBMITTALS

- A. Work plan for temporary service.

PART 2 -- PRODUCTS

2.1 THREADED ITEMS

- A. All threaded items furnished under this contract, including but not limited to mechanical joint connectors, flanged joint connectors, mainline valves, saddles, corporation stops, curb stops, hydrants, and air release valves shall be furnished to the nominal size as specified with ENGLISH threads.

2.2 OPEN CUT WATERMAIN MATERIAL

- A. The following water pipe materials will be allowed for use on this project:
 - 1. Ductile Iron Pipe, Class 52 with conductive gaskets or conductivity strips shall be used.
 - 2. Polyvinyl Chloride (PVC) pressure pipe conforming to the current requirements of AWWA C900 (DR 18) for pipe diameters 4" through 12" or AWWA C905 (DR 25) for pipe diameters 14" through 24". Pipe shall be manufactured in cast iron outside diameters and shall have integral bell and spigot with elastomeric gasket conforming to ASTM D3139. The pipe and components shall meet the requirements of ANSI/NSF 61 for the conveyance of potable water.
 - 3. Polyethylene (PE) Pressure Pipe (DR 11 for a 160 psi working pressure).

2.3 TRENCHLESS PIPE MATERIAL & STRUCTURAL REQUIREMENTS

- A. All pipe shall be made from virgin material. No rework except that obtained from the manufacturer's own production of the same formulation shall be used.
- B. The pipe shall be homogenous throughout and shall be free of visible cracks, holes, foreign material, blisters, and/or other deleterious faults.
- C. Any section of pipe with a gash, blister, abrasion, nick scar, or other deleterious fault greater than 10 percent of the wall thickness, shall not be used and must be removed from the site. However, a defective portion of pipe, as defined above may be cut out and butt-fused in accordance with the procedures herein.
- D. Any section of pipe having other defects such as concentrated ridges, discoloration, excessive spot roughness, pitting, variable wall thickness or any other defect of manufacturing and/or handling shall not be used and shall be removed from site.
- E. The actual inside barrel diameter of the pipe used for pressure pipe shall not be less than that of DIP, Class 52 for the corresponding nominal pipe size.
- F. Fusible C900/C905TM
 - 1. As manufactured by Underground Solutions (www.undergroundsolutions.com). ASTM D 1784-02. with Cell Classification 12454. The formulation for extrusion of Fusible C-900™/C-905™/PVC™ shall be compounded to the specific proprietary recipe for Fusible pipe, and meet the requirements of **PPI TR-2**.

2. Butt joint fused PVC pressure pipe conforming to the current requirements of AWWA C900 (DR 18) for pipe diameters 4.0-inch through 12.0-inch or AWWA C905 (DR 25) for pipe diameters 14.0-inch through 24.0-inch. However, structurally stronger pipe may be required to ensure resistance to pulling stresses. Pipe shall be manufactured in cast iron outside diameters. The pipe and components shall meet the requirements of ANSI/NSF 61 for the conveyance of potable water.
 3. Pipe fusing shall meet manufacturer requirements.
 4. A manufacturer's representative shall be present during fusing and installation.
- G. Restrained Joint DIP Pipe and Fittings
1. Flex-Ring Joint Pipe (DIP), as manufactured by American Ductile Iron Pipe or equal. The pipe shall be pressure pipe with a 350 psi working pressure for diameters up to and including 12.0-inch, and 250 psi for diameters 14.0-inch to and including 20.0-inch. Structurally stronger pipe may be needed to ensure resistance to damaging stresses relative to the trenchless construction technique.
 2. Joints shall be Flex-Ring Restrained Joint couplings as manufactured by American Ductile Iron Pipe or equal.
- H. High Density Polyethylene (HDPE) Pipe and Fittings
1. The pipe material shall be extra high molecular weight, high density polyethylene (EHMW-HDPE, PE3408) conforming with the minimum structural standards of ASTM D3350 with Cell Classification 345434C as manufactured by Chevron Phillips Chemical Company 4000/4100 Series, or equal. All HDPE pipe material shall meet the requirements of ASTM D1248 for a Type III, Class C, Category 5, Grade P34.
 2. The pipe to be used shall be (HDPE) pressure pipe conforming to the requirement of AWWA C-906 of a 160 psi working pressure. The grade used shall be resistant to aggressive soils or corrosive substances present. Unless otherwise specified, the dimensions and tolerances of the pipe barrel shall conform to ductile iron pipe equivalent outside diameters.
 3. The dimension ratio (DR) shall be 11.
 4. HDPE pipe shall have butt-fused joints.
 5. The Contractor shall verify the lengths of conduit necessary in the field before fabrication.
 6. Polyethylene fittings and adaptors shall be butt-fused, EHMW-HDPE, PE3408 meeting the same resin requirements as specified for the pipeline. In addition, the fittings shall meet the applicable requirements of ASTM D2513 and ASTM D3261.
 7. Mechanical joint pressure pipe joints shall be restrained using ductile iron clamps (series Ebaa Iron, Inc. or equal) supplied with a sufficient number of ductile iron bolts to restrain the working and test pressures for this application.

2.4 WATERMAIN FITTING MATERIALS

- A. The following pressure pipe fitting materials will be allowed for use on this project:
1. Mechanical Class 350 ductile iron fittings shall be used. Adaptors, back-up rings, and oversize sleeves shall be provided for transitions and connections to dissimilar types of pipe materials. All sleeve fittings shall be long mechanical joint.
 2. All fittings shall be coated with a 6-8 mil nominal thickness fusion bonded epoxy conforming to the requirements of ANSI/AWWA C550 and C116/A21.16.
 3. All fittings, valves, hydrants, etc., shall be secured utilizing COR-BLUE T-BOLTS as manufactured by NSS Industries or approved equal.
 4. Quality control of all fitting manufacturers shall conform to the requirements of International Organization for Standardization (International Organization for Standardization (ISO))

2.5 FIRE HYDRANTS

- A. Hydrants shall be Waterous Improved Pacer Style, Model WB-67-250, UL, 250 psi rating, with safety flange and stem coupling. The bury length shall be 8.0-feet, unless otherwise noted on the plans. The break-off height shall be 16.0-inches. The Contractor shall install the hydrant so that the center of the nozzle is 24.0-inches above the finished grade. The hydrant shall be painted red.
- B. The hydrant pumper nozzle shall be of one-piece design, compatible with 5.0-inch Storz hose coupling. The nozzle shall be an integral part of the fire hydrant and must be furnished by the manufacturer or authorized distributor designated by the manufacturer. Storz adapters will not be accepted.
- C. All hydrants shall be equipped with Hydrafinder fiberglass shafts, or approved equal.
- D. All hydrants shall have been manufactured in the year of construction or prior two calendar years.
 - 1. All hydrant extensions shall be manufactured by the same manufacturer as the hydrant.
 - 2. The local fire department shall be contacted before ordering hydrants to obtain the correct nozzle threads and type of operating nut and cap bolts.

2.6 VALVE AND VALVE HOUSING

- A. All water valves shall have been manufactured in the year of construction or prior two calendar years.
- B. All valves shall be epoxy coated.
- C. All nuts and bolts shall be 304 stainless steel.
- D. Valve Housing
 - 1. Cast-iron screw type valve boxes shall be installed where indicated on underground valves. The cast-iron valve boxes shall be of either the two-piece or three-piece style and shall be furnished with a stay-put cover with raised letters indicating "WATER." The shaft shall be 5 1/4" inside diameter.
 - 2. All valve box assemblies shall be furnished with a valve umbrella anchorage assembly. The valve umbrella anchorage assembly shall be manufactured by Adaptor, Inc., Oak Crest, WI, or equivalent.
 - 3. High Density Polyethylene valve housings will not be allowed on this project.
- E. Gate Valves
 - 1. All valves up to and including 12-inch diameter shall be gate valves conforming to the referenced specification.
- F. Butterfly Valves
 - 1. All valves greater than 12-inch diameter shall be butterfly valves conforming to the referenced specification.
 - 2. All butterfly valves shall be manufactured with the rubber seat bonded to the body. Valve discs shall be furnished with 316 stainless steel seating edge.

2.7 WATER SERVICE PIPE AND FITTINGS

- A. Service Pipe and Fittings
 - 1. General
 - (a) Water service pipe and fittings shall conform to the provisions of 2611.2D, AWWA C800 and the following:
 - (b) Valves and fitting models to vary according to water main pipe size. See mfg. catalogue data.
 - (c) Saddles shall be provided for all services if PVC pipe is installed.

- (d) Curb boxes shall be adjustable and 8.0-feet in length with Minneapolis Pattern. Stationary rods are required.
2. Copper Service Pipe Notes & Specifications:
- (a) Copper pipe shall conform to ASTM B88, Seamless Copper Water Tubing, Type K, Soft Annealed Copper.
- (b) Copper water service pipe connections shall be flared type.
3. Polyethylene (PE) Service Pipe Notes & Specifications
- (a) PE pipe shall conform to Grade PE-3408 or PE-4710 pipe and shall be rated for 200 PSI working pressure, SDR-9.
- (b) PE pipe shall conform to ASTM D-1248 & D-2737 for Copper Tube Size, outside diameter controlled.
- (c) PE water service pipe connections shall be compression type.
- (d) PE pipe shall be permanently marked at 2' intervals indicating Mfg., PE Material Type, Date of Manufacture, etc.
- (e) Type 304 stainless steel pipe inserts / stiffeners shall be furnished and installed in the ends of the PE pipe at all connections. Inserts shall meet requirements of AWWA C901 and ASTM 240-92B, unless otherwise shown on the plans.
4. Tracer Wire
- (a) Tracer wire shall be supplied when using PE water service pipe. Tracer wire shall be fastened to the underside of the top of the curb stop boxes with waterproof connections, unless otherwise shown on the plans.
5. The Utility should be contacted before ordering to verify the manufacturers' type and style. The water service materials style commonly used by the Utility are to be considered as a basis for quality are

WATER SERVICE PIPE & APPURTENANCES			
ITEM:	SERVICE PIPE SIZE	FLARED TYPE Valves & Fittings For TYPE K COPPER PIPE	
		FORD MODEL #	
Corporation Stop		FORD	
	3/4"	FB600-3-NL	
	1"	FB600-4-NL	
	1.5"	FB600-6-NL	
	2"	FB600-7-NL	
Tapping Saddle		FORD for DIP WMN	FORD for PVC WMN
	3/4"	F202	FS323
	1"	F202	FS323
	1.5"	F202	FS323
	2"	F202	FS323
Curb Stop		FORD	
	3/4"	B22-333M-NL	
	1"	B22-444M-NL	

WATER SERVICE PIPE & APPURTENANCES		
ITEM:	SERVICE PIPE SIZE	FLARED TYPE Valves & Fittings For TYPE K COPPER PIPE
		FORD MODEL #
Curb Stop	1.5"	B22-666M-NL
	2"	B22-777M-NL
Curb Box	1.5" Diam. Base Tap for ¾" to 1.25" Curb Stops	FORD 8'- EM2-80-56
Curb Box	2" Diam. Base Tap for 1.5" to 2" Curb Stops	FORD 8'- EM2-80-57

WATER SERVICE PIPE & APPURTENANCES		
ITEM:	SERVICE PIPE SIZE	COMPRESSION TYPE Valves & Fittings For POLYETHYLENE PIPE
		FORD MODEL #
Corporation Stop		FORD
	¾"	FB1000-3-Q-NL
	1"	FB1000-4-Q-NL
	1.5"	FB1000-6-Q-NL
	2"	FB1000-7-Q-NL
Tapping Saddle		FORD for DIP WMN FORD for PVC WMN
	¾"	F202 FS323
	1"	F202 FS323
	1.5"	F202 FS323
	2"	F202 FS323
Curb Stop		FORD
	¾"	B44-333M-Q-NL
	1"	B44-444M-Q-NL
	1.5"	B44-666M-Q-NL
	2"	B44-777M-Q-NL
Curb Box	1.5" Diam. Base Tap for ¾" to 1.25" Curb Stops	FORD 8'- EM2-80-56
Curb Box	2" Diam. Base Tap for 1.5" to 2" Curb Stops	FORD 8'- EM2-80-57

2.8 RESTRAINED JOINT RETAINER GLANDS

- A. Where stainless steel is not used restrained joint retainer glands shall be coated with a 6-8 mil nominal thickness fusion bonded epoxy conforming to the requirements of ANSI/AWWA C550 and C116/A21.16 or approved equal.

2.9 POLYETHYLENE ENCASEMENT

- A. If ductile iron pipe is used, the Contractor shall furnish and install polyethylene encasement for the entire main and all appurtenances in accordance with the referenced specification.
- B. If flexible pipe is used, the Contractor shall furnish and install polyethylene encasement for all joint fittings, hydrant riser pipes and valves in accordance with the referenced specification.

PART 3 -- EXECUTION

3.1 INSTALLATION OF PIPE AND FITTINGS

A. Aligning and Fitting of Pipes

- 1. The Contractor, together with the utility's personnel, shall jointly examine and operate all curb stops and mainline valves prior to final acceptance.
- 2. Anchoring of Pipe
 - (a) A thrust block of cast-in-place concrete, which covers the installed fitting, is not permitted. Restrained joint retainer glands shall be provided at all bends, tees, hydrants, valves and plugged crosses or wherever the watermain changes direction or dead ends

B. Polystyrene Insulation

- 1. The Contractor shall install polystyrene insulation in those areas where the watermain or services may be susceptible to frost or freezing, or as directed by the Engineer.
- 2. Rigid foam insulation shall be placed between the watermain and storm or sanitary sewer where adequate vertical clearance cannot be maintained. The insulation shall be placed on a bed of sand and sand shall be placed above the insulation to isolate the insulation from rocks and other sharp objects. The ultimate thickness of insulation required shall be achieved by using 2 layers of insulation, the second layer shall be placed perpendicular to first layer and the joints shall be offset.

C. Water Service Installation

- 1. The Contractor shall keep accurate records as to the location of the service connections, as specified in the referenced specification. Final payment for the project will not be made until the information is in the possession of the Owner.
- 2. No warranty is expressed or implied as to the location, size or material type of existing service lines. The Contractor shall furnish and install all fittings required to make the connections.
- 3. The Contractor shall install new service pipe, at 7.0-foot bury depth, from the corporation stop to the property line, or as shown on the plans, or as directed by the Engineer.
- 4. The water services shall be hydrostatically tested and disinfected.
- 5. All water services shall be verified as operative and the corporation stops shall be turned to open position prior to backfilling.
- 6. Contractor shall collect photos as described in Section 01130 - Submittals prior to Backfilling.

D. Polyethylene Encasement

- 1. If ductile iron pipe is used, the Contractor shall furnish and install polyethylene encasement for the entire main and all appurtenances in accordance with the referenced specification.
- 2. If flexible pipe is used, the Contractor shall furnish and install polyethylene encasement for all joint fittings, hydrant riser pipes and valves in accordance with the referenced specification.

3.2 FIELD QUALITY CONTROL

A. Electrical Conductivity Test

1. Conductive Pipe Materials
 - (a) See CEAM 2611.3.F
2. Non-conductive Pipe Materials
 - (a) The conductivity requirements shall be deleted.

3.3 HYDROSTATIC TESTING

- A. Hydrostatic tests shall be conducted in accordance with the referenced specification. Individual tests from valve to valve are required. These tests shall be conducted prior to the bacteriological tests required with the disinfection of the main. No drop in pressure will be allowed during the last two hours of the pressure test.
- B. Water services, including corporation and curb stops, shall be tested. The Contractor may choose to include services at the time of watermain testing or as a separate operation at a reduced pressure of 100 psig. If performed separately, testing shall be done with the corporation stops open.

3.4 DISINFECTION

- A. The Contractor shall disinfect the watermain in accordance with the provisions of AWWA C-651.
- B. Testing options A and B as described in AWWA C-651 and below shall be required for the bacteriological testing for total coliform analysis.

Option A: Before approving a main for release, take an initial set of samples after flushing and then resample again after a minimum of 16 hours using the sampling site procedures outlined. Both sets of samples must pass for the main to be approved for release.

Option B: Before approving a main for release, flush the main and let it sit for a minimum of 16 hours without any water use. Then collect, using the sampling site procedures outlined and without flushing the main, two sets of samples a minimum of 15 minutes apart while the sampling taps are left running. Both sets of samples must pass for the main to be approved for release.
- C. If the initial disinfection fails to produce satisfactory bacteriological results, or if other results indicate unacceptable water quality, the main may be re-flushed and shall be resampled. If check samples fail to produce acceptable results, the main shall be re-chlorinated by the continuous-feed or slug method until satisfactory results are obtained.
- D. No lines shall be placed in service until a satisfactory result is obtained.

****END OF SECTION****

SECTION 02720 - AGGREGATE BASE

PART 1 -- GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to construct the aggregate base course as indicated on the drawings or as specified herein.

1.2 METHODS OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
 - 1. No exception to the referenced specification is made.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances shall not be individually paid in the absence of a specific bid item for the work. The costs shall be included in the unit price bid for the associated aggregate items. Such items of work include but are not limited to:
 - 1. Protecting existing improvements and previously accepted in-process improvements from damage.
 - 2. Subgrade excavation, furnishing stabilizing aggregate, geotextile fabric installation, compaction, regrading and/or other efforts necessary to repair the subgrade after satisfying the rolling test and failing to protect the integrity of the subgrade.
 - 3. The cost of all labor, equipment and materials necessary for meeting the testing requirements of field quality control, if required, include in price bid for Aggregate Base.
 - 4. Furnishing and installing blue tops for gravel surface.
 - 5. Test rolling of the compacted aggregate base using a fully loaded aggregate truck (tandem)..

1.3 SPECIFICATION REFERENCES

- A. MnDOT 2211 shall apply to the construction of aggregate base, except as modified herein.
- B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS

- A. When no percent crushing is designated in the Schedule of Prices, the material to be used shall conform to the Specifications for Aggregate Base Class 5 modified so that the percent passing the No. 200 sieve shall be 5 to 10 percent.
- B. Materials included here consist of new Class 5 aggregate base. If additional rock is added to meet the Class 5 gradation, the added materials must pass the Los Angeles Rattler (L.A.R.) test. The percent crushed shall also be tested on the aggregate base class 5 samples.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. At the end of each day the Contractor shall eliminate surface indentations, including those caused by sheeps foot rollers and tractor cletes, and roll the surface with a steel wheel or rubber tired roller.
- B. The depth and class of aggregate base to be constructed shall be as shown on the plans. Aggregate base construction shall take place only after the street subgrade condition and grade has been examined by the Engineer.

- C. All aggregate base courses shall be compacted using the Quality Compaction Method.
- D. The compacted aggregate base shall be test rolled using a fully loaded aggregate truck (tandem) in a pattern approved by the Engineer. The stability of the compacted base shall be considered adequate when the surface shows less than 1.0-inch of yielding or rutting after one pass, or as otherwise approved by the Engineer. The test rolling of the compacted aggregate base using a fully loaded aggregate truck (tandem) shall be incidental.

3.2 SOURCE QUALITY CONTROL

- A. The Contractor shall arrange for having the following testing performed:
 - 1. One gradation test for each 500 tons or 275 cubic yards (CV) of each class of aggregate base.
 - 2. One percent crushing test.
 - 3. One aggregate quality test.
- B. Samples for testing shall be taken from material in stock at locations approved by the Engineer. All sampling methods shall be approved by the Engineer.
- C. The Contractor shall cooperate fully with the individuals performing the tests.
- D. Should any of the specified tests fail, the Contractor may arrange and pay for additional tests as may be necessary to satisfy the Engineer that the requirements have been met.

3.3 FIELD QUALITY CONTROL

- A. "Blue Top" stakes shall be provided by the Contractor at 50.0-foot intervals to confirm that the base is constructed to the required grades and elevations. Methods other than "Blue Top" staking may be allowed, if approved by the Engineer.

*******END OF SECTION*******

SECTION 02751 - CONCRETE PAVEMENT

PART 1 -- GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the construction of Portland cement concrete as indicated on the drawings or as specified herein.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. All measurements for payments for Concrete Pavement items shall be based on the Unit Price bid per item.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances shall not be individually paid in the absence of a specific bid item for the work. The costs shall be included in the unit price bid for the associated concrete paving items. Such items of work include but are not limited to:
 - 1. Furnishing and installing material, as specified, to seal the joints.
 - 2. Unless otherwise shown on the typical section, subcutting the excavation 3-inches below the bottom of the pavement, furnishing, placing and compacting 3.0-inches of aggregate base, Class 5, backfilling with topsoil and related work.
 - 3. Cold weather concrete protection methods and materials required.
 - 4. Provide adequate barricades and personnel to protect fresh concrete from pedestrian traffic and graffiti.
 - 5. Provide temporary walk ways spanning fresh concrete where required to maintain access into building entrances.

1.3 SPECIFICATION REFERENCES

- A. MnDOT 2301 shall apply to the construction of concrete pavement, except as modified herein.
- B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.
- C. MnDOT Standard Plan Sheets.

1.4 SUBMITTALS

- A. The mix proportions shall be determined by an independent certified testing laboratory secured by the Contractor. A current mix design may be submitted and accepted, provided the aggregate source is the same as that being used for this project. Two copies of the certified mix design shall be submitted to the Engineer for review prior to the construction of the project.
- B. Test reports and certification by an approved testing laboratory hired by the Contractor that the following meet all of the requirements of these Specifications.
 - 1. MnDOT 3126, Fine Aggregate for Portland Cement Concrete.
 - 2. MnDOT 3137, Coarse Aggregate for Portland Cement Concrete.
 - 3. ASTM C-1260, Fine aggregate and cementitious material.
- C. In the event ready-mix concrete is used, the Contractor shall furnish the Engineer with numbered delivery tickets showing the date, time, place of delivery, number of cubic yards, the weight of cement, fine aggregate and coarse aggregates, and amount of mixing water in each load. At the end of each paving day, the Contractor shall obtain from the supplier a summary showing the average component amounts that day.

PART 2 -- PRODUCTS

2.1 MATERIAL

- A. The coarse aggregate shall contain a minimum of 50 percent of Class A material as specified in MnDOT 3137, unless the aggregate source is approved by the Engineer.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. The use of dimensional lumber as forms is permitted if the dimension of the lumber is within ½-inch of the specified dimension of the finished concrete.
- B. A bull float with 8-foot minimum width shall be used for finishing the concrete.
- C. Longitudinal, contraction and expansion joints shall be constructed as specified in MnDOT 2301 and as shown on the plans.

3.2 FIELD QUALITY CONTROL

- A. The Owner may conduct various material tests throughout the construction to determine conformance with these specifications, including but not limited to:
 - 1. Air and slump cone tests.
 - 2. Beam and cylinder testing.
- B. The Contractor's shall cooperate with the individuals conducting the testing operations.
- C. If allowed by the Engineer in lieu of smoothness testing per reference MnDOT 2301.M3, a 10.0-foot straight edge or bull float with the capability of checking the deviation in any direction over the entire width of the fresh concrete shall be supplied by the Contractor during all concrete pavement installation. The Contractor shall check the pavement longitudinally in each driving and parking lane by placing the straight edge in a wheel track or center of panel, and moving the straight edge at 5.0-foot overlaps. The Contractor shall check the pavement transversely where directed by the Engineer. The acceptable deviation tolerance shall be a 1/8-inch dip or hump as measured in 10-feet. A 1/8-inch deviation in less than 10.0-feet shall be considered out of tolerance. There shall be no more than one 1/8-inch deviation in 25.0-feet. The Contractor may make corrections during placement while the concrete is still fresh. Otherwise, the Engineer may require corrective action after the concrete has cured. Dips shall be corrected by full panel replacement. Humps may be corrected by grinding as directed by the Engineer.

******END OF SECTION******

SECTION 02770 - CONCRETE CURBING AND DRIVEWAY PAVEMENT

PART 1 -- GENERAL

1.1 SUMMARY

- A. This work consists of constructing cast-in-place concrete curbs, curb and gutter, medians, driveway pavement, pedestrian ramps, and other similar traffic delineation or service items as indicated on the drawings or as specified herein.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
 - 1. Special curb and gutter sections shall be measured and paid for as a part of the design style of curb and gutter shown on the plans.
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances shall not be individually paid in the absence of a specific bid item for the work. The costs shall be included in the unit price bid for the associated concrete curb and gutter, and concrete driveway items. Such items of work include, but are not limited to:
 - 1. Aggregate base placed under pavements.
 - 2. Cold weather concrete protection methods and materials required.
 - 3. High early strength concrete.
 - 4. Provide adequate barricades and personnel to protect fresh concrete from pedestrian traffic and graffiti.
 - 5. Provide temporary walk ways spanning fresh concrete where required to maintain access into building entrances.
 - 6. Casting and curing concrete compressive test cylinders and the performance of compressive strength tests as specified.
- C. Slump and air entrainment testing.

1.3 SPECIFICATION REFERENCES

- A. MnDOT 2531 shall apply to the work under this section, except as modified herein.
- B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.
- C. MnDOT Standard Plates.

1.4 SUBMITTALS

- A. The mix proportions shall be determined by an independent certified testing laboratory secured by the Contractor. A current mix design may be submitted and accepted, provided the aggregate source is the same as that being used for this project. Two copies of the certified mix design shall be submitted to the Engineer for review prior to the construction of the project.

PART 2 -- PRODUCTS

2.1 MATERIAL

- A. Fifty percent of the coarse aggregate shall be Class A material as specified in MnDOT 3137, unless the aggregate source is approved by the Engineer.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. The use of dimensional lumber as forms is permitted if the dimension of the lumber is within ½-inch of the specified dimension of the finished concrete.
- B. The width of all driveways shall be established in the field by the project Engineer or Owner.
- C. The joints in the driveway pavement shall match with the sidewalk and curb control joints. The Contractor shall be fully responsible for proper jointing patterns. Mismatched jointing will require removal and replacement of components in order to achieve the desired results. All removal and replacement of rejected construction shall be at the Contractor's expense.
- D. The tooling tolerances as outlined in MnDOT 2531 for surface uniformity, alignment and jointing shall be reviewed by the Contractor prior to the construction. Defects found during examinations will require the Contractor to remove and replace those areas. No deduction in unit price will be acceptable to satisfy defective areas found.
- E. Backfill along exposed edges of slabs and/or behind the curb with selected salvage material from the excavation to the elevation shown on the design detail plate.
- F. The Contractor shall imprint the concrete curb at the locations of the utility service locations if indicated and in accordance with the plans.
- G. When the pavement is placed directly on natural subgrade, earth check dams shall be constructed immediately after passage of the slip forms or removal of the forms to prevent water from flowing along the edge of the pavement and undermining the concrete. They shall not be spaced or be of a width to provide an approach over which a vehicle may be driven onto the pavement.

3.2 FIELD QUALITY CONTROL

- A. Testing
 - 1. The Contractor shall conduct various material tests throughout the construction to determine conformance with these specifications, including but not limited to:
 - (a) Air and slump cone tests.
 - (b) Beam and cylinder testing.
 - 2. The Contractor's shall cooperate with the individuals conducting the testing operations.
- B. Warranty Period
 - 1. During the warranty period indicated in the Supplementary Conditions, necessary repairs shall include but not be limited to defects in concrete and workmanship such as cracking, pop-outs, spalling, improper joint placement and settlement.

******END OF SECTION******

SECTION 02775 - WALKS - CONCRETE

PART 1 -- GENERAL

1.1 SUMMARY

- A. This work consists of constructing concrete or bituminous walks

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
- B. The furnishing and installing of specific items and/or the performance of work under certain circumstances shall not be individually paid in the absence of a specific bid item for the work. The costs shall be included in the unit price bid for the associated walks - concrete items. Such items of work include but are not limited to:
 - 1. Cold weather concrete protection methods and materials required.
 - 2. Provide adequate barricades and personnel to protect fresh concrete from pedestrian traffic and graffiti.
 - 3. Provide temporary walk ways spanning fresh concrete where required to maintain access into building entrances.
 - 4. Use of high early strength concrete.

1.3 SPECIFICATIONS REFERENCES

- A. MnDOT 2521 shall apply to the construction of concrete walks, except as modified herein.
- B. MnDOT Standard Plates.
- C. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.4 SUBMITTALS

- A. Two copies of the certified mix design shall be submitted to the engineer for review prior to the construction of the project. The mix proportions shall be determined by an independent certified testing laboratory secured by the Contractor. A current MnDOT Design Mix may be accepted provided the aggregate sources are the same as that being used for this project.

PART 2 -- PRODUCTS

2.1 MATERIALS

- A. CONCRETE
 - 1. Fifty percent of the coarse aggregate shall be Class A material as specified in MnDOT 3137, unless the aggregate source is approved by the Engineer.
- B. The foundation materials shall be in accordance with the plans.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. The use of dimensional lumber as forms is permitted if the dimension of the lumber is within ½-inch of the specified dimension of the finished concrete.

- B. When the pavement is placed directly on natural subgrade, earth check dams shall be constructed immediately after passage of the slip forms or removal of the forms to prevent water from flowing along the edge of the pavement and undermining the concrete. They shall not be constructed to provide an approach over which a vehicle may be driven onto the pavement.

3.2 FIELD QUALITY CONTROL

A. Testing

- 1. The Owner may conduct various material tests throughout the construction to determine conformance with these specifications, including but not limited to:
 - (a) Air and slump cone tests.
 - (b) Beam and cylinder testing.
- 2. The Contractor's shall cooperate with the individuals conducting the testing operations.

B. Warranty Period

- 1. During the warranty period indicated in the Supplementary Conditions, necessary repairs shall include but not be limited to defects in concrete and workmanship such as cracking, pop-outs, spalling, improper joint placement and settlement.

******END OF SECTION******

SECTION 02920 - TURF RESTORATION

PART 1 -- GENERAL

1.1 SUMMARY

- A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to turf restoration as indicated on the drawings or as specified herein.
- B. A variety of different seeding mixtures may be utilized on this project. The Contractor shall refer to the plan for the locations of the different turf establishment areas.
- C. Temporary seeding may be necessary during construction in erosion sensitive areas. The Contractor shall do temporary seeding work as specified herein or as directed by the Engineer.

1.2 METHOD OF MEASUREMENT AND PAYMENT

- A. Measurement and compensation for the following items shall be paid according to the referenced specification or as modified below:
 - 1. All measurements for payments for turf establishment items shall be based on the Unit Price bid per item.
- B. The furnishing and installing specific items and/or the performance of work under certain circumstances shall not be individually paid in the absence of a specific bid item for the work. The costs shall be included in the unit price bid for the associated seeding and sodding items. Such items of work include but are not limited to:
 - 1. Application of starter fertilizer on all areas to be sodded shall be included in the price bid for sodding.
 - 2. Subgrade preparation and topsoil placement as required on all areas shown on the plans.
 - 3. Maintenance of newly sodded and seeded areas, as specified, include in the unit price for the associated items.
 - 4. Stapling of sod on sloped areas, include in the unit price bid for sodding.

1.3 SPECIFICATION REFERENCES

- A. MnDOT 2574 – Soil Preparation
- B. MnDOT 2575 - Establishing Turf and Controlling Erosion
- C. MnDOT 3876 – Seed
- D. MnDOT 3877 - Topsoil
- E. MnDOT 3878 - Sod
- F. MnDOT 3881 - Fertilizer
- G. MnDOT 3882 - Mulch Material
- H. MnDOT 3884 - Hydraulic Erosion Control Products
- I. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS

- A. Seeding
 - 1. Mulch shall be Flexterra Hydromulch or approved equal placed at a rate of 3000 lb/ac.

2. The seed mixture to be used shall be 270 RT placed at a rate of 300 lb/ac.
 3. A general additive shall be applied at a rate of 20 lb/ac.
 4. Seed must be obtained from as close to the project site as reasonably possible with an emphasis on obtaining seed from the local ecotype region.
 5. Source identified (Yellow tag) seed through the Minnesota Crop Improvement Association (MCIA) unless otherwise approved by the Engineer.
 6. All seed shall be supplied as pure-live seed (PLS).
 7. All seed and seed mixes shall conform to State seed requirements for noxious weed content.
 8. All seed and seed mixes shall conform to State labeling requirements. For all species in the mix, the label and or invoice shall include the county of origin, and if from Canada, the province.
- B. Fertilizer
1. Fertilizer shall be (22-5-10).
 2. Fertilizer shall be applied at a rate of (300 lb/ac).

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. GENERAL

1. The subgrade shall be shaped to the approximate contour of the finished surface. All construction debris shall be removed from the area prior to the placement of the topsoil. The subgrade shall be loosened with a disc or harrow to a depth of 6.0-inches prior to application of the topsoil.
2. The topsoil shall be shaped to the approximate contour of the finished surface, with a minimum depth of 6.0-inches, unless otherwise shown on the plan. All construction debris, rocks and trash shall be removed from the area prior to seeding or sodding. The topsoil shall be loosened with a disc or harrow to its full depth prior to seeding.
3. The Contractor shall be responsible for providing water and maintenance for a period of 60 calendar days, or until final acceptance by the Owner, to firmly establish the seed. The term maintenance shall include mowing, weed control and watering, as necessary. Failure to perform this work within 24-hours of notification of non-compliance may result in the Owner or Engineer arranging for completion of the work by others. A contract deduction shall be made equal to the total of all costs to perform such work so arranged, including but not limited to, labor, materials, equipment and administrative costs.
4. Where dormant seeding or sodding is authorized, the maintenance period shall be extended to include the first 30 calendar days after the beginning of the growing season. The beginning of growing season shall be defined as bud burst.

B. SEEDING REQUIREMENTS

1. Turf establishment by seeding shall be done utilizing the various combinations of seed mixtures (including aquatic plants), fertilizing and mulching at disturbed areas as shown on the plans.
2. Areas prepared for seeding shall be free of rocks, debris and clumps of soil. The areas shall be graded uniformly and vegetated areas shall be raked free of chunks exceeding ½-inch diameter.
3. Seed shall be applied with a drill seeder, unless otherwise approved by the Owner.
4. The Contractor shall furnish weight tickets documenting pounds of hydraulic soil stabilizer placed, pounds of fertilizer placed and pounds of seed placed. The seed tickets shall show individual plant

species along with the percent purity and percent germination. The fertilizer tickets shall show mix proportions. The Contractor shall also furnish its QA/QC data to the Engineer.

5. Dormant seeding and snow seeding may be utilized in accordance with the referenced specification and technical memorandum, provided the final acceptance standards are met.
6. Final acceptance of seeding shall be based on an established growth of 6.0-inches with a uniform density to cover 90 percent of the designated area, free of weeds and bare spots. Any re-seeding necessary shall be performed at the Contractor's expense.

******END OF SECTION******

HICKORY PARK WARMING HOUSE AND ICE RINKS

BELLE PLAINE, MN

ARCHITECT OF RECORD

OLESON + HOBBIE ARCHITECTS, LLC

WWW.OHARCHITECTS.COM
ARCHITECTURE • INTERIORS • PLANNING • SUSTAINABILITY
330 Stadium Road, Suite 202, Mankato, MN 56001
T: 507.385.1158

CONSULTANT

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.

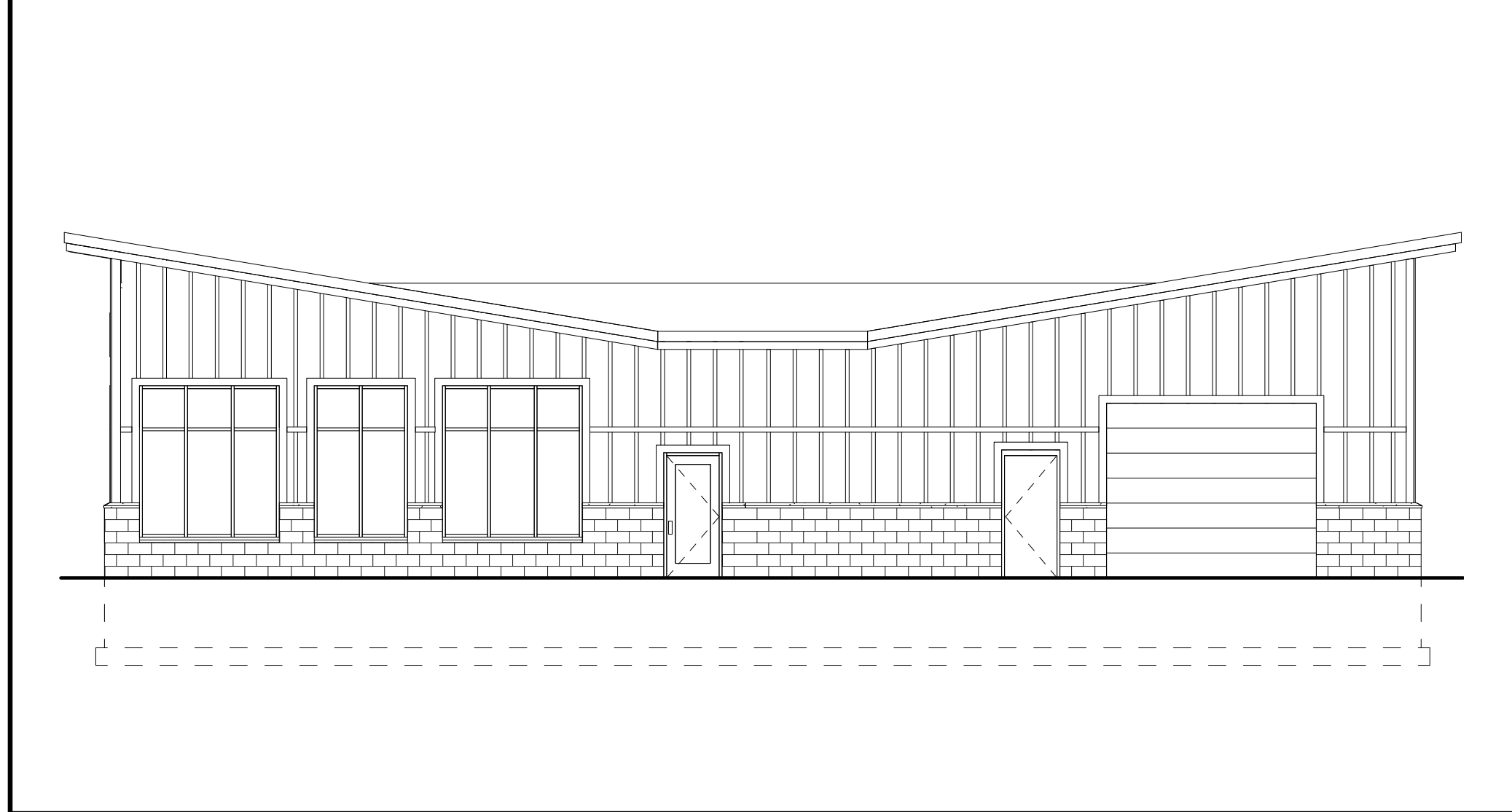
Eric L. Oleson
Eric L. Oleson, AIA

Dated: 08.01.19 Reg. No. 42143

HICKORY PARK WARMING HOUSE AND ICE RINKS

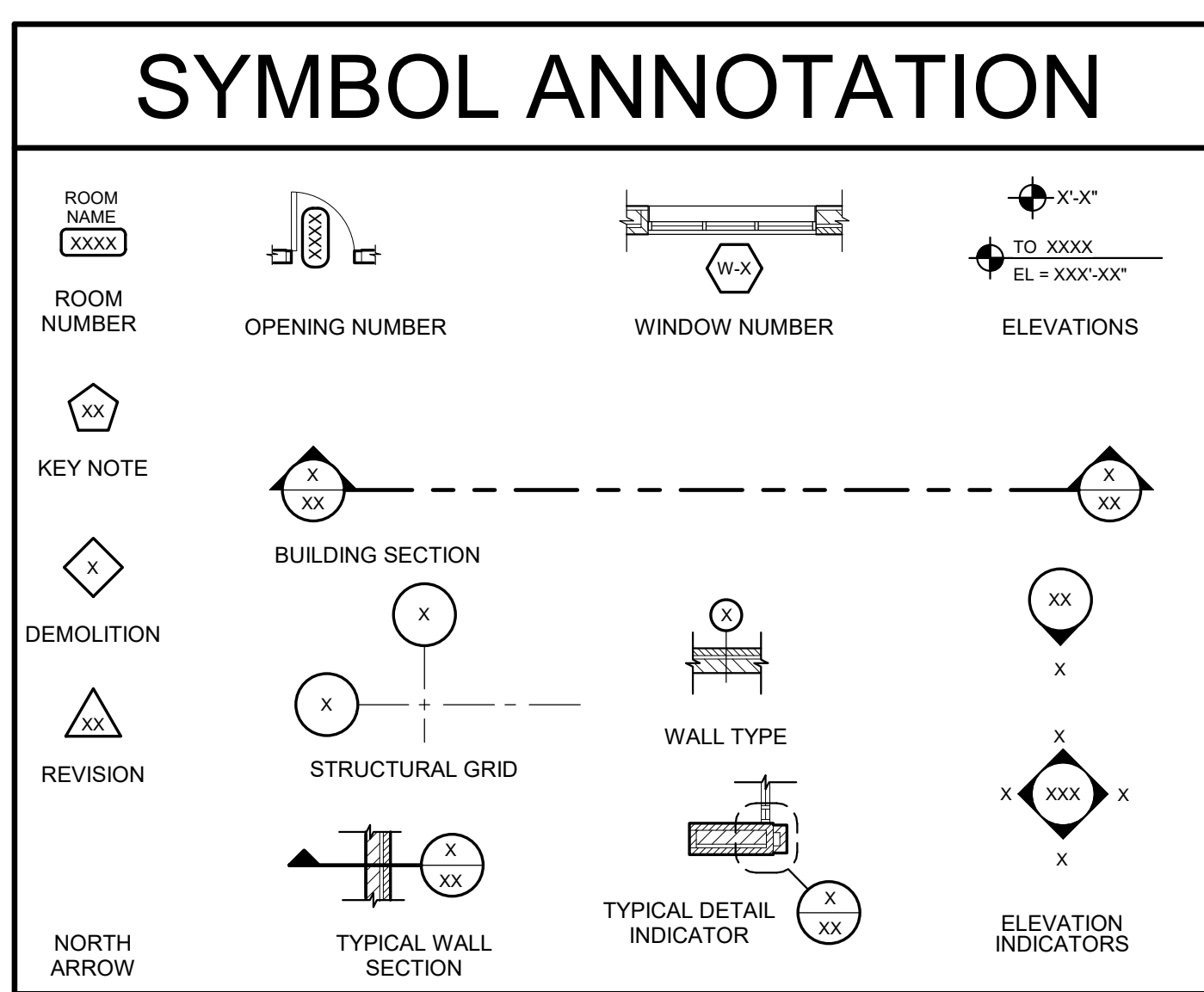
ABBREVIATIONS

AB	Anchor Bolt	HB	Hose Bib	STAG	Staggered
AC	Acoustic	HC	Hollow Core	STD	Standard
ACT	Acoustical Ceiling Tile	HD	Head	STL	Steel
ADJ	Adjustable	HDR	Header	STOR	Storage
AFF	Above Finish Floor	HDW	Hardware	STRUC	Structural
ALT	Alternate	HM	Hollow Metal	SUSP	Suspend(ed)
ALUM	Aluminum	HORIZ	Horizontal	SV	Sheet Vinyl
ANCH	Anchor	HR	Hour	SYM	Symmetrical
AP	Access Panel	HT	Height	SW	Slat Wall
APPROX	Approximate(ly)	HW	Hot Water	T	Tread
ARCH	Architect	ID	Inside Diameter	T&G	Tongue & Groove
AWC	Acoustical Wall Covering	INSUL	Insulation	TB	Tackboard
BC	Bottom of Curb	INT	Interior	TC	Top of Curb
BCS	Baby Changing Station	INT	Interior	TD	Trench Drain
BD	Board	JAN	Janitor	TEMP	Temporary, Tempered
BF	Both Faces	JST	Joist	TERR	Terrazzo
BIT	Bituminous	JC	Joint	THRESH	Threshold
BK	Brick	KD	Knocked Down	TO	Top of
BL	Borrowed Lite	LAM	Laminated	TOB	Top of Beam
BLDG	Building	LAV	Lavatory	TOD	Top of Deck
BLK	Block	LB	Pound (weight)	TOF	Top of Footing
BLKG	Blocking	LLV	Long Leg Vertical	TOJ	Top of Joist
BM	Beam, Bench Mark	LONG	Longitudinal	TOS	Top of Steel
BO	By Others/ By Owner	LSJ	Long Span Joist	TP	Top of Pavement
BOT	Bottom	LT	Light	TPH	Toilet Paper Holder
BRDG	Bridging	LWC	Light Weight Concrete	TR	Trash Receptacle
BRG	Bearing	MAS	Masonry	TRANS	Transverse
BRKT	Bracket	MAT	Material	TYP	Typical
BS	Backset	MAX	Maximum	UH	Unit Heater
BSMT	Basement	MC	Mechanical Contractor	UNEX	Unexcavated
BUR	Built-up Roofing	MECH	Mechanical	UNFIN	Unfinished
CAB	Cabinet	MEMB	Membrane	UON	Unless Otherwise
CB	Catch Basin, Chart Box	MET	Metal	UNOT	Unless Otherwise
CER	Ceramic	MEZZ	Mezzanine	UR	Urinal
CG	Corner Guard	MFG	Manufacturer	UV	Unit Ventilator
CI	Cast Iron	MGR	Manager	VB	Vinyl Base
CJ	Control Joint	MH	Manhole	VCT	Vinyl Composition Tile
CLG	Ceiling	MIN	Minimum	VERT	Vertical
CLO	Closet	MISC	Miscellaneous	VFY	Verify
CLR	Clear	ML	Metal Lath	VOL	Volume
CMU	Concrete Masonry Unit	MO	Masonry Opening	VWC	Vinyl Wall Covering
CO	Clean out	NIC	Not In Contract	W	Width
COL	Column	ND	Napkin Disposal	W/O	Without
COMP	Composition	NOM	Nominal	WC	Watercloset
CONC	Concrete	OAL	Overall Length	WDB	Wood
COND	Conductor, Conduit	OC	On Center	WDB	Wood Base
CONST	Construction	OD	Outside Diameter	WDF	Wood Flooring
CONT	Continuous	CONTR	Contractor	WDS	Wood Solid Core
CONV	Convector	OFCI	Owner Furnished/ Contractor Installed	WH	Wall Hydrant
CRS	Course	OFOW	Owner Furnished/ Owner Installed	WI	Wrought Iron
CORR	Corridor	OH	Overhead	WR	Water Resistant
CSK	Countersink	OP	Opening	WS	Weatherstripping
CT	Ceramic Tile	OPP	Opposite	WSCT	Wainscot
CTR	Center	OZ	Ounce	WWM	Welded Wire Mesh
CUH	Cabinet Unit Heater	P	Paint		
CWT	Ceramic Wall Tile	PAR	Parallel		
DEMO	Demolition	PART	Partition		
DET	Detail	PB	Particle Board		
DF	Drinking Fountain	PC	Precast Concrete		
DIA	Diameter	PERM	Perimeter		
DIM	Dimension	PERP	Perpendicular		
DN	Down	PL	Plate		
DR	Door	PLAM	Plastic Laminate		
DS	Downspout	PLAS	Plaster		
DW	Dish Washer	PLBG	Plumbing		
DWG	Drawing	PLWD	Plywood		
DWL	Dowel	POL	Polished		
EA	Each	PP	Polished Plate		
EC	Electrical Contractor	PR	Part		
EFD	Exhaust Fan	PREFAB	Prefabricated		
EHD	Electric Hand Dryer	PREFIN	Prefinished		
EIFS	Exterior Insulation and Finish System	PS	Projection Screen		
EJ	Expansion Joint	PSF	Pounds per square ft		
EL	Elevation	PSI	Pounds per square in		
ELEC	Electrical	PT	Porcelain Tile		
ELEV	Elevator	PTD	Paper Towel Dispenser		
ENCL	Enclosure	QT	Quarry Tile		
EP	Electrical Panel	R	Riser, Radius		
EQ	Equipment	RAD	Radiation		
EQU	Equipment	RCP	Reflected Ceiling Plan, Roof Drain		
EW	Each Way	RD	Reinforced Concrete Pipe		
EWC	Electric Water Cooler	RDWD	Redwood		
EXC	Excavate	REC	Recessed		
EXIST	Existing	REIN	Reinforced		
EXP	Expansion, Exposed Structure	REINF	Reinforced(ing)		
EXT	Exterior	REQD	Required		
FA	Fresh Air	REV	Reverse		
FC	Fire Code	RFG	Roofing		
FD	Floor drain	RFM	Recessed Floor Mat		
FE	Finished End	RH	Robe Hook		
FEC	Fire Extinguisher Cabinet	RI	Rigid Insulation		
FF	Finished Floor	RO	Rough Opening		
FIN	Finish	RM	Room		
FLEX	Flexible	R/W	Reinforced With		
FLR	Floor	RL	Rain Leader		
FLSHG	Flashing	RT	Rubber Treads		
FOS	Face of Stud(s)	S	Sirk		
FP	Fireproofing	SB	Soil Boring		
FR	Frame	SC	Solid Core, Sealed Concrete		
FRP	Fiberglass Reinforced	SCHED	Schedule		
FTG	Footing	SD	See Detail, Soap Dispenser		
GA	Gauge	SECT	Section		
GALV	Galvanized	SF	Square Foot		
GB	Grab Bar	SGT	Structural Glazed Tile		
GC	General Contractor	SHT	Sheet		
GEN	General	SIM	Similar		
GI	Galvanized Iron	SM	Smooth		
GL	Glass, Glazed	SND	Sanitary Napkin Dispenser		
GMU	Glazed Masonry Unit	SPEC	Specifications		
GR	Grille	SPK	Speaker		
GYP	Gypsum	SQ	Square		
GYP BD	Gypsum Board	SS	Stainless Steel		
		ST	Street, Storm Water		



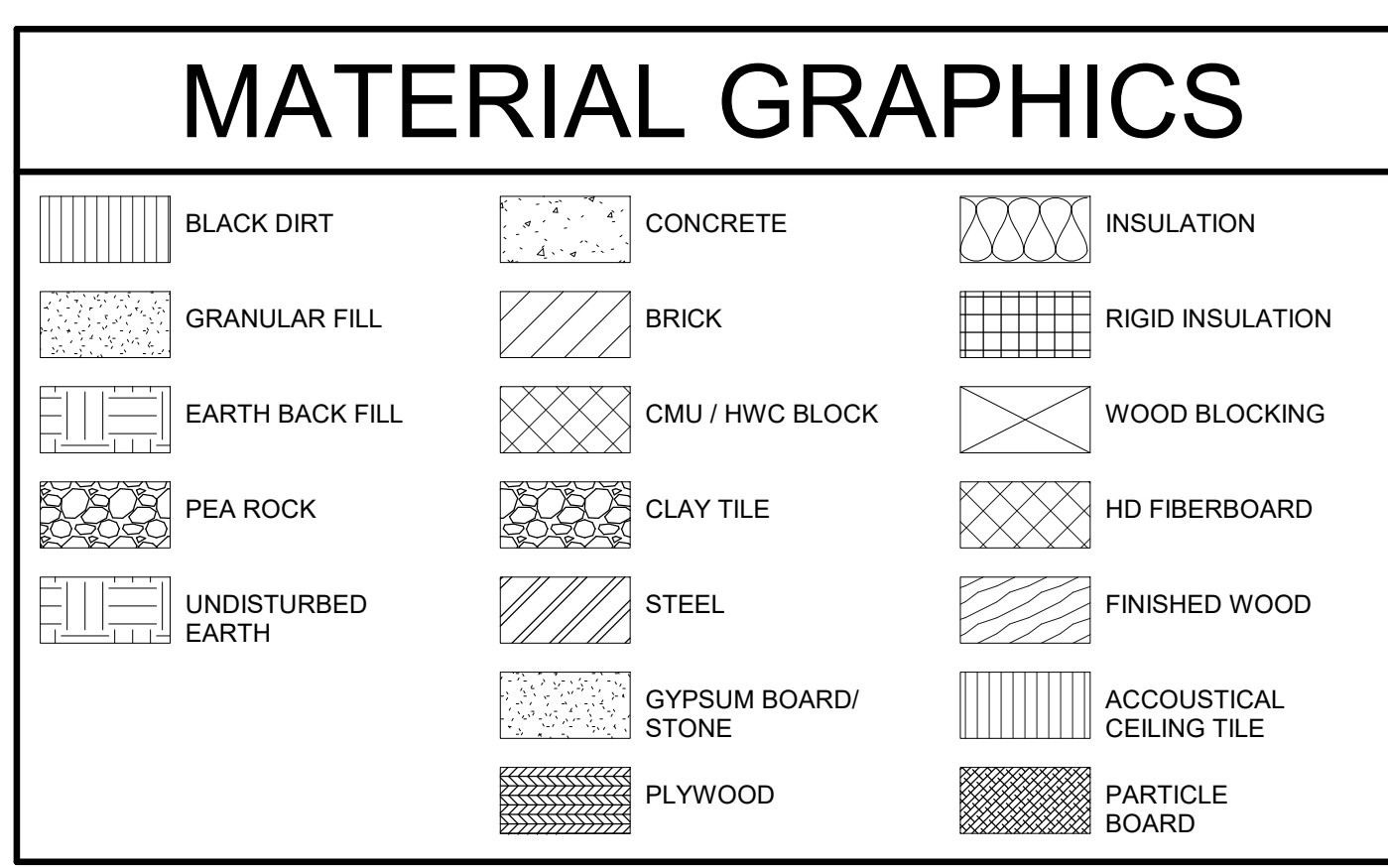
SHEET INDEX

TITLE SHEET	T1	TITLE SHEET
	T2	CODE REVIEW PLAN
CIVIL	G0.01	TITLE SHEET
	G0.02	LEGEND
	G0.03	GENERAL NOTES
	G0.01	EXISTING CONDITIONS & REMOVALS
	C1.01	DETAILS & TYPICAL SECTIONS
	C3.01	PROPOSED SITE PLAN
	C3.02	PROPOSED GRADING PLAN
STRUCTURAL	S1.00	STRUCTURAL NOTES
	S1.10	FOUNDATION AND SLAB PLAN
	S1.20	FOUNDATION AND SLAB DETAILS
	S3.10	ROOF FRAMING PLAN
	S3.11	CEILING FRAMING PLAN AND DETAILS
	S3.20	FRAMING DETAILS
ARCHITECTURAL	A1.1	FIRST LEVEL FLOOR PLAN, OPENING SCHEDULE
	A2.1	DETAILS
	A3.1	EXTERIOR ELEVATIONS
	A4.1	BUILDING SECTIONS
	A5.1	WALL SECTIONS
	A7.1	REFLECTED CEILING PLAN, ROOF PLAN, & DETAILS
	A8.1	INTERIOR ELEVATIONS AND FINISH PLANS
MECHANICAL - HVAC	M1.0	FLOOR PLAN - H.V.A.C.
	M2.0	H.V.A.C. SCHEDULES & DETAILS
MECHANICAL - PLUMBING	P1.0	PLUMBING FLOOR PLANS
	P2.0	PLUMBING RISERS DETAILS & SCHEDULES
ELECTRICAL	E1.0	SITE PLAN - ELECTRICAL
	E2.0	FLOOR PLAN - LIGHTING
	E3.0	FLOOR PLAN - POWER & SPECIAL SYSTEMS SCHEDULES, POWER RISER, SYMBOLS & ABBREVIATIONS
	E4.0	



Oleson + Hobbie Architects, LLC. Architect
330 Stadium Road, Suite 202
Mankato, MN 56001
T: 507.385.1158 www.oharchitects.com

Midwest Engineering 47130 Fort Road Nicollet, MN 56074 507.380.9313	Structural Engineer	Dolejs Associates 1624 N. Riverfront Dr. Mankato, MN 56001 507.625.7869	Mechanical Engineer
Bolton & Menk Inc. 1960 Premier Drive Mankato, MN 56001 507.625.4171	Civil Engineer	Dolejs Associates 1624 N. Riverfront Dr. Mankato, MN 56001 507.625.7869	Electrical Engineer



PROJECT DATA

BUILDING CODE:	MINNESOTA STATE BUILDING CODE 2015 EDITION
FIRE CODE:	MINNESOTA STATE FIRE CODE, 2015 EDITION
MECHANICAL CODE:	MINNESOTA MECHANICAL AND FUEL AND GAS CODE 2015 EDITION
PLUMBING CODE:	MINNESOTA PLUMBING CODE, 2015 EDITION
ELECTRICAL CODE:	MINNESOTA ELECTRICAL CODE
ACCESSIBILITY CODE:	MINNESOTA STATE ACCESSIBILITY CODE 2015 EDITION
ENERGY CODE:	MINNESOTA COMMERCIAL ENERGY CODE 2015 EDITION
CONSTRUCTION TYPE:	TYPE VB
OCCUPANCY TYPE:	GROUP S-2 & A-3
OCCUPANCY SEPARATION:	MIXED USE / NON-SEPERATED

BELLE PLAINE, MN

REVISIONS	XX
PROJECT #	19-019BP
DATE	08/01/2019
DRAWN BY	DMS
CHECKED BY	ELO
©	2019 OLESON+HOBBIE ARCHITECTS, LLC.
SHEET TITLE	TITLE SHEET
SHEET	T1

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.

Eric L. Oleson
Eric L. Oleson, AIA

Dated: 08.01.19 Reg. No. 42143

**HICKORY PARK
WARMING
HOUSE AND ICE
RINKS**

**BELLE PLAINE,
MN**

REVISIONS XX

PROJECT # 19-019BP
DATE 08/01/2019
DRAWN BY DGH
CHECKED BY ELO
© 2019 OLESON+HOBBIE ARCHITECTS, LLC

SHEET TITLE
**CODE REVIEW
PLAN**

SHEET

T2

PROJECT DATA
BUILDING CODE: 2015 MINNESOTA BUILDING CODE
FIRE CODE: 2015 MINNESOTA PLUMBING CODE
MECHANICAL CODE: 2015 MINNESOTA MECHANICAL AND FUEL GAS CODE
PLUMBING CODE: 2015 MINNESOTA PLUMBING CODE
ELECTRICAL CODE: MINNESOTA ELECTRICAL CODE
ACCESSIBILITY CODE: 2015 MINNESOTA ACCESSIBILITY CODE
ENERGY CODE: 2015 MINNESOTA ENERGY CODE

CONSTRUCTION TYPE: TYPE VB

OCCUPANCY TYPE: A-3 - ASSEMBLY
S-2 - LOW HAZARD STORAGE

SQUARE FOOTAGE: 2,280 SF (OVERALL BUILDING)

ALLOWABLE AREA FOR OCCUPANCY TYPE A-3 (MOST RESTRICTIVE): 6,000 SF MAX

OCCUPANCY SEPARATION: MIXED USE / NONSEPARATED OCCUPANCIES

TABLE 1004.1.2 - MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT
ASSEMBLY W/O FIXED SEATS
UNCONCENTRATED (TABLES AND CHAIRS): 15 NET
GARAGE: 200 GROSS

- ASSEMBLY	795 SF / 15	= 53
- GARAGE	631 SF / 200	= 4
- MECHANICAL	148 SF / 300	= 1
OCCUPANT LOAD TOTAL		= 58

TABLE 1014.3 - COMMON PATH OF EGRESS TRAVEL
IN 'A' OCCUPANCY WITHOUT SPRINKLER SYSTEM AND AN OCCUPANT LOAD OF GREATER THAN 30 - COMMON PATH OF EGRESS TRAVEL CANNOT EXCEED 75'-0"

TABLE 1015.1 - SPACES WITH ONE EXIT OR EXIT ACCESS DOORWAY
IN 'A' OCCUPANCY - MAXIMUM OCCUPANT LOAD = 49 FOR ONE EXIT DOORWAY

TABLE 1016.2 - EXIT ACCESS TRAVEL DISTANCE
IN 'A' OCCUPANCY WITHOUT AUTOMATIC SPRINKLER SYSTEM - EXIT ACCESS TRAVEL DISTANCE CANNOT EXCEED 200'-0"



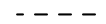
PLUMBING CALCULATIONS

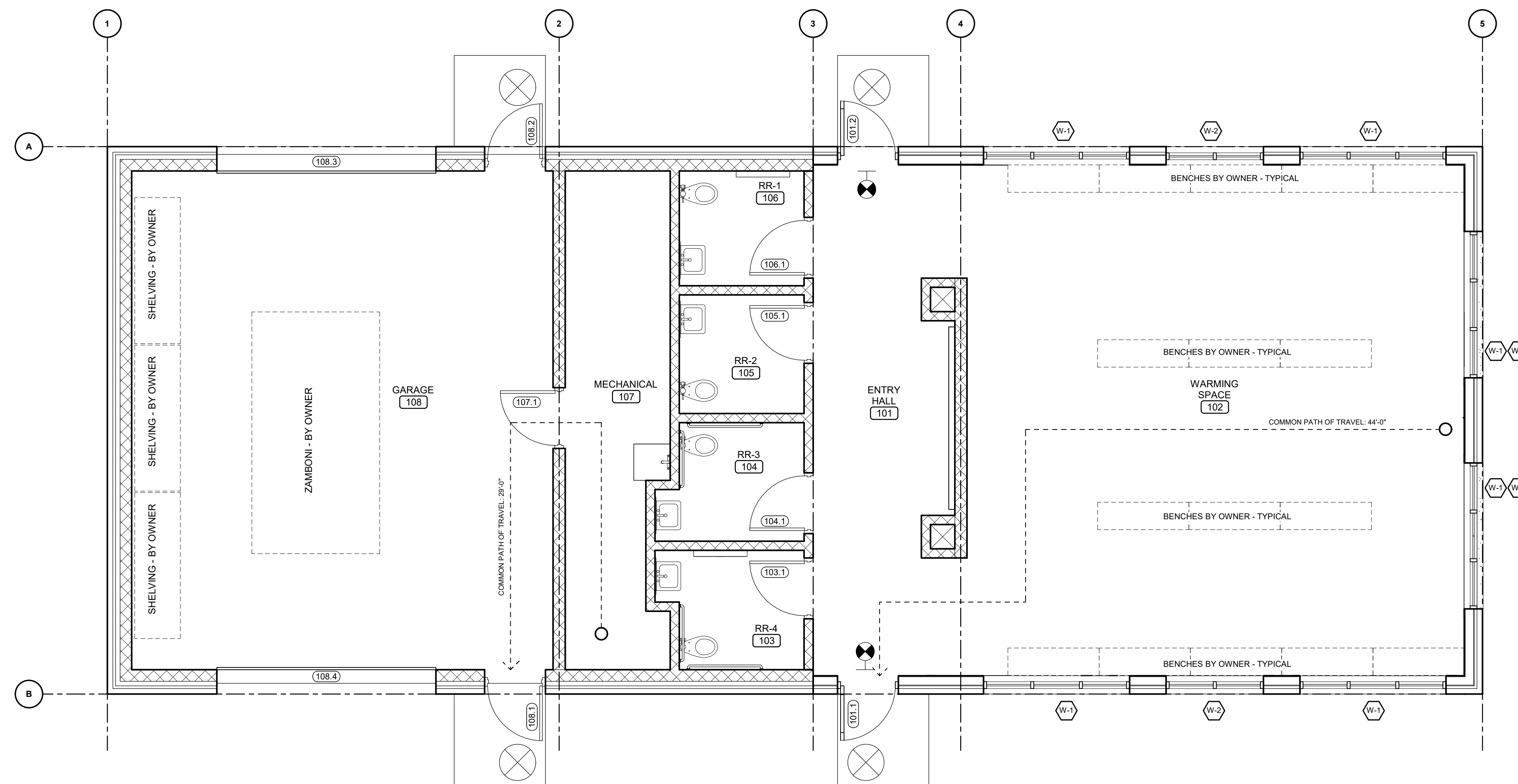
GROUP A-3 - ASSEMBLY
WATER CLOSETS - 1 PER 125 (MALE), 1 PER 65 (FEMALE)
29 (MALE) OCCUPANTS / 125 = 1 WATER CLOSET REQUIRED
29 (FEMALE) OCCUPANTS / 65 = 1 WATER CLOSET REQUIRED
LAVATORIES - 1 PER 200
29 (MALE) OCCUPANTS / 200 = 1 LAVATORIES REQUIRED
29 (FEMALE) OCCUPANTS / 200 = 1 LAVATORIES REQUIRED
DRINKING FOUNTAINS - 1 PER 500 = 1 REQUIRED
SERVICE SINKS - 1 REQUIRED

TOTAL FIXTURES

REQUIRED	PROVIDED
1 (MALE) WATER CLOSET REQUIRED	4 WATER CLOSETS PROVIDED
1 (FEMALE) WATER CLOSET REQUIRED	4 LAVATORIES PROVIDED
1 (MALE) LAVATORY REQUIRED	1 DRINKING FOUNTAIN PROVIDED
1 (FEMALE) LAVATORY REQUIRED	1 SERVICE SINK PROVIDED
1 DRINKING FOUNTAINS REQUIRED	
1 SERVICE SINK REQUIRED	

CODE PLAN LEGEND

-  = EXIT
-  = EXIT SIGN LOCATION - REFER TO ELECTRICAL
-  = COMMON PATH OF EGRESS TRAVEL



3 CODE PLAN
T2 SCALE: 1/4" = 1'-0" NORTH

CONSULTANT



**MIDWEST
ENGINEERING**
47130 Fort Road, Nicollet, MN 56074
www.midweg.com

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 Engineer under the laws of the state of Minnesota.

Brandon Viland

BRANDON VILAND SE PE

Dated: 08/01/2019 Reg. No. 53688

**HICKORY PARK
WARMING
HOUSE AND ICE
RINKS**

**BELLE PLAINE,
MN**

REVISIONS

PROJECT # 19-1172
DATE 08/01/2019
DRAWN BY BOV
CHECKED BY BOV
© 2019 OLESON+HOBBIE ARCHITECTS, LLC

SHEET TITLE

**STRUCTURAL
NOTES**

SHEET

S1.00

APPLICABLE CODES AND STANDARDS:

- | | |
|--|---------------------|
| 1. 2012 INTERNATIONAL BUILDING CODE (IBC) | |
| 2. ACI AMERICAN CONCRETE INSTITUTE | 318-14 |
| 3. AISC AMERICAN INSTITUTE OF STEEL CONSTRUCTION | 14TH EDITION (LRFD) |
| 4. SDI STEEL DECK INSTITUTE | CURRENT EDITION |
| 5. AWS AMERICAN WELDING SOCIETY | CURRENT EDITION |
| 6. ASTM AMERICAN SOCIETY FOR TESTING MATERIALS | CURRENT EDITION |
| 7. NDS NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION | CURRENT EDITION |
| 8. MASONRY STANDARDS JOINT COMMITTEE | CURRENT EDITION |

DESIGN CRITERIA:

1. OCCUPANCY CATEGORY - II

DESIGN LOADS:

- | | |
|--------------------------------------|---------------------------------|
| 1. WIND LOADS | |
| A. BASIC WIND SPEED (ULTIMATE) | 115 MPH |
| B. BASIC WIND SPEED (SERVICE) | 90 MPH |
| C. EXPOSURE CATEGORY | C |
| D. ENCLOSED | Gcpi = +/-0.18 |
| E. GUST FACTOR | 0.85 (RIGID) |
| 2. LIVE LOADS | |
| A. ROOF = 20 PSF (REDUCABLE PER IBC) | |
| B. FLOOR = REFER TO PLAN | |
| 3. DEAD LOADS | |
| A. SELF-WEIGHT OF MEMBERS | |
| B. SUPERIMPOSED = REFER TO PLANS | |
| 4. SNOW LOADS | |
| A. GROUND SNOW LOAD | PG = 50 PSF |
| B. SNOW IMPORTANCE FACTOR | I = 1.0 |
| C. SNOW EXPOSURE FACTOR | Ce = 1.0 (C, PARTIALLY EXPOSED) |
| D. SNOW THERMAL FACTOR | Ct = 1.1 (TYPICAL) |
| E. SLOPE FACTOR | Cs = 1.0 |

GENERAL:

- ALL CONSTRUCTION SHALL BE IN CONFORMANCE WITH THE GOVERNING BUILDING CODE AND SUPPLEMENTS UNLESS HIGHER STANDARD IS REQUIRED BY LOCAL BUILDING OFFICIAL.
- THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AT THE SITE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SAFETY AND PROTECTION WITHIN AND ADJACENT TO THE JOB SITE.
- THE CONTRACTOR IS RESPONSIBLE FOR MEETING ALL APPLICABLE OSHA SAFETY REQUIREMENTS DURING CONSTRUCTION.
- DURING AND AFTER CONSTRUCTION THE CONTRACTOR AND/OR OWNER SHALL KEEP LOADS ON THE STRUCTURE WITHIN THE LIMITS OF THE DESIGN LOADS. CONSTRUCTION MATERIAL SHALL BE SPREAD OUT IF PLACED ON FRAMED FLOORS OR ROOFS.
- DO NOT SCALE DRAWINGS. IF DIMENSIONS ARE IN QUESTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING CLARIFICATION FROM THE ENGINEER BEFORE CONTINUING WITH CONSTRUCTION.
- SHOP DRAWINGS SHALL BE SUBMITTED TO THE GENERAL CONTRACTOR PRIOR TO FABRICATION OR ERECTION FOR THE FOLLOWING ITEMS:
 - REINFORCING STEEL
 - STRUCTURAL STEEL
 - PRE-ENGINEERED WOOD TRUSSES
 - PLYWOOD JOISTS
 - MISCELLANEOUS METALS
 THE GENERAL CONTRACTOR SHALL SUBMIT ONE (1) COPIES OF ALL SHOP DRAWINGS TO THE STRUCTURAL ENGINEER FOR REVIEW PRIOR TO FABRICATION OR ERECTION. FIVE (5) WORKING DAYS MINIMUM SHALL BE ALLOWED FOR THE REVIEW OF THESE SHOP DRAWINGS BY THE ENGINEER.
- THE TYPICAL DETAILS SHALL BE USED WHEREVER APPLICABLE UNLESS OTHERWISE NOTED ON THE DRAWINGS. SPECIFIC NOTES AND DETAILS ON DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL NOTES AND TYPICAL DETAILS.
- ALL OMISSIONS OR CONFLICTS BETWEEN THE VARIOUS ELEMENTS OF THE WORKING DRAWINGS AND/OR SPECIFICATION SHALL BE BROUGHT TO THE ATTENTION OF THE STRUCTURAL ENGINEER BEFORE PROCEEDING WITH ANY WORK INVOLVED. IN CASE OF CONFLICT, FOLLOW MOST STRINGENT REQUIREMENT AS DETERMINED BY STRUCTURAL ENGINEER WITHOUT COST TO OWNER.
- OBSERVATION VISITS TO THE JOBSITE BY ENGINEERING FIELD REPRESENTATIVES SHALL NEITHER BE CONSTRUED AS INSPECTION NOR APPROVAL OF CONSTRUCTION. THE CONTRACT STRUCTURAL DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES.
- WHERE REFERENCE IS MADE TO VARIOUS TEST STANDARDS FOR MATERIALS, SUCH STANDARDS SHALL BE THE LATEST EDITION AND/OR ADDENDUM.
- ESTABLISH AND VERIFY ALL OPENINGS AND INSERTS FOR ARCHITECTURAL, MECHANICAL, ELECTRICAL, AND PLUMBING WITH APPROPRIATE TRADES, DRAWINGS, AND SUBCONTRACTORS PRIOR TO CONSTRUCTION. DO NOT PENETRATE ANY STRUCTURAL ELEMENTS (BEAMS, COLUMNS, WALLS, SLABS, STEEL DECK, ETC) WITHOUT PRIOR WRITTEN APPROVAL FROM THE STRUCTURAL ENGINEER THROUGH ARCHITECT.
- ANY ENGINEERING DESIGN PROVIDED BY OTHERS AND SUBMITTED FOR REVIEW SHALL BEAR THE SEAL OF A CIVIL OR STRUCTURAL ENGINEER REGISTERED IN THE STATE IN WHICH THE PROJECT IS LOCATED.
- ALL EXTERIOR FINISH MATERIALS, DRAINAGE, AND FLASHING DETAILS ARE NOT PART OF THE STRUCTURAL DRAWINGS. CONTRACT DOCUMENTS ADDRESS STRUCTURAL DESIGN ONLY.
- LARGE-SCALE, MORE SPECIFIC DETAILS TAKE PRECEDENCE OVER SMALL-SCALE, LESS SPECIFIC DETAILS AND INFORMATION. MORE STRINGENT REQUIREMENTS FOR CODE, PRODUCTS AND INSTALLATION TAKE PRECEDENCE OVER LESS STRINGENT REQUIREMENTS. NOTIFY ENGINEER OF ANY DISCREPANCIES, CONDITIONS REQUIRING INFORMATION, OR CLARIFICATIONS BEFORE PROCEEDING WITH WORK.
- DETAILS SHOWN ARE INTENDED TO BE INDICATIVE OF THE PROFILE AND TYPES OF DETAILING REQUIRED THROUGHOUT THE WORK. DETAILS NOT SHOWN ARE SIMILAR IN CHARACTER TO DETAILS SHOWN. WHERE SPECIFIC DIMENSIONS, DETAILS, OR DESIGN INTENT CANNOT BE DETERMINED, NOTIFY THE ENGINEER BEFORE PROCEEDING WITH WORK.
- WRITTEN DIMENSIONS SHALL TAKE PRECEDENCE OVER SCALED DIMENSIONS. NOTIFY ENGINEER OF ANY DISCREPANCIES OR CONDITIONS REQUIRING INFORMATION OF CLARIFICATIONS BEFORE PROCEEDING WITH THE WORK.
- GENERAL CONTRACT DOCUMENTS SHALL BE ISSUED TO ALL SUBCONTRACTORS BY THE GENERAL CONTRACTOR IN COMPLETE SETS IN ORDER TO ACHIEVE FULL EXTENT AND COMPLETE COORDINATION OF ALL WORK.

SHOP DRAWINGS:

- THE GENERAL CONTRACTOR WILL REVIEW AND STAMP ALL SHOP DRAWINGS AND PRODUCT DATA FOR CONFORMANCE WITH THE CONSTRUCTION DOCUMENTS PRIOR TO SUBMITTAL. ANY SHOP DRAWING OR PRODUCT DATA NOT REVIEWED AND STAMPED BY THE GENERAL CONTRACTOR WILL BE RETURNED WITHOUT REVIEW.
- ANY SHOP DRAWING NOT CHECKED AND INITIALED BY THE SUPPLIER/DETAILER PRIOR TO SUBMITTING FOR ARCHITECTURAL AND ENGINEERING REVIEW, WILL BE RETURNED WITHOUT REVIEW.
- THE CONSTRUCTION DOCUMENTS MAY NOT BE REPRODUCED FOR USE AS SHOP DRAWINGS.
- ELECTRONIC FILES OF CONSTRUCTION DOCUMENTS WILL NOT BE MADE AVAILABLE FOR USE AS SHOP DRAWINGS UNLESS APPROVED BY THE SER.
- UNLESS INDICATED OTHERWISE, THE GENERAL CONTRACTOR SHALL SUBMIT SHOP DRAWINGS OF THE FOLLOWING ITEMS FOR STRUCTURAL REVIEW. REFER TO SPECIFIC SECTION OF THE STRUCTURAL NOTES FOR ANY ADDITIONAL CRITERIA:
 - CONCRETE MIX DESIGNS
 - CONCRETE REINFORCING
 - PRE-ENGINEERED ROOF TRUSSES

CAST-IN-PLACE CONCRETE:

- CONCRETE SHALL CONFORM TO ALL REQUIREMENTS OF ACI 318-14 "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE", EXCEPT AS MODIFIED BY THE SUPPLEMENTAL REQUIREMENTS BELOW:
 - BEARING WALLS, PIERS - LOW ALKALI PER ASTM C150, MAX WATER TO CEMENT RATIO = 0.45.
 - EXTERIOR SLABS ON GRADE - AIR CONTENT TO BE 6 1/2% +/- 1 1/2% PER ASTM C20 WITH MAXIMUM SIZE AGGREGATE 1 1/2" PER ASTM C33, MAX WATER TO CEMENT RATIO = 0.45.
 - INTERIOR SLABS ON GRADE - TYPE 2 LOW ALKALI PER ASTM C150, MAXIMUM AIR CONTENT 3 1/2% +/- 1 1/2% PER ASTM C20 WITH MAX SIZE AGGREGATE 1 1/2" PER ASTM C33, MAX WATER TO CEMENT RATIO = 0.45 - NO WATER TO BE ADDED TO CONCRETE ON SITE. SUPERPLASTICIZER MAY BE ADDED TO INCREASE SLUMP AS REQUIRED FOR PLACEMENT. HIGH RANGE WATER REDUCING ADMIXTURE AS PER ASTM C494 TYPE G.
 - CONCRETE SHALL ATTAIN THE FOLLOWING MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS:
 - FOOTING, GRADE BEAMS, AND INTERIOR FOUNDATION WALLS - 4000 PSI
 - EXTERIOR FOUNDATION WALLS - 4500 PSI
 - EXTERIOR SLABS ON GRADE - 4500 PSI
 - INTERIOR SLAB-ON-GRADE - 4000 PSI
 - A STATEMENT OF MIX DESIGN FOR ALL CONCRETE SHALL BE SUBMITTED AND APPROVED BY THE STRUCTURAL ENGINEER OF RECORD PRIOR TO COMMENCING WORK.
- ALL SLABS ON GRADE SHALL BE PLACED WITH CONSTRUCTION JOINTS OR SAW CUTS AT 12'-6" ON CENTER MAXIMUM OR AS SHOWN OR NOTED ON THE DRAWINGS. CONCRETE TESTS SHALL BE MADE ON MAJOR POURS AND AT SUCH OTHER TIMES AS MAY BE REQUIRED BY THE STRUCTURAL ENGINEER OF RECORD. EACH TEST SHALL CONSIST OF 4 CYLINDERS OF WHICH (1) SHALL BE TESTED AT (7) DAYS, (2) SHALL BE TESTED AT (28) DAYS, AND (1) SHALL BE RETAINED IN RESERVE FOR LATER TESTS, IF REQUIRED.
- IN GENERAL, ONE TEST SHALL BE MADE FOR EACH 150 CUBIC YARDS OF CONCRETE, NOR LESS THAN ONCE EACH 5000 SF OF SURFACE AREA FOR SLABS OR WALLS ON EACH DAY'S POUR. SPECIMENS SHALL BE MADE AND TESTED IN ACCORDANCE WITH ASTM C-31 AND ASTM C-39 STANDARDS. SLUMP AND AIR ENTRAINMENT TESTS SHALL ALSO BE MADE WITH EACH SET OF CYLINDERS TAKEN. AIR SHALL BE ADDED TO ALL CONCRETE EXPOSED TO WEATHER. CONCRETE TESTS SHALL BE PROVIDED PER ACI-318.
- BEFORE CONCRETE IS POURED, CHECK WITH ALL TRADES TO ENSURE PROPER PLACEMENT OF ALL OPENINGS, SLEEVES, CURBS, CONDUIT, BOLTS, INSERTS, DOWELS, ETC., RELATED TO THE WORK.
- DOWEL VERTICAL BARS TO FOOTINGS. IN ADDITION, PROVIDE (2) #5 CONTINUOUS BARS AT TOP OF WALLS UNLESS OTHERWISE NOTED ON DRAWINGS.
- ADD (2) #5 BARS AROUND ALL OPENINGS (UNO) AND EXTEND 24" BEYOND OPENINGS.

REINFORCING STEEL:

- ALL CONCRETE SHALL INCLUDE REINFORCEMENT. IF REINFORCEMENT IS NOT SPECIFICALLY INDICATED ON THE DRAWINGS VERIFY WITH THE SER.
- REINFORCEMENT SHALL CONFORM TO THE FOLLOWING STANDARDS AND MATERIAL PROPERTIES:

A. DEFORMED BARS	ASTM A615 - Grade 60
B. WELDABLE DEFORMED BARS	ASTM A706 - Grade 60
C. EPOXY COATED DEFORMED BARS	ASTM A615/A775
D. WELDED WIRE FABRIC	ASTM A185
E. EPOXY COATED WELDED WIRE FABRIC	ASTM A185/A884
- U.O.N. ON STRUCTURAL DRAWINGS, PROVIDE MINIMUM CONCRETE PROTECTION FOR REINFORCING, AS FOLLOWS:

A. CAST AGAINST EARTH:	3"
B. EXPOSED TO EARTH OR WEATHER:	
a. #5 AND SMALLER BARS AND WWF:	1-1/2"
b. #6 AND LARGER BARS:	2"
C. NOT EXPOSED TO EARTH OR WEATHER:	
a. SLABS AND WALLS:	3/4"
b. COLUMNS, PEDESTALS, BEAMS:	1-1/2"
- WHERE CONSTRUCTION JOINTS ARE PROVIDED, THE REINFORCING MUST PASS UNINTERRUPTED THROUGH THE JOINT. PROVIDE ADDITIONAL #4 X 4'-0" AT 12" O.C. DOWELS CENTERED TO AND PERPENDICULAR TO THE JOINT.
- WWF SHALL BE PROVIDED IN SHEETS ONLY AND SHALL HAVE ENDS LAPPED 1.5 FULL PANEL ON ALL SIDES.
- DOWELS SHALL MATCH SIZE AND SPACING OF MAIN REINFORCEMENT, UNO.
- REINFORCING INDICATED AS CONTINUOUS SHALL BE PROVIDED AT LONGEST PRACTICAL BAR LENGTHS WITH MINIMUM SPLICES.
- PROVIDE LAP LOCATIONS AS FOLLOWS, UNO ON THE ON THE DRAWINGS:

A. BEAM AND SLAB TOP REINFORCING: AT CENTER OF SPAN
B. BEAM AND SLAB BOTTOM REINFORCING: AT SUPPORTS
C. WALL AND BEAM SIDE HORIZONTAL REINFORCEMENT: STAGGER SPLICES
D. WALL INSIDE FACE (VERTICAL REINFORCEMENT): AT SUPPORT
E. WALL OUTSIDE FACE (VERTICAL REINFORCEMENT): AT MID-HEIGHT OF WALL
- ALL REINFORCING SPLICES SHALL BE CLASS B LAP SPLICES UNO UNLESS OTHERWISE NOTED TERMINATE BARS AT DISCONTINUOUS ENDS WITH STANDARD HOOKS OR LENTON TERMINATORS.
- PROVIDE EPOXY COATED REINFORCEMENT AND ACCESSORIES IN AREAS OF DIRECT EXPOSURE TO THE ENVIRONMENT, CHEMICALS, OR DE-ICING, AND FOR THE AREAS INDICATED ON THE DRAWINGS.

CONCRETE MASONRY:

- FURNISH AND CONSTRUCT MASONRY IN ACCORDANCE WITH THE BUILDING CODE REQUIREMENTS AND SPECIFICATIONS FOR MASONRY STRUCTURES AS PER MSJC.
- CONCRETE MASONRY UNITS SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF fm = 1,500PSI.
- SEE PLANS FOR LOCATION OF REINFORCED WALLS.
- MINIMUM VERTICAL REINFORCEMENT SHALL CONSIST OF (1) #4 BAR PROVIDED AT CORNERS, AT EACH SIDE OF OPENINGS, WITHIN 8" OF EACH SIDE OF MOVEMENT JOINTS, WITHIN 8" OF THE ENDS OF WALLS, AND AT A MAXIMUM SPACING OF 96" ON-CENTER, UNLESS NOTED OTHERWISE.
- MINIMUM HORIZONTAL REINFORCEMENT SHALL BE (1) #4 BARS PROVIDED IN BOND BEAMS AT TOP OF WALL, UNLESS NOTED OTHERWISE.
- HORIZONTAL REINFORCEMENT SHALL ALSO BE PROVIDED AT THE BOTTOM AND TOP OF WALL OPENINGS AND SHALL EXTEND NOT LESS THAN 48 BAR DIAMETERS PAST THE OPENINGS, CONTINUOUSLY AT STRUCTURALLY CONNECTED ROOF AND FLOOR LEVELS, AND WITHIN 16" OF THE TOP OF WALLS.
- CLEAR DISTANCE BETWEEN PARALLEL REINFORCEMENT SHALL NOT BE LESS THAN 2.5 x BAR DIAMETER.
- CONNECTION OF INTERSECTING WALLS SHALL CONSIST OF REINFORCED BOND BEAMS WITH (1) #4 HORIZONTAL REINFORCEMENT AT 48" ON-CENTER MAXIMUM, AND (1) #4 VERTICAL REINFORCEMENT WITHIN 12" OF INTERSECTING WALLS, UNLESS NOTED OTHERWISE.
- VERTICAL STEEL SHALL BE CONTINUOUS WITH 24" LAP AT SPLICES, UNLESS NOTED OTHERWISE.
- IN COLUMNS, PIERS, AND PILASTERS, THE CLEAR DISTANCE BETWEEN VERTICAL BARS SHALL NOT BE LESS THAN 3 BAR DIAMETERS, NOR LESS THAN 1 1/2". HORIZONTAL JOINT REINFORCEMENT SHALL BE CONTINUOUS WITH 8" LAP SPLICES, WHERE USED.
- CONCRETE BLOCK WALL LINTELS:
 - EXTEND ALL LINTELS A MINIMUM OF 8" BEYOND EACH EDGE OF OPENING. WHERE LINTEL BEARS ON CONCRETE BLOCK, FILL TWO COURSES OF BLOCK MINIMUM WITH CONCRETE. IF THE OPENING OCCURS NEXT TO CONCRETE WALL OR COLUMN, BOLT ANGLE TO COLUMN AND REST LINTEL ON ANGLE. OBTAIN ANGLE SIZE AND BOLT REQUIREMENTS FROM ENGINEER. IF OPENING OCCURS NEXT TO STEEL COLUMN, WELD ANGLE TO COLUMN AND REST LINTEL ON ANGLE. OBTAIN ANGLE SIZE AND WELD REQUIREMENTS FROM ENGINEER.
- WALL CONSTRUCTION SHALL NOT EXCEED HEIGHTS OF 4'-8" BEFORE PLACEMENT OF CORE GROUT UNLESS CLEANOUT HOLES ARE PROVIDED AT THE BOTTOM OF EACH GROUT LIFT, THEN A MAXIMUM HEIGHT OF 8'-0" BEFORE PLACEMENT OF CORE GROUT.
- SEE PLANS FOR SIZE AND LOCATION OF CONDUITS, PIPES, AND SLEEVES THROUGH MASONRY WALLS.
- FOLLOW COLD WEATHER CONSTRUCTION WHEN AMBIENT AIR TEMPERATURE IS BELOW 40° F.
- FOLLOW HOT WEATHER CONSTRUCTION PROCEDURES WHEN AMBIENT AIR TEMPERATURE EXCEEDS 90° F WITH WIND VELOCITY GREATER THAN 8 MPH.

FOOTINGS AND FOUNDATION:

- GEOTECHNICAL CONSULTANT: NOT AVAILABLE
- DESIGN BEARING CONTACT PRESSURE: 1500PSF
- FOOTINGS SHALL BEAR UPON APPROVED EXISTING FILL MATERIAL OR NEW STRUCTURAL FILL THAT MEETS THE RECOMMENDATIONS AND SHALL BE VERIFIED IN FIELD BY A GEOTECHNICAL ENGINEER.
- ALL WATER SHALL BE REMOVED FROM FOUNDATION EXCAVATION PRIOR TO PLACING OF CONCRETE. DO NOT PLACE CONCRETE UNDER WATER OR ON FROZEN GROUND.
- ANY FILL TO BE PLACED UNDER THE BUILDING AND FOOTINGS SHALL MEET THE REQUIREMENTS OF 98% STANDARD PROCTOR DENSITY. WIDTH OF COMPACTED STRUCTURAL FILL SHALL EXTEND A MINIMUM DISTANCE EQUAL TO THE DEPTH OF THE STRUCTURAL FILL MATERIAL BEYOND THE EDGES OF THE FOOTING.
- ANY UNUSUAL SOIL CONDITIONS (WATER, SOFT LAYERS, ROCK OUTCROPPINGS, ETC) ENCOUNTERED DURING EXCAVATION FOR FOOTINGS SHOULD BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE STRUCTURAL AND SOIL ENGINEERS PRIOR TO PROCEEDING.

SPECIAL INSPECTION:

- SPECIAL INSPECTION AND QUALITY ASSURANCE, AS REQUIRED BY SECTION 1704 OF THE 2012 IBC, SHALL BE PROVIDED BY AN INDEPENDENT AGENCY EMPLOYED BY THE OWNER UNLESS WAIVED BY THE BUILDING OFFICIAL. THE CONTRACTOR SHALL COORDINATE AND COOPERATE WITH THE REQUIRED INSPECTIONS.
- ALL SPECIAL INSPECTORS SHALL BE UNDER THE SUPERVISION OF A REGISTERED CIVIL OR STRUCTURAL ENGINEER.
- THE QUALIFICATIONS OF ALL SPECIAL INSPECTORS SHALL BE REVIEWED AND APPROVED BY THE STRUCTURAL ENGINEER OF RECORD.
- THE MINIMUM QUALIFICATIONS FOR THE SPECIAL INSPECTORS ARE AS FOLLOWS:

A. CONCRETE INSPECTION - I.C.B.O. OR I.C.C. CERTIFICATION IN REINFORCED CONCRETE AND PRE STRESSED CONCRETE.
B. STRUCTURAL WELDING INSPECTION
a. VISUAL TESTING - I.C.B.O. OR I.C.C. CERTIFICATION IN STRUCTURAL STEEL AND WELDING OR A.W.S. CERTIFIED WELD INSPECTOR (C.W.I.)
b. NON-DESTRUCTIVE TESTING - A.W.S. C.W.I.
C. HIGH STRENGTH BOLTING INSPECTION - I.C.B.O. OR I.C.C. CERTIFICATION IN STRUCTURAL STEEL AND WELDING.
D. EXPANSION/ADHESIVE ANCHOR INSPECTION - I.C.B.O. OR I.C.C. CERTIFICATION IN REINFORCED CONCRETE AND MASONRY.
E. SPECIAL CASES - EXPERIENCE ACCEPTABLE TO THE STRUCTURAL ENGINEER OF RECORD.
- DUTIES OF THE SPECIAL INSPECTOR:

A. THE SPECIAL INSPECTOR SHALL REVIEW ALL WORK LISTED BELOW FOR CONFORMANCE WITH THE CONTRACT DOCUMENTS AND THE GOVERNING BUILDING CODE.
B. THE SPECIAL INSPECTOR SHALL FURNISH INSPECTION REPORTS TO THE BUILDING OWNER, BUILDING OFFICIAL, ENGINEER OF RECORD, ARCHITECT, AND CONTRACTOR. ALL ITEMS NOT IN COMPLIANCE SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION, THEN IF UNCORRECTED, TO THE DESIGN AUTHORITY AND THE BUILDING OFFICIAL. ONCE CORRECTIONS HAVE BEEN MADE BY THE CONTRACTOR, THE SPECIAL INSPECTOR SHALL SUBMIT A FINAL SIGNED REPORT STATING WHETHER THE WORK REQUIRING SPECIAL INSPECTION WAS, TO THE BEST OF THE INSPECTOR'S KNOWLEDGE, IN CONFORMANCE TO THE APPROVED PLANS AND SPECIFICATIONS AND THE APPLICABLE WORKMANSHIP PROVISIONS OF THE GOVERNING BUILDING CODE.
C. DUTIES AND RESPONSIBILITIES OF THE CONTRACTOR.
A. NOTIFY THE RESPONSIBLE INSPECTOR THAT WORK IS READY FOR INSPECTION AT LEAST ONE WORKING DAY (24 HOURS MINIMUM) BEFORE SUCH INSPECTION IS REQUIRED.
B. ALL WORK REQUIRING SPECIAL STRUCTURAL INSPECTION SHALL REMAIN ACCESSIBLE AND EXPOSED UNTIL IT IS OBSERVED BY THE SPECIAL STRUCTURAL INSPECTOR.

REBAR SPLICE SCHEDULE

BAR SIZE	SPLICE IN CONCRETE	
	HORIZ. BAR	VERT. BAR
#3	18"	14"
#4	24"	18"
#5	30"	24"
#6	36"	28"
#7	56"	44"
#8	70"	54"
#9	88"	68"

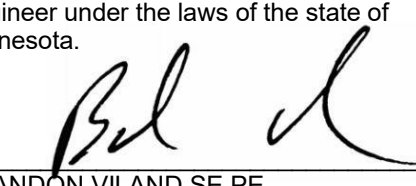
SPLICES IN WELDED WIRE MESH/FABRIC SHALL BE 12"

REBAR LAP SPLICE SCHEDULE

4
s1
2
NTS


GENERAL SHEET NOTES:
 1) BESIDES EQUIPMENT PADS AND STOOPS, REFER TO CIVIL PLANS FOR EXTERIOR CONCRETE SIDEWALKS/PAVEMENTS.
 2) TOP OF FOOTING ELEVATION = 96'-0" UNO.
 3) TOP OF BUILDING FOUNDATION WALL = REFER TO DETAILS.
 4) REFER TO MECHANICAL AND ELECTRICAL DOCUMENTS FOR COORDINATION OF SIZE AND LOCATION OF ALL SLEEVES AND PENETRATIONS REQUIRED THROUGH CONCRETE FOUNDATION WALLS. PROVIDE SCHEDULE 40 PIPE SLEEVES THROUGH FOUNDATION WALLS SIZED #2" LARGER IN DIA.
 5) BLOCK-OUT FOUNDATION STEM WALL AT DOOR LOCATIONS 8" DOWN FROM FFE, UNO.
 6) COORDINATE GROUNDING ELECTRODE LOCATION REQUIREMENTS W/ ELECTRICAL CONTRACTOR.
 7) TOP OF SLAB ELEVATION IS 100'-0" UNO.
 8) COORDINATE FLOOR DRAIN LOCATIONS AND REQUIRED SLAB SLOPING WITH ARCHITECTURAL AND MECHANICAL DOCUMENTS. CONSTRUCT THICKENED CONCRETE DETAILING AT TRENCH DRAIN PER MANUFACTURERS RECOMMENDATIONS.
 9) SLAB CONSTRUCTION JOINTS SHALL USE PLATE DOWELS, PNA DIAMOND DOWEL (or similar) @ 18"oc SPACING.
 10) ALL VERTICAL FOUNDATION WALL REINFORCING SHALL BE SET WITH A STANDARD 90° HOOK INTO CONCRETE FOOTINGS.

CONSULTANT
ME
 MIDWEST ENGINEERING
 47130 Fort Road, Nicollet, MN 56074
 www.midwesteng.com

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 Engineer under the laws of the state of Minnesota.

 BRANDON VILAND SE PE
 Dated: 08/01/2019 Reg. No. 53688

HICKORY PARK WARMING HOUSE AND ICE RINKS

BELLE PLAINE, MN

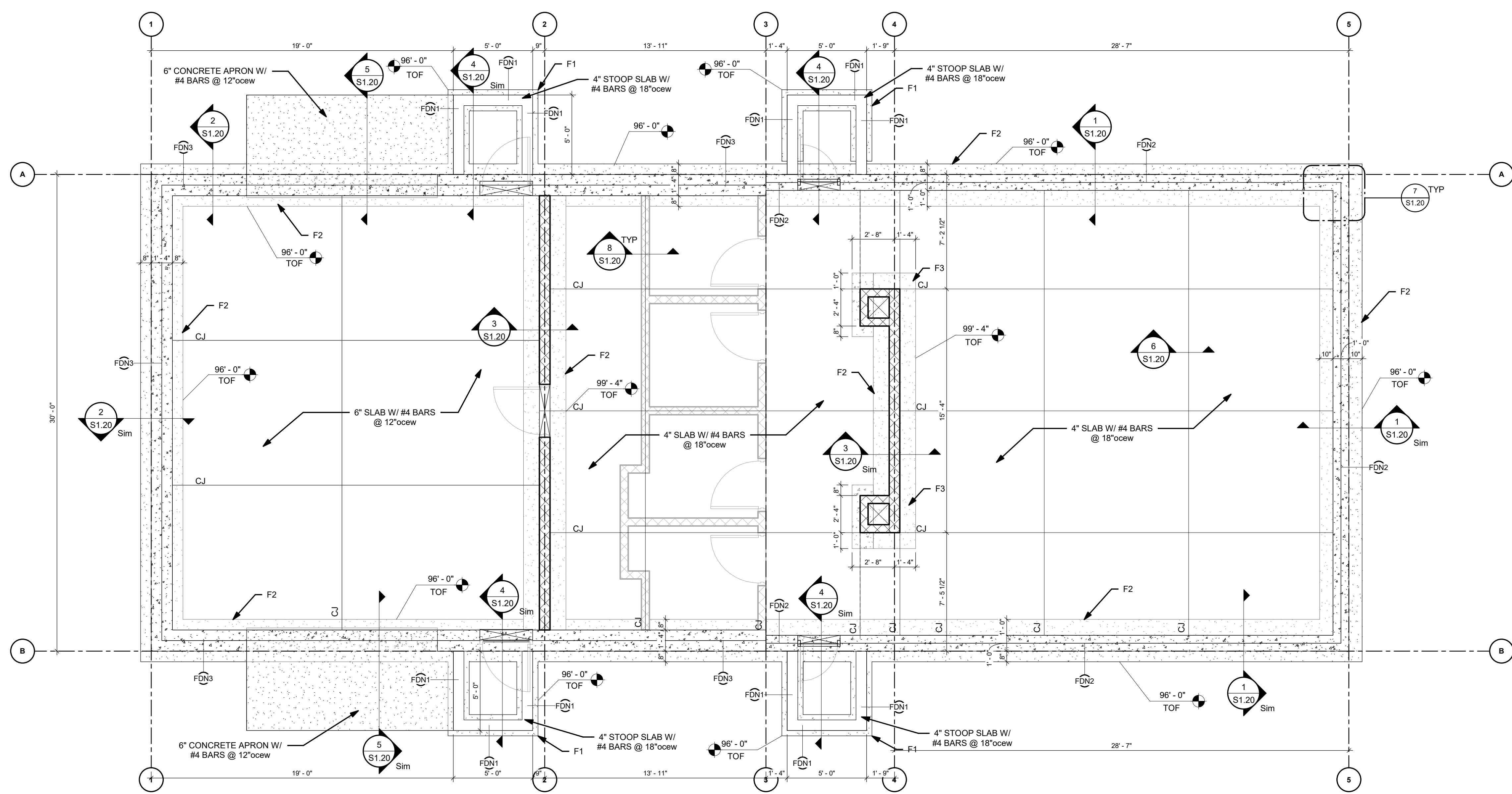
REVISIONS 

PROJECT # 19-1172
 DATE 08/01/2019
 DRAWN BY BOV
 CHECKED BY BOV
 © 2019 OLESON+HOBBIE ARCHITECTS, LLC

SHEET TITLE
FOUNDATION AND SLAB PLAN

SHEET

S1.10



1 FOUNDATION PLAN
 1/4" = 1'-0"


FOUNDATION WALL SCHEDULE				
WALL DESIGNATION	THICKNESS	ELEVATION OF TOP OF WALL	REINFORCING	NOTES
FDN1	0'-8"	REFER TO PLAN	#4 BARS @ 12"oc HORIZONTAL 18" VERTICAL	REINFORCING STEEL CENTERED IN WALL
FDN2	1'-0"	REFER TO PLAN	(2) MATS OF #4 BARS @ 12"oc HORIZONTAL 18"oc VERTICAL	REINFORCING STEEL AT EACH FACE OF WALL
FDN3	1'-4"	REFER TO PLAN	(2) MATS OF #4 BARS @ 12"oc HORIZONTAL 18"oc VERTICAL	REINFORCING STEEL AT EACH FACE OF WALL

FOOTING SCHEDULE							
FOOTING DESIGNATION	LENGTH	WIDTH	THICKNESS		ELEVATION OF TOP OF FOOTING	REINFORCING	NOTES
			WALL FOOTING	FOOTING PAD			
F1		1'-4"	12"		4'-0" BELOW EXTERIOR FINISHED GRADE	(2)-#4 BARS CONTINUOUS	TYPICAL FROST FOOTING
F2		2'-8"	12"		REFER TO PLAN	(3)-#4 BARS CONTINUOUS WITH #4 BARS @ 18"oc PERPENDICULAR	LOAD BEARING FOOTING
F3	4'-0"	4'-0"	12"		REFER TO PLAN	#4 BARS @ 12"ocw	LOAD BEARING FOOTING

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 Engineer under the laws of the state of Minnesota.

Brandon Viland
 BRANDON VILAND SE PE
 Dated: 08/01/2019 Reg. No. 53688

**HICKORY PARK
 WARMING
 HOUSE AND ICE
 RINKS**

BELLE PLAINE,
 MN

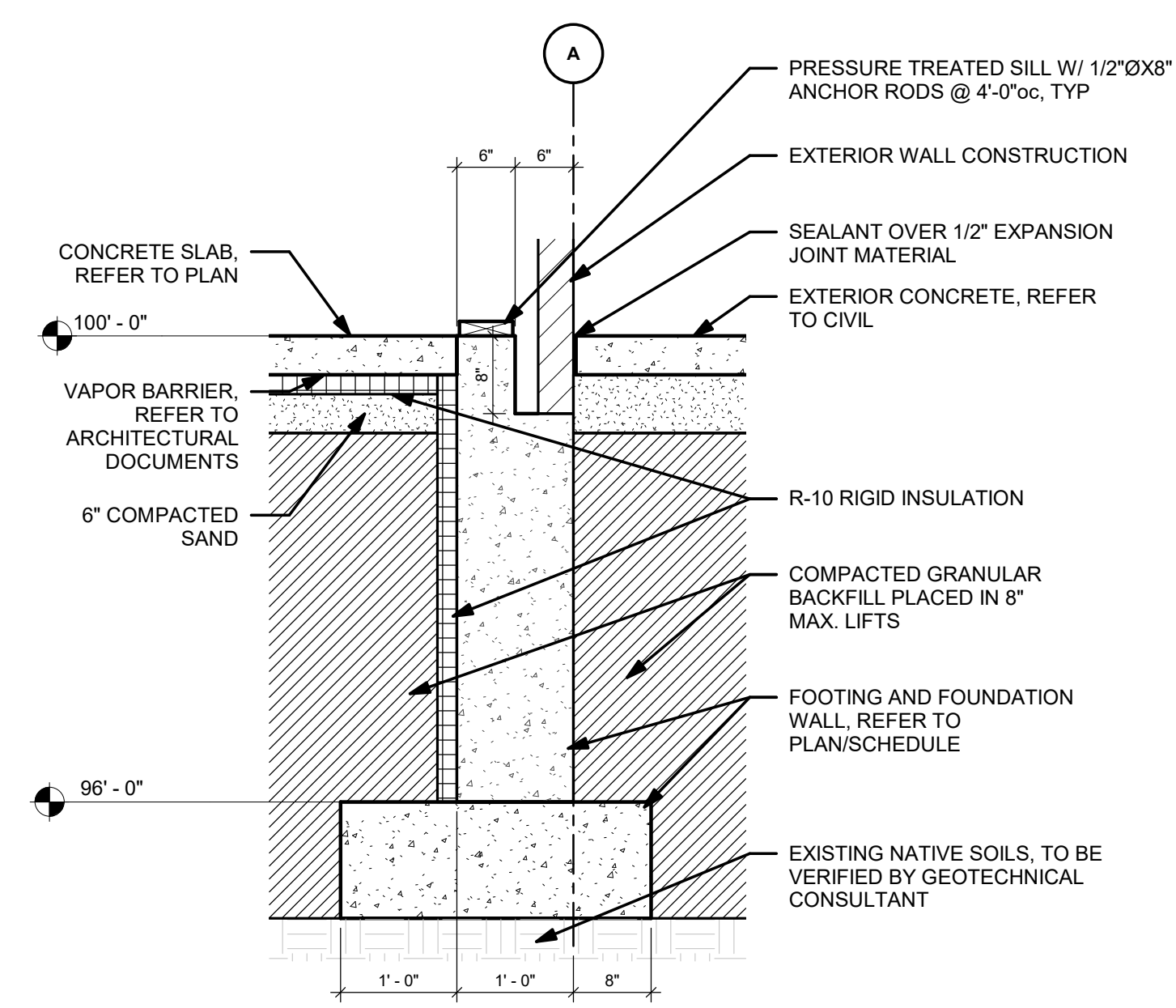
REVISIONS Δ XX

PROJECT # 19-1172
 DATE 08/01/2019
 DRAWN BY BOV
 CHECKED BY BOV
 © 2019 OLESON+HOBBIE ARCHITECTS, LLC

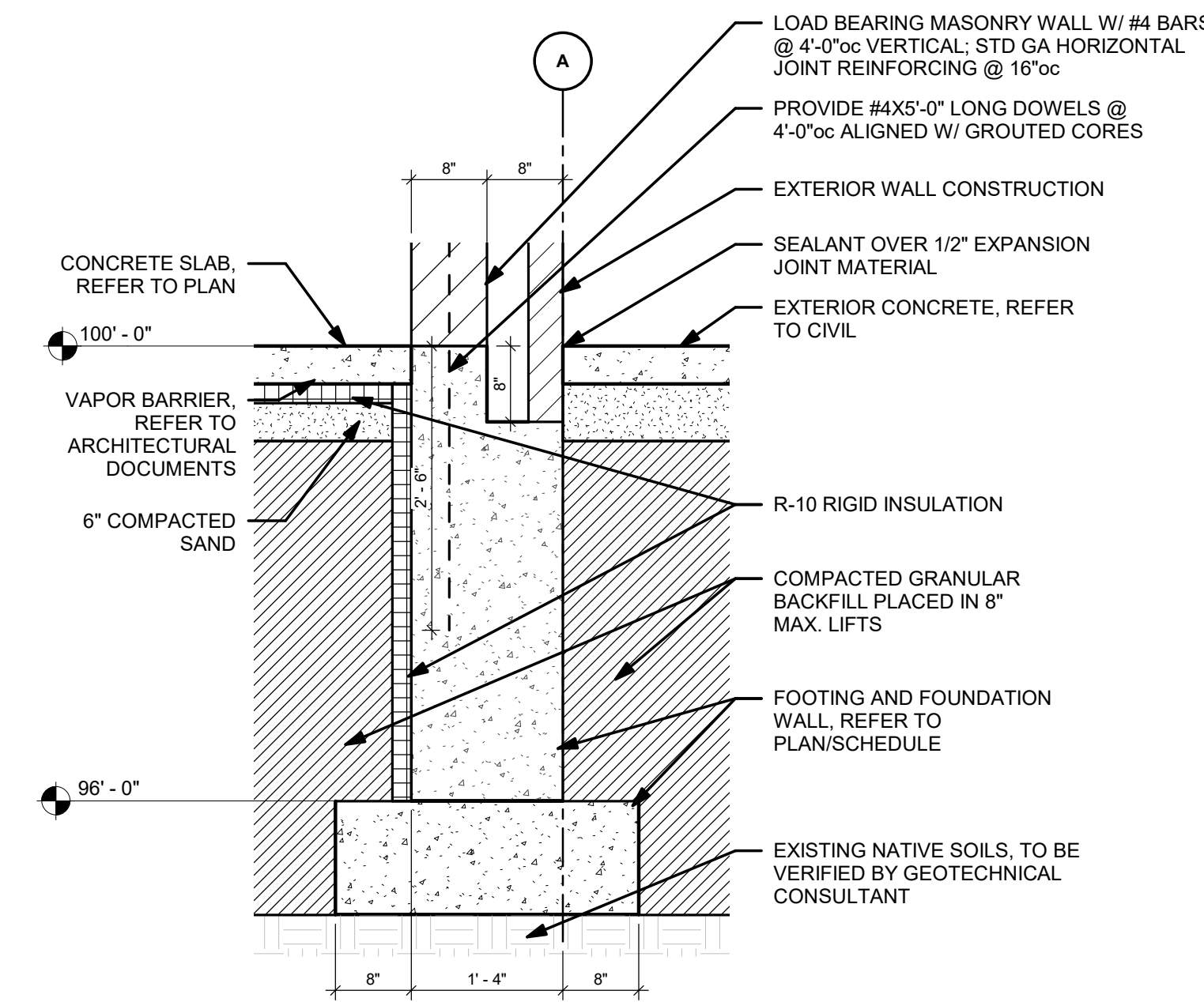
SHEET TITLE
**FOUNDATION
 AND SLAB
 DETAILS**

SHEET

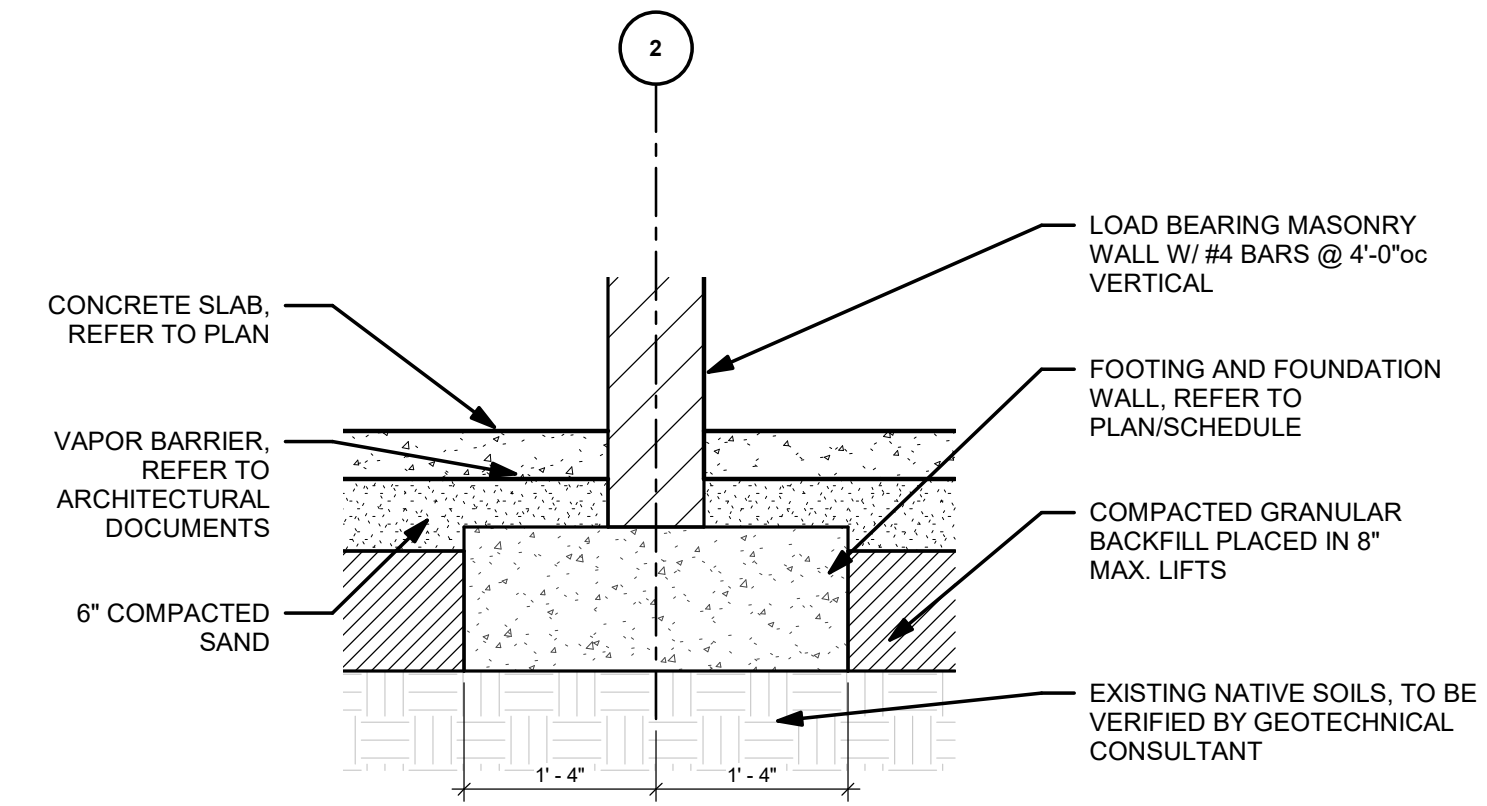
S1.20



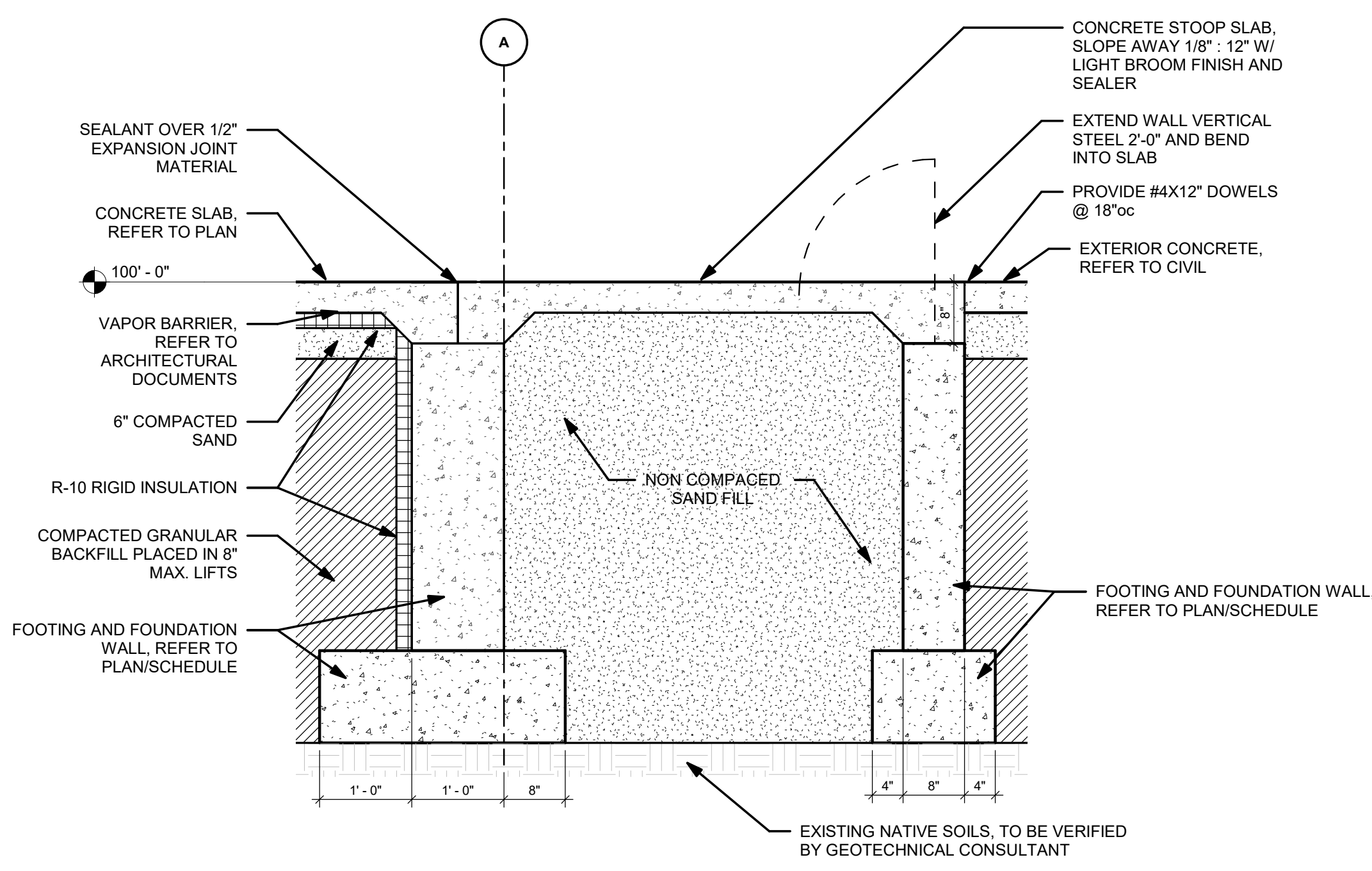
1 FOUNDATION SECTION @ WOOD
 3/4" = 1'-0"



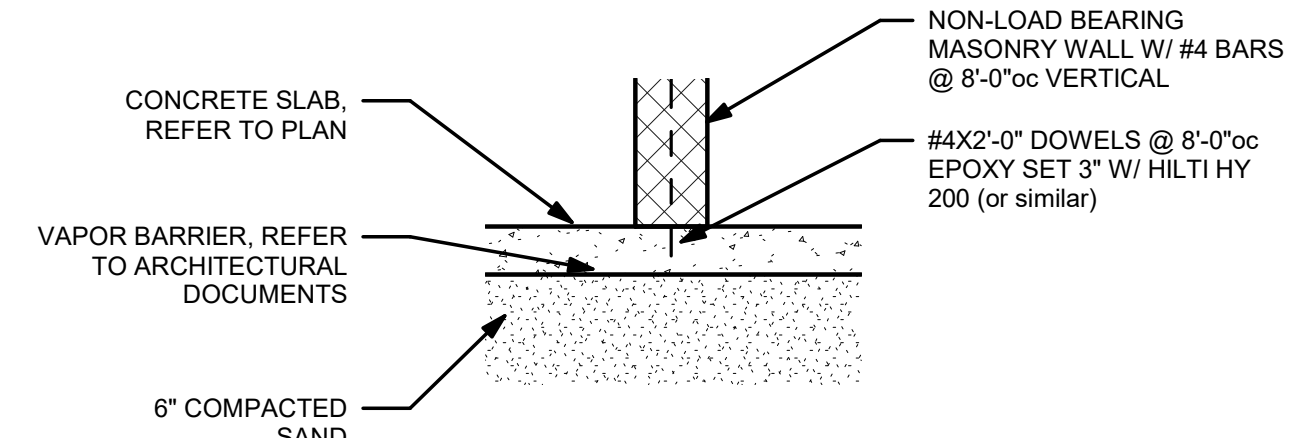
2 FOUNDATION SECTION @ CMU
 3/4" = 1'-0"



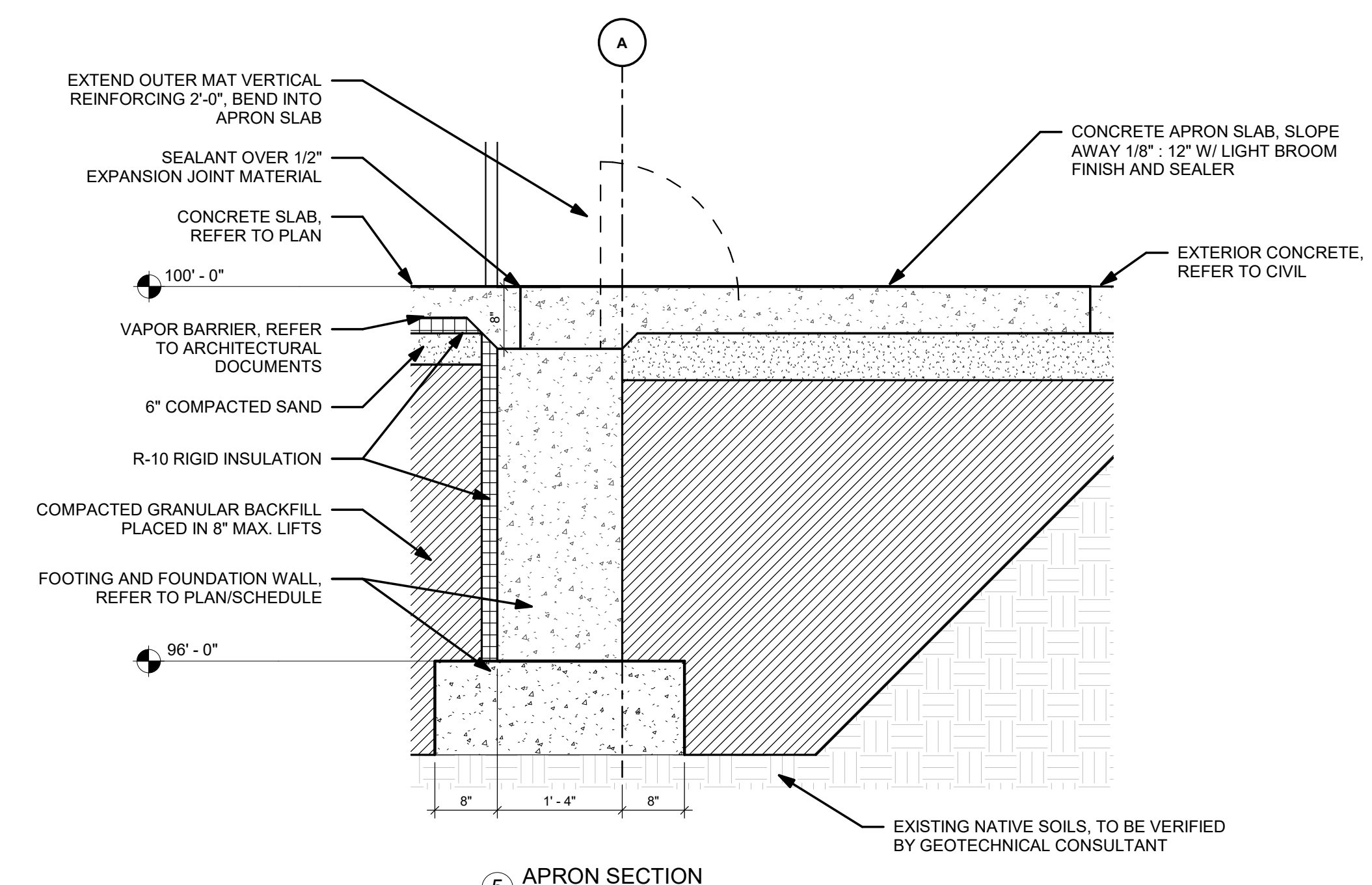
3 INTERIOR FOOTING SECTION
 3/4" = 1'-0"



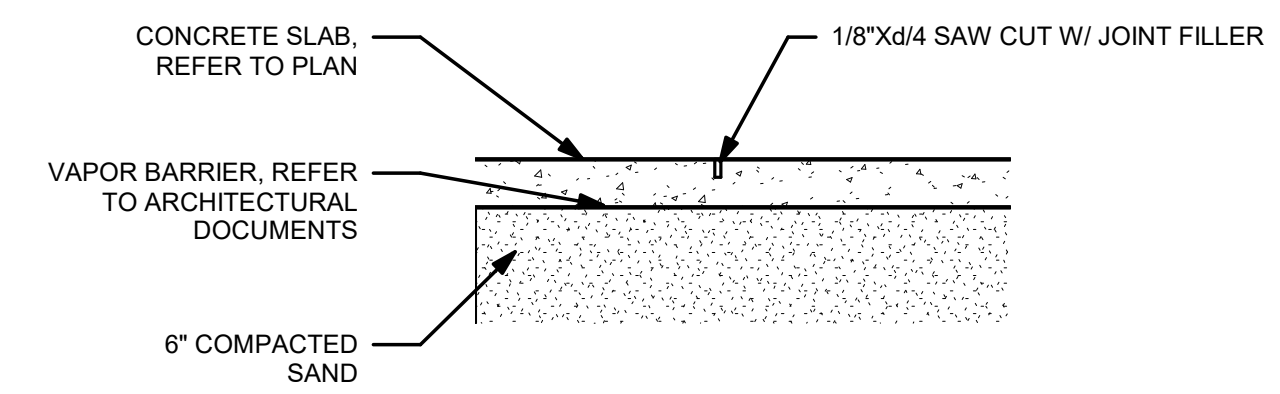
4 STOOP SECTION
 3/4" = 1'-0"



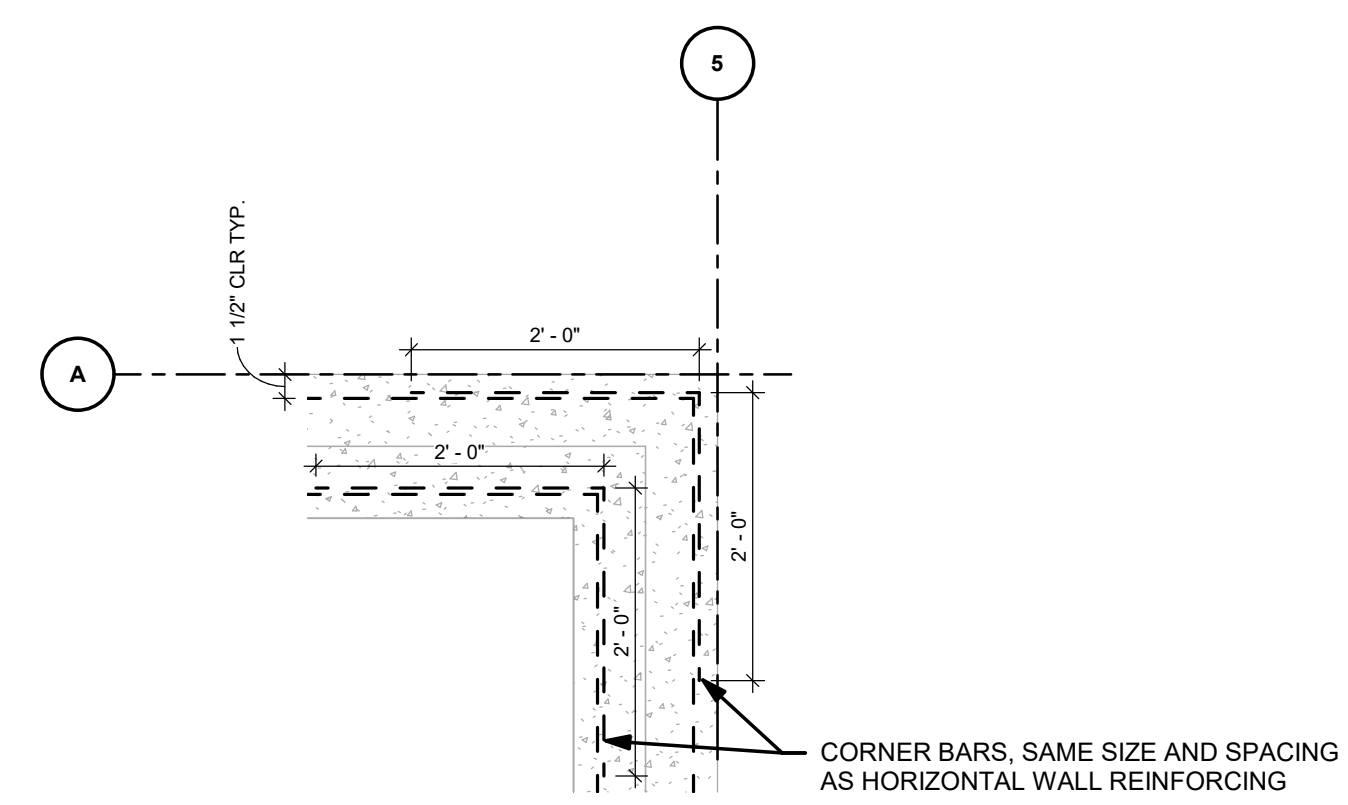
8 BASE OF INTERIOR WALL
 3/4" = 1'-0"



5 APRON SECTION
 3/4" = 1'-0"



6 CONTROL JOINT
 3/4" = 1'-0"



7 FOUNDATION CORNER DETAIL
 3/4" = 1'-0"

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 Engineer under the laws of the state of Minnesota.

Brandon Viland
 BRANDON VILAND SE PE
 Dated: 08/01/2019 Reg. No. 53688

HICKORY PARK WARMING HOUSE AND ICE RINKS

BELLE PLAINE, MN

REVISIONS

XX

PROJECT # 19-1172
 DATE 08/01/2019
 DRAWN BY BOV
 CHECKED BY BOV
 © 2019 OLESON+HOBBIE ARCHITECTS, LLC

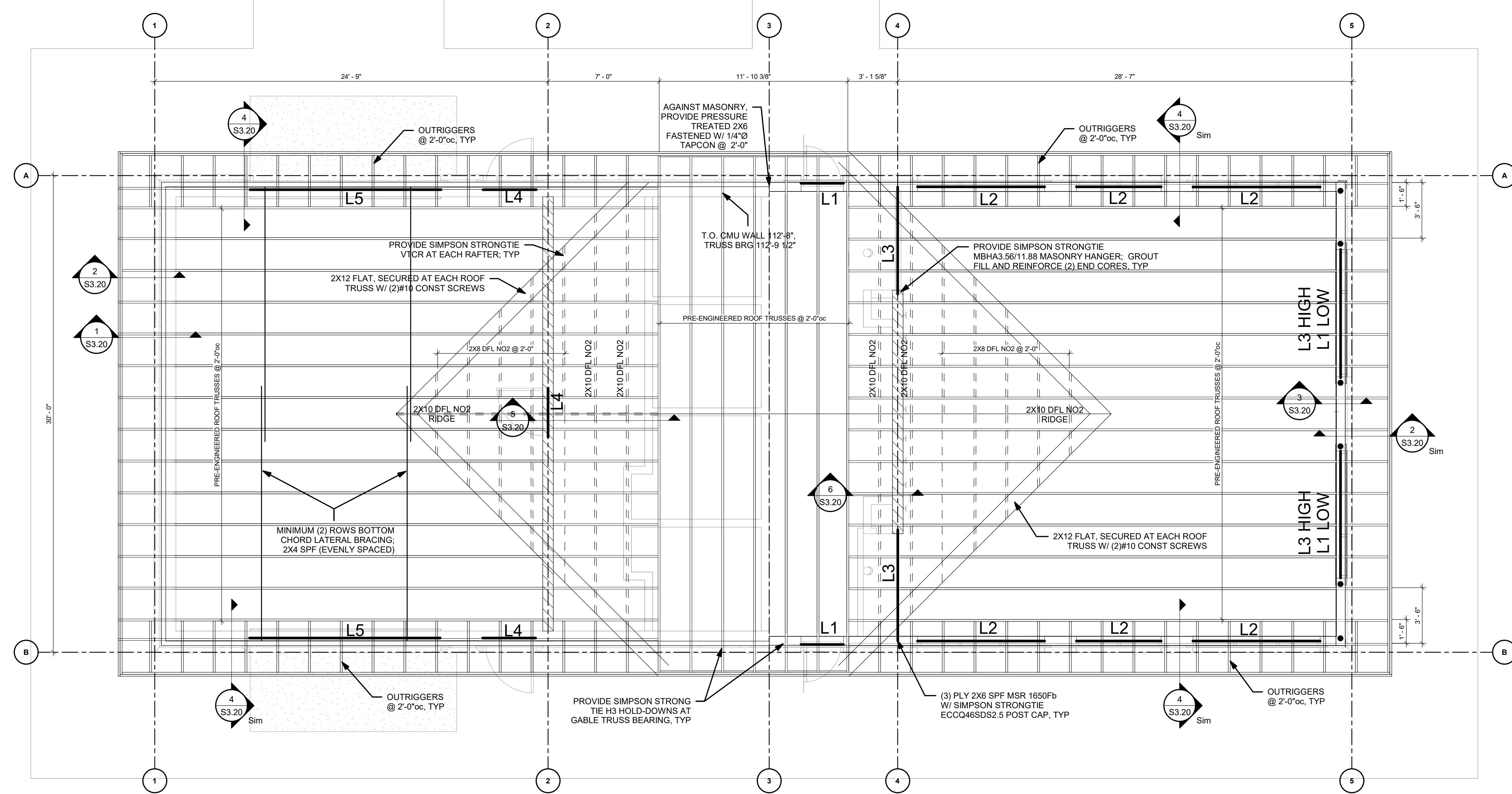
SHEET TITLE
ROOF FRAMING PLAN

SHEET
S3.10

ROOF TRUSS DESIGN LOADS:
 38.5PSF TOP CHORD SNOW LOAD
 10PSF TOP CHORD DEAD LOAD
 10PSF BOTTOM CHORD DEAD LOAD
 *ALL GABLE TRUSSES SHALL CONSIDER UNBALANCED SNOW LOADS PER DIAGRAM

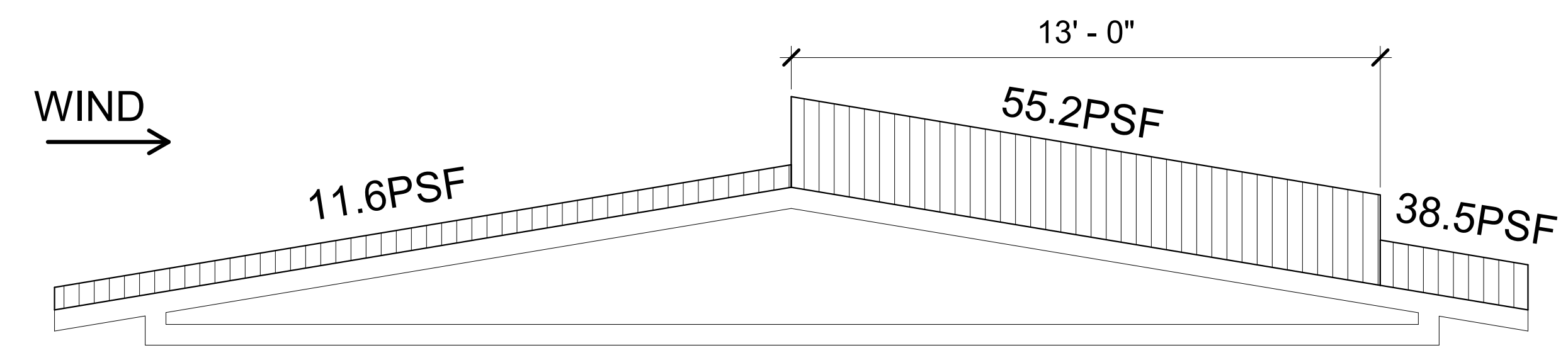
GENERAL SHEET NOTES:
 1) REFER TO MECHANICAL AND ELECTRICAL DOCUMENTS FOR COORDINATION OF ALL ROOF SUPPORTED EQUIPMENT.
 2) EXTERIOR ALL FRAMING 2X6 SPF MSR 1650Fb @ 16"oc AND SHEATHING USING MINIMUM 15/32" STRUCTURAL I WITH BLOCKED EDGES, FASTENED WITH 8d @ 4"oc EDGES, 12"oc FIELD.
 3) EXTERIOR WALL FRAMING SILL PLATES ANCHORED WITH 1/2"x6" ANCHOR BOLTS @ 48"oc SPACING, MINIMUM (2) PER SILL PLATE SECTION.
 4) REFER TO ARCHITECTURAL DOCUMENTS FOR TYPICAL INSULATED PANEL ROOF ASSEMBLY.
 5) UNLESS INDICATED OTHERWISE, ALL FASTENING SHALL COMPLY WITH IBC NAILING SCHEDULE TABLE 2304.9.1.
 6) PROVIDE (2) PLY SILLS BELOW WINDOWS, TYP.

● = SIMPSON STRONGTIE HD5B W/ 5/8"Ø HAS THREADED ROD SET IN HILTI HY200 (14" EMBED)



1 ROOF FRAMING
 1/4" = 1'-0"
 NORTH

LINTEL SCHEDULE			
MARK	SIZE/TYPE	BEARING	COMMENTS
L1	(2) 2X8 DOUGLAS-FIR LARCH NO. 2	(1) JACK STUD, (1) KING STUD	LINTEL DIRECTLY OVER OPENING
L2	(2) 2X10 DOUGLAS-FIR LARCH NO. 2	(1) JACK STUD, (2) KING STUD	LINTEL DIRECTLY OVER OPENING
L3	(2) 1.75X11.875 MICROLLAM LVL 2.0E	(2) JACK STUD, (2) KING STUD	(3) 2X6 POST @ BEAM BEARING
L4	8" DEEP MASONRY LINTEL W/ (1) #4 CONT.	(1) CORE GROUTED W/ (1) #4 VERTICAL	CONTINUE LINTEL STEEL PAST JAMB 2'-0"; JAMB VERTICAL STEEL SHALL CONTINUE FULL HEIGHT OF WALL
L5	16" DEEP MASONRY LINTEL W/ (1) #4 CONT. TOP AND BOTTOM	(1) CORE GROUTED W/ (1) #4 VERTICAL	CONTINUE LINTEL STEEL PAST JAMB 2'-0"; JAMB VERTICAL STEEL SHALL CONTINUE FULL HEIGHT OF WALL



2 UNBALANCED SNOW LOAD
 3/8" = 1'-0"

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 Engineer under the laws of the state of Minnesota.

Brandon Viland
 BRANDON VILAND SE PE
 Dated: 08/01/2019 Reg. No. 53688

**HICKORY PARK
 WARMING
 HOUSE AND ICE
 RINKS**

**BELLE PLAINE,
 MN**

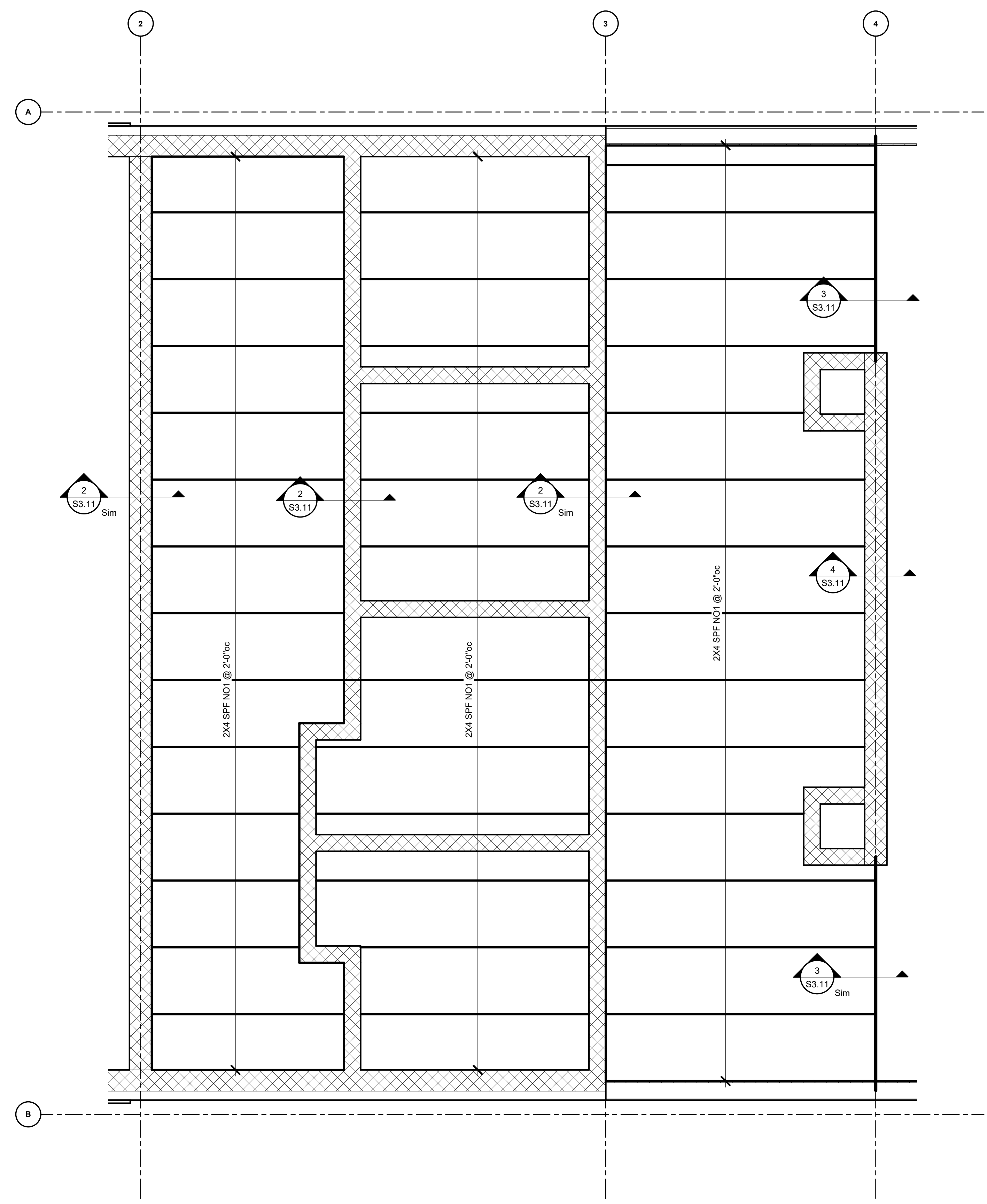
REVISIONS *XX*

PROJECT # 19-1172
 DATE 08/01/2019
 DRAWN BY BOV
 CHECKED BY BOV
 © 2019 OLESON+HOBBIE ARCHITECTS, LLC

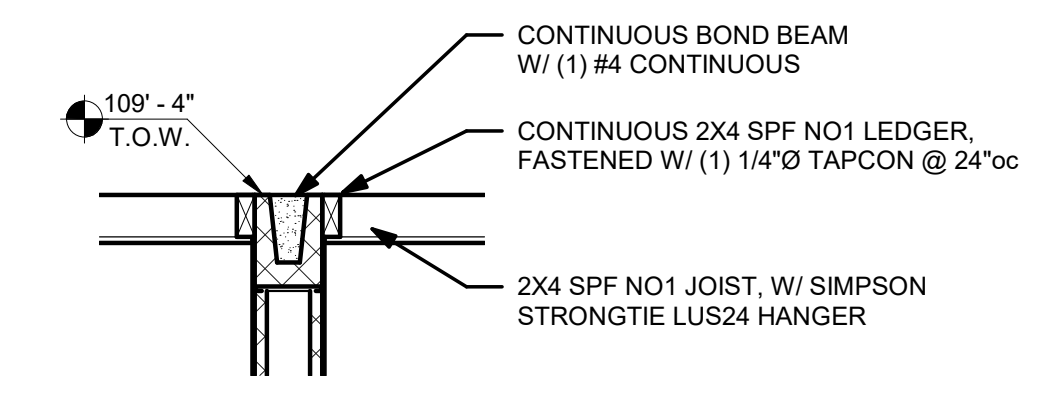
SHEET TITLE
**CEILING
 FRAMING PLAN
 AND DETAILS**

SHEET

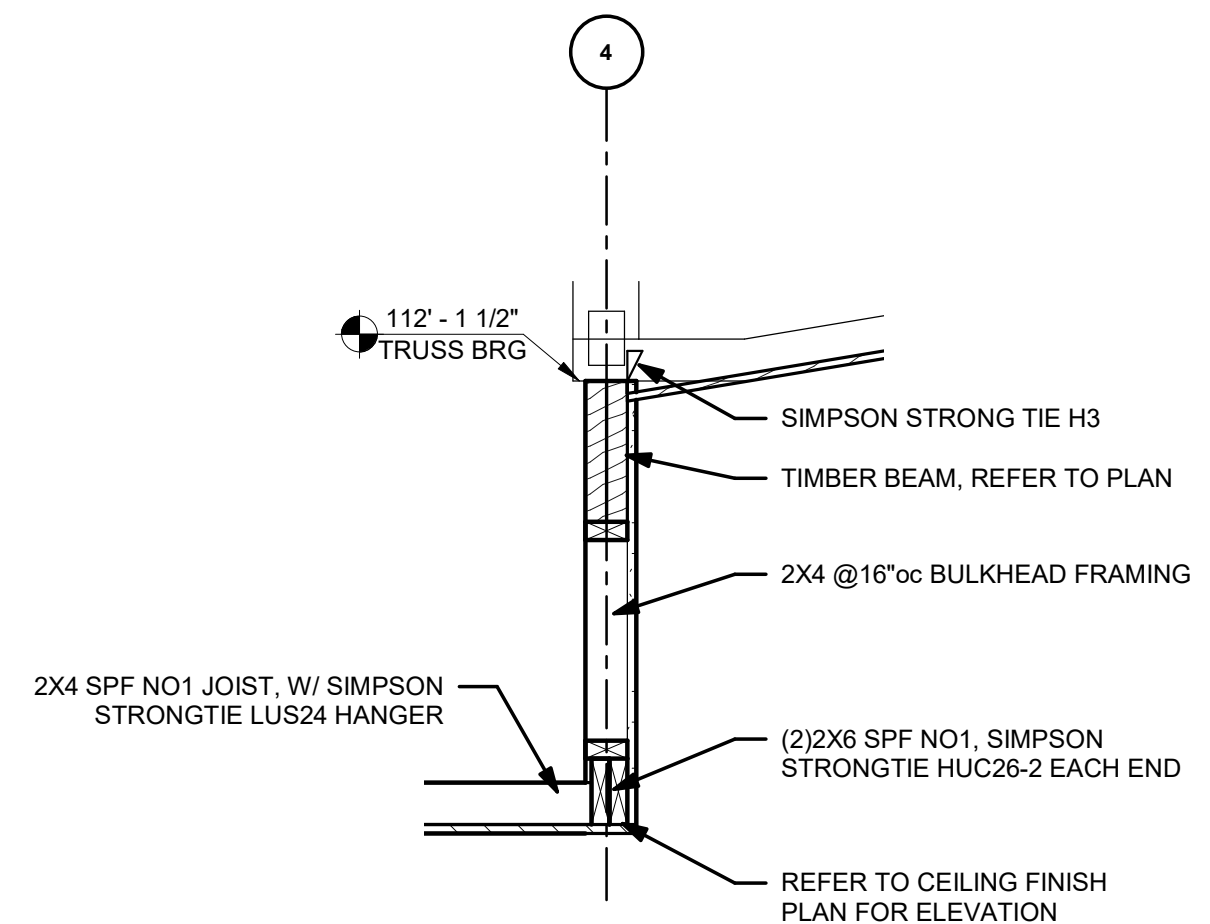
S3.11



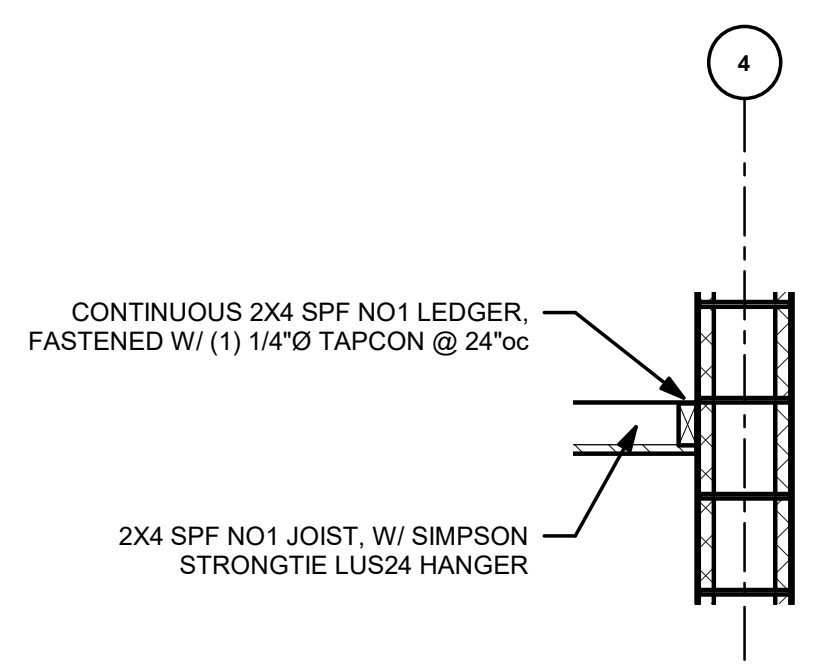
① CEILING FRAMING PLAN
 1/2" = 1'-0"



② CEILING JOIST LEDGER
 3/4" = 1'-0"



③ CEILING JOIST GIRDER
 3/4" = 1'-0"



④ CEILING JOIST LEDGER @ 4
 3/4" = 1'-0"

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 Engineer under the laws of the state of Minnesota.

Brandon Viland
 BRANDON VILAND SE PE
 Dated: 08/01/2019 Reg. No. 53688

**HICKORY PARK
 WARMING
 HOUSE AND ICE
 RINKS**

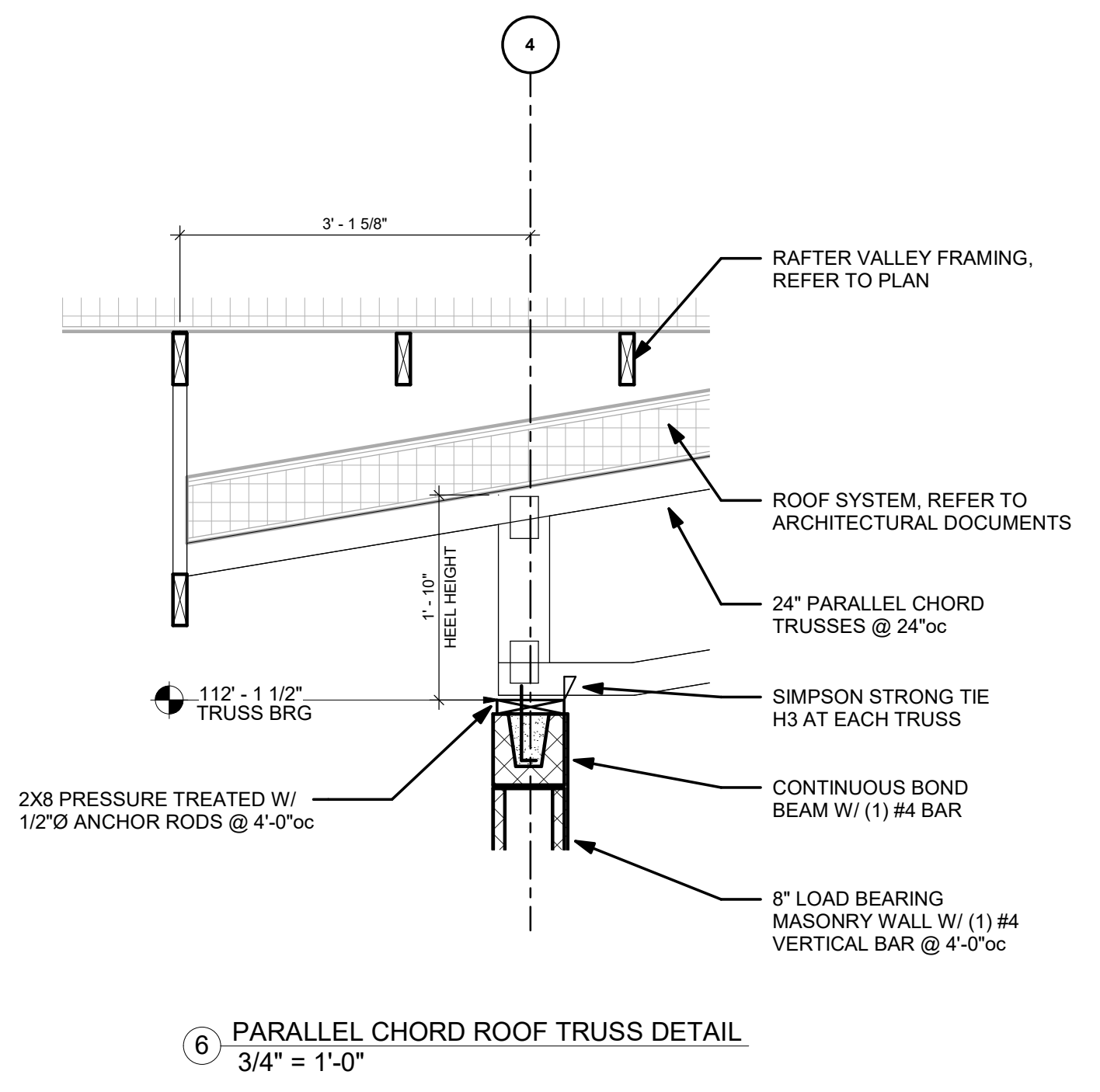
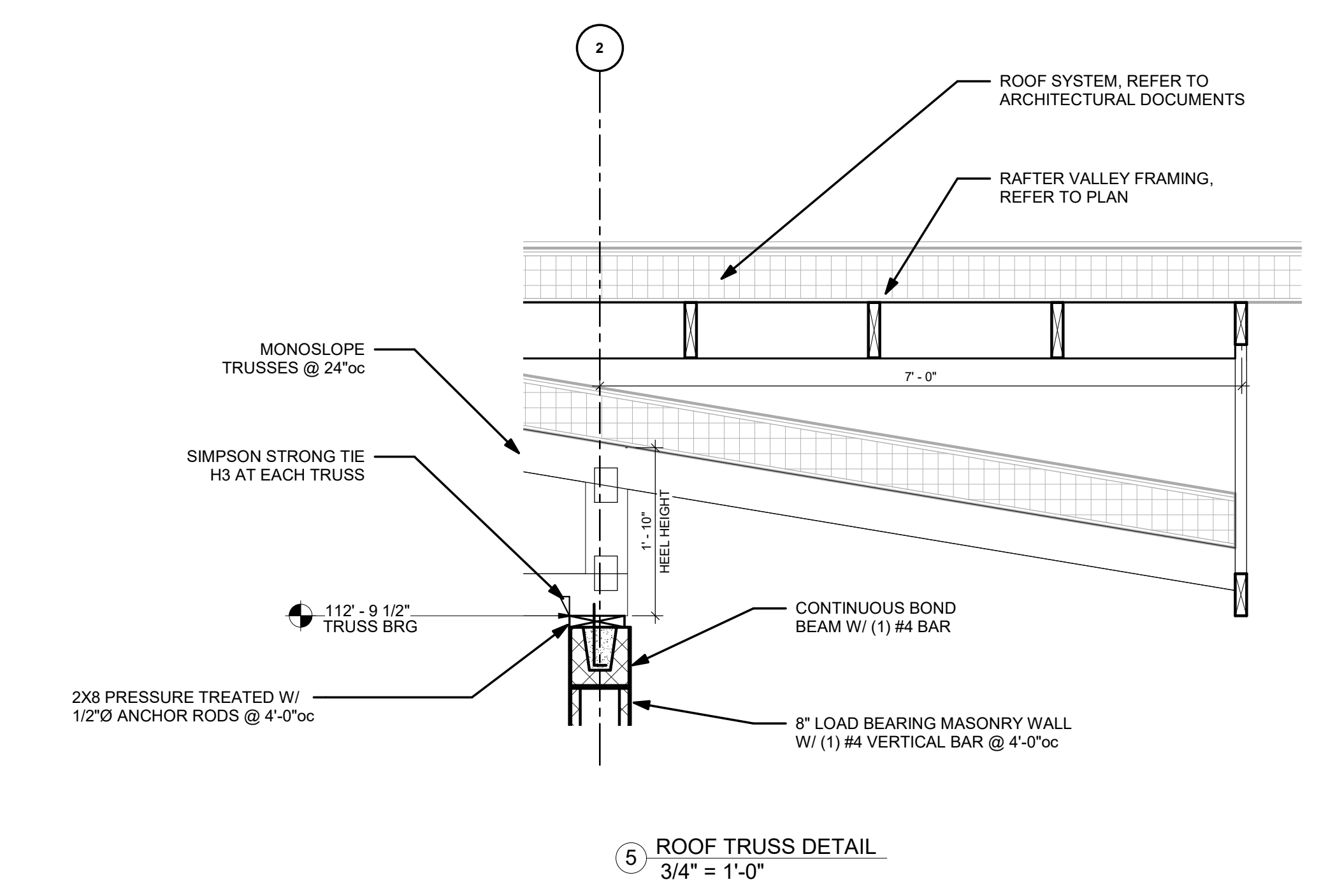
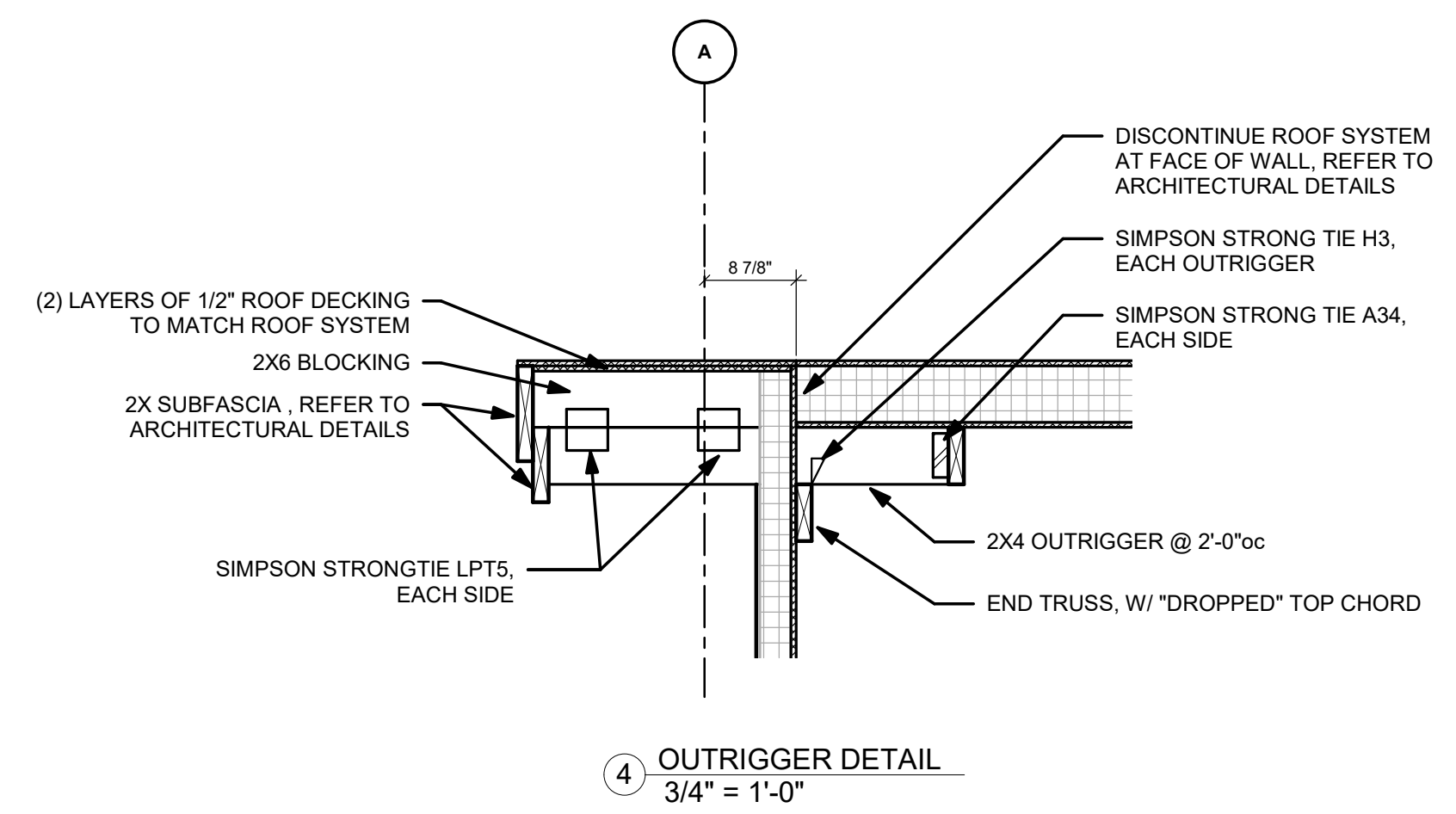
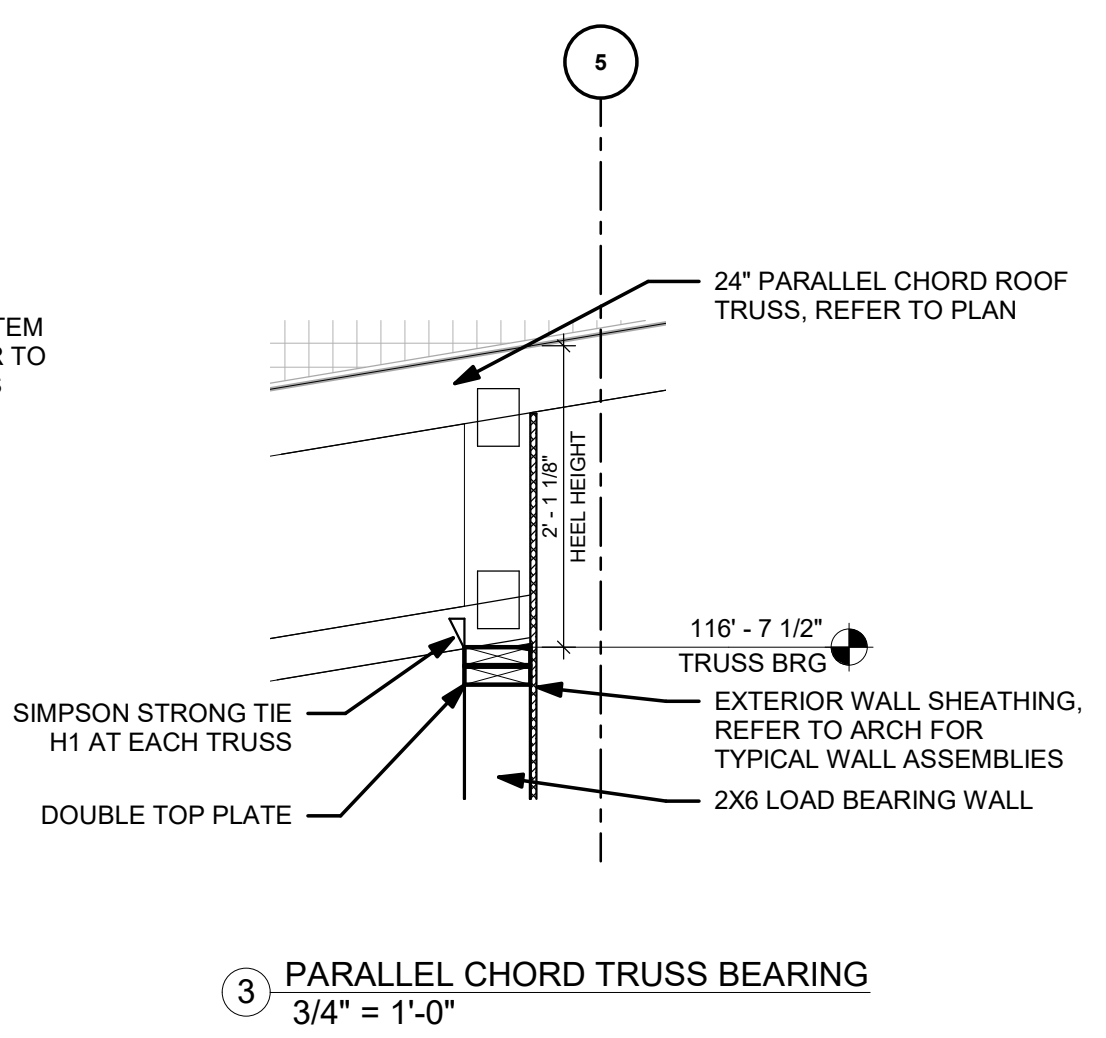
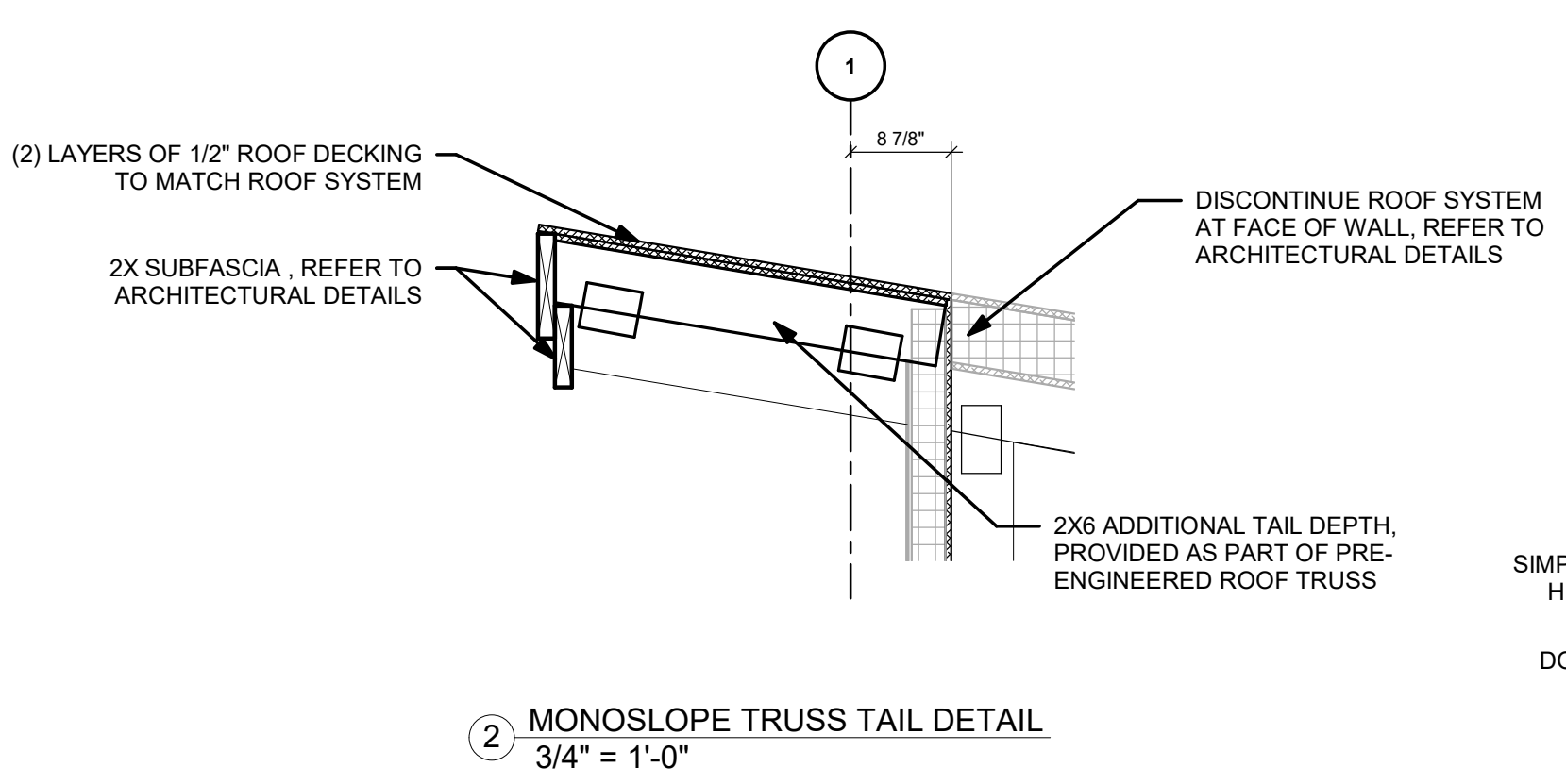
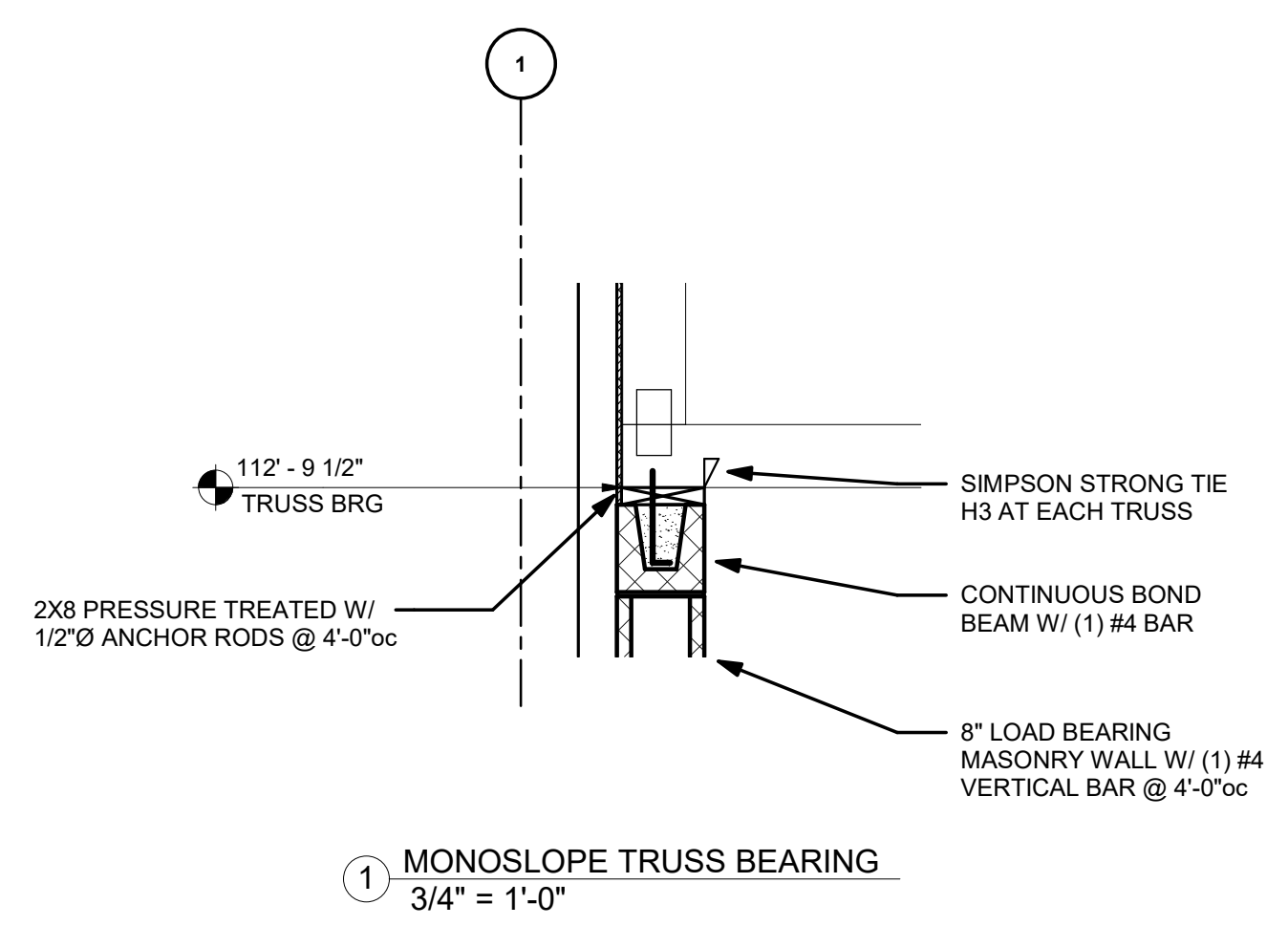
**BELLE PLAINE,
 MN**

REVISIONS *XXX*

PROJECT # 19-1172
 DATE 08/01/2019
 DRAWN BY BOV
 CHECKED BY BOV
 © 2019 OLESON+HOBBIE ARCHITECTS, LLC.

SHEET TITLE
**FRAMING
 DETAILS**

SHEET
S3.20



CONSULTANT

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.

Eric L. Oleson
 Eric L. Oleson, AIA
 Dated: 08.01.19 Reg. No. 42143

HICKORY PARK WARMING HOUSE AND ICE RINKS

BELLE PLAINE, MN

REVISIONS

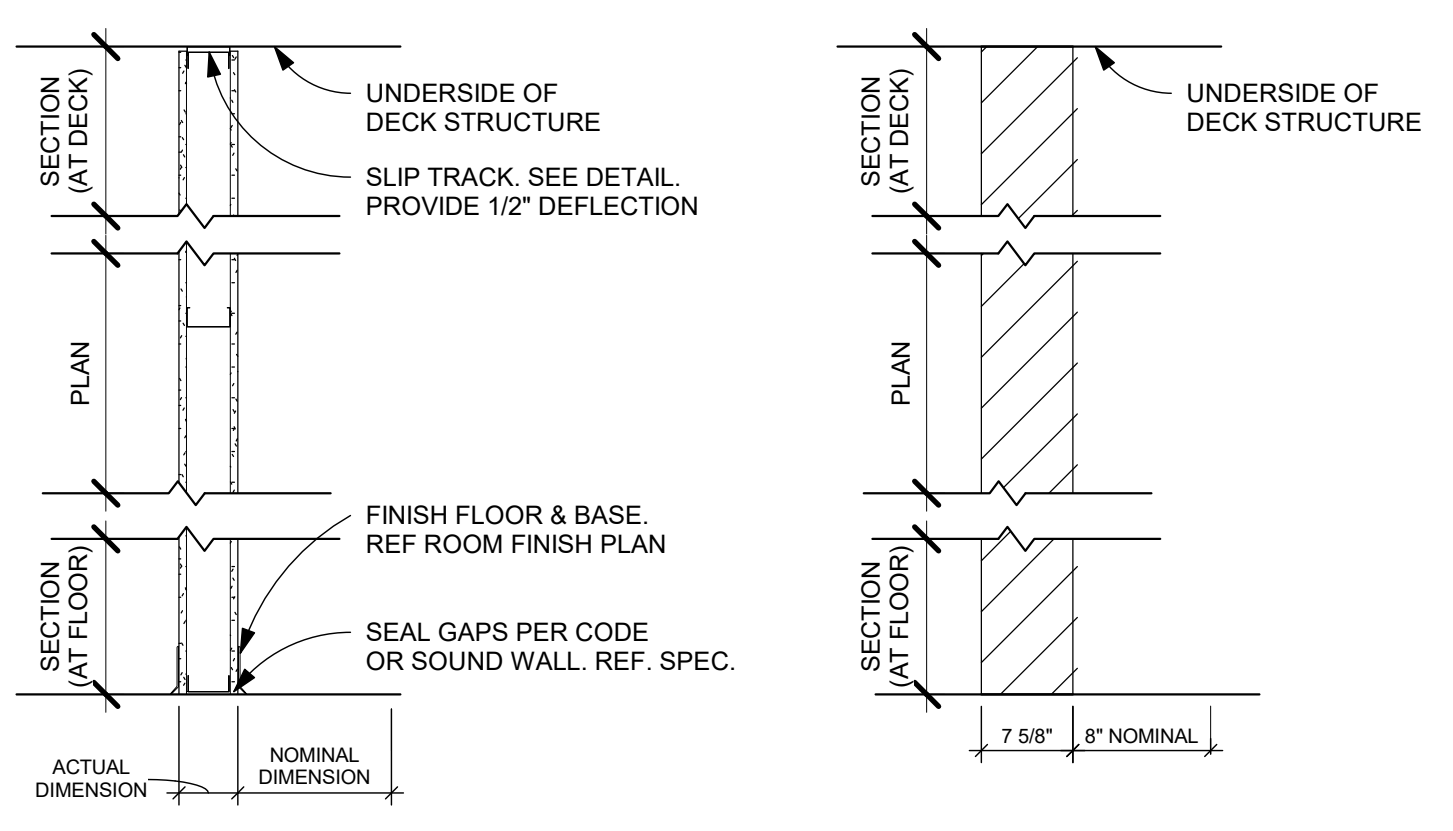
PROJECT # 19-019BP
 DATE 08/01/2019
 DRAWN BY DMS
 CHECKED BY ELO
 © 2019 OLESON+HOBBIE ARCHITECTS, LLC.

SHEET TITLE
FIRST LEVEL FLOOR PLAN, OPENING SCHEDULE

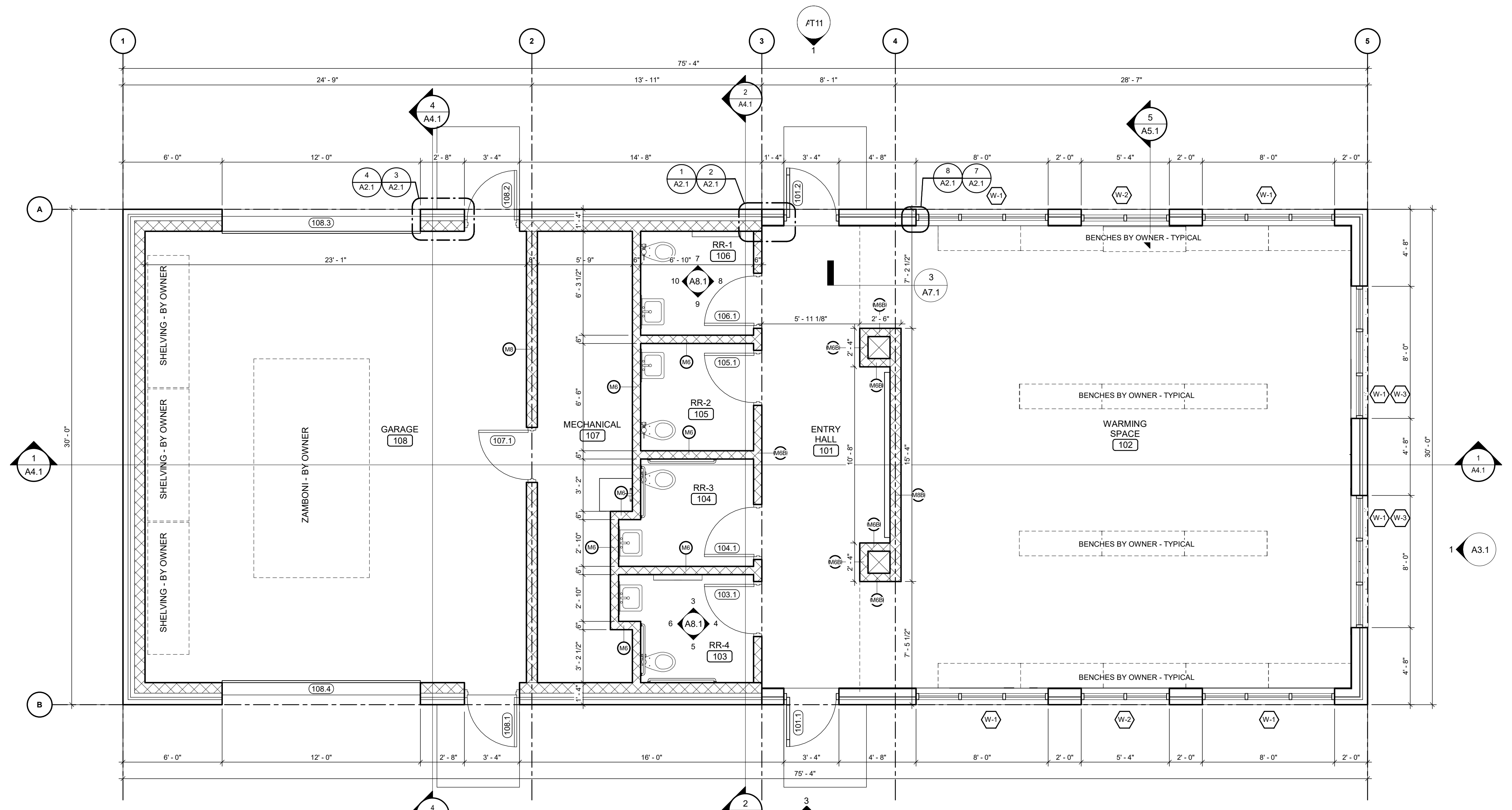
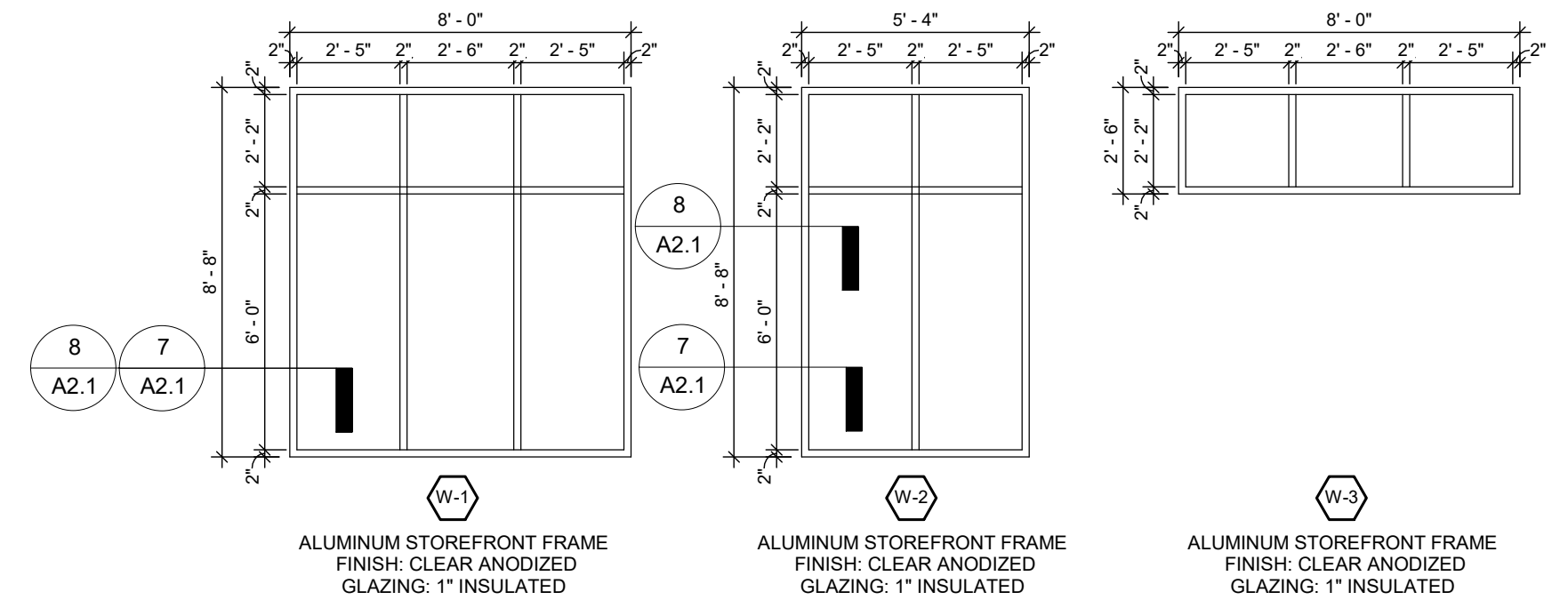
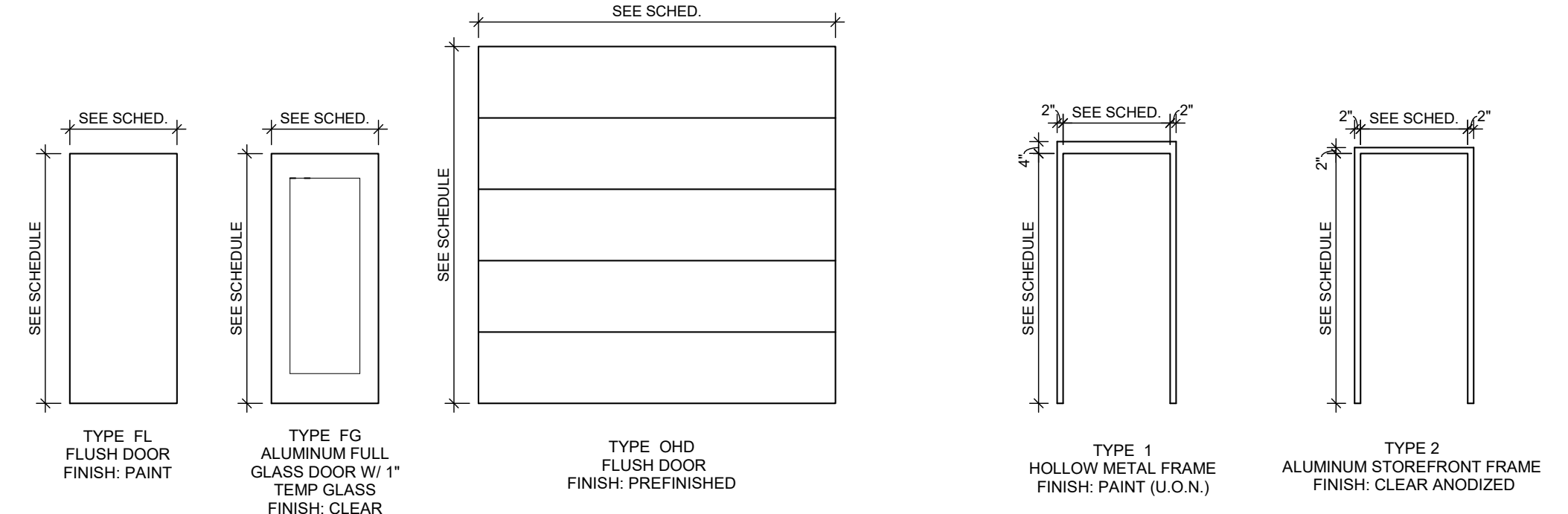
SHEET

A1.1

OPENING SCHEDULE															
MARK	RATING	DOOR						FRAME						COMMENTS	
		TYPE	MATERIAL	WIDTH	HEIGHT	THICKNESS	GLASS THICKNESS	TYPE	MATERIAL	DEPTH	JAMB	HEAD	SILL		HARDWARE
101.1	--	FG	ALUM	3'-0"	7'-0"	1 3/4"	1"	2	ALUM	4 1/2"	1 & 2/A2.1			1	
101.2	--	FG	ALUM	3'-0"	7'-0"	1 3/4"	1"	2	ALUM	4 1/2"	1 & 2/A2.1			1	
103.1	--	FL	HM	3'-0"	7'-0"	1 3/4"	0"	1	HM	5 3/4"	5/A2.1	--	--	2	--
104.1	--	FL	HM	3'-0"	7'-0"	1 3/4"	0"	1	HM	5 3/4"	5/A2.1	--	--	2	--
105.1	--	FL	HM	3'-0"	7'-0"	1 3/4"	0"	1	HM	5 3/4"	5/A2.1	--	--	2	--
106.1	--	FL	HM	3'-0"	7'-0"	1 3/4"	0"	1	HM	5 3/4"	5/A2.1	--	--	2	--
107.1	--	FL	HM	3'-0"	7'-0"	1 3/4"	0"	1	HM	5 3/4"	5/A2.1	--	--	3	--
108.1	--	FL	HM	3'-0"	7'-0"	1 3/4"	0"	1	HM	5 3/4"	3 & 4/A2.1	--	--	4	--
108.2	--	FL	HM	3'-0"	7'-0"	1 3/4"	0"	1	HM	5 3/4"	3 & 4/A2.1	--	--	4	--
108.3	--	OHD	STL	12'-0"	10'-0"	1 1/2"			STL		3 & 4/A2.1				
108.4	--	OHD	STL	12'-0"	10'-0"	1 1/2"			STL		3 & 4/A2.1				



- ASSEMBLY LEGEND:** (RATING)
 PARTITION NAME
- TYPE 'M' PARTITION SERIES:**
 CONCRETE MASONRY UNITS WALLS
 (M6) 6" CONCRETE MASONRY UNITS
 (M6B) 6" CONCRETE MASONRY UNITS - BURNISHED
 (M8) 8" CONCRETE MASONRY UNITS
 (M8B) 8" CONCRETE MASONRY UNITS - BURNISHED
- WALL ASSEMBLY**
 • XXXX
 • XXXX
 • XXXX
- WALL TYPES**
 3/4" = 1'-0"



1 FLOOR PLAN
 A1.1 SCALE: 1/4" = 1'-0" NORTH

**HICKORY PARK
WARMING
HOUSE AND ICE
RINKS**

**BELLE PLAINE,
MN**

REVISIONS Δ XX

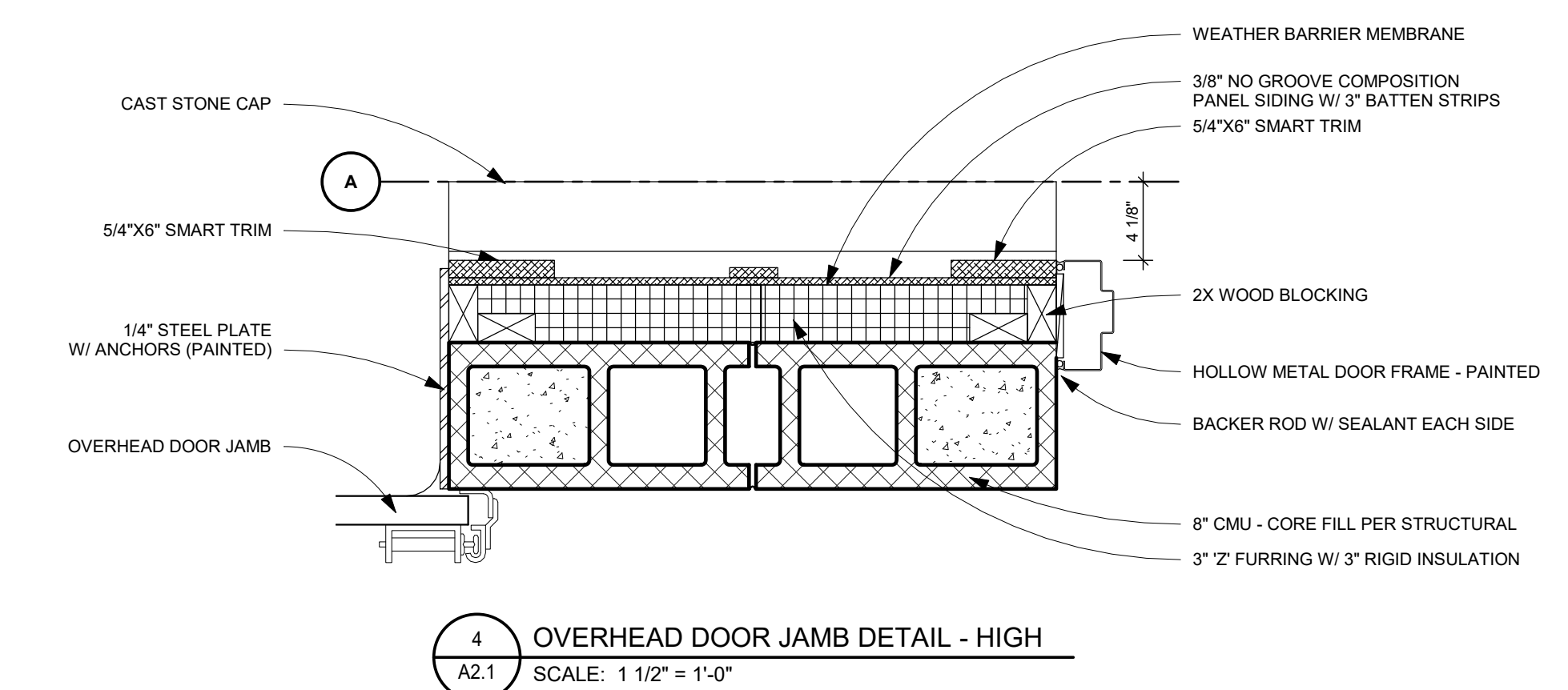
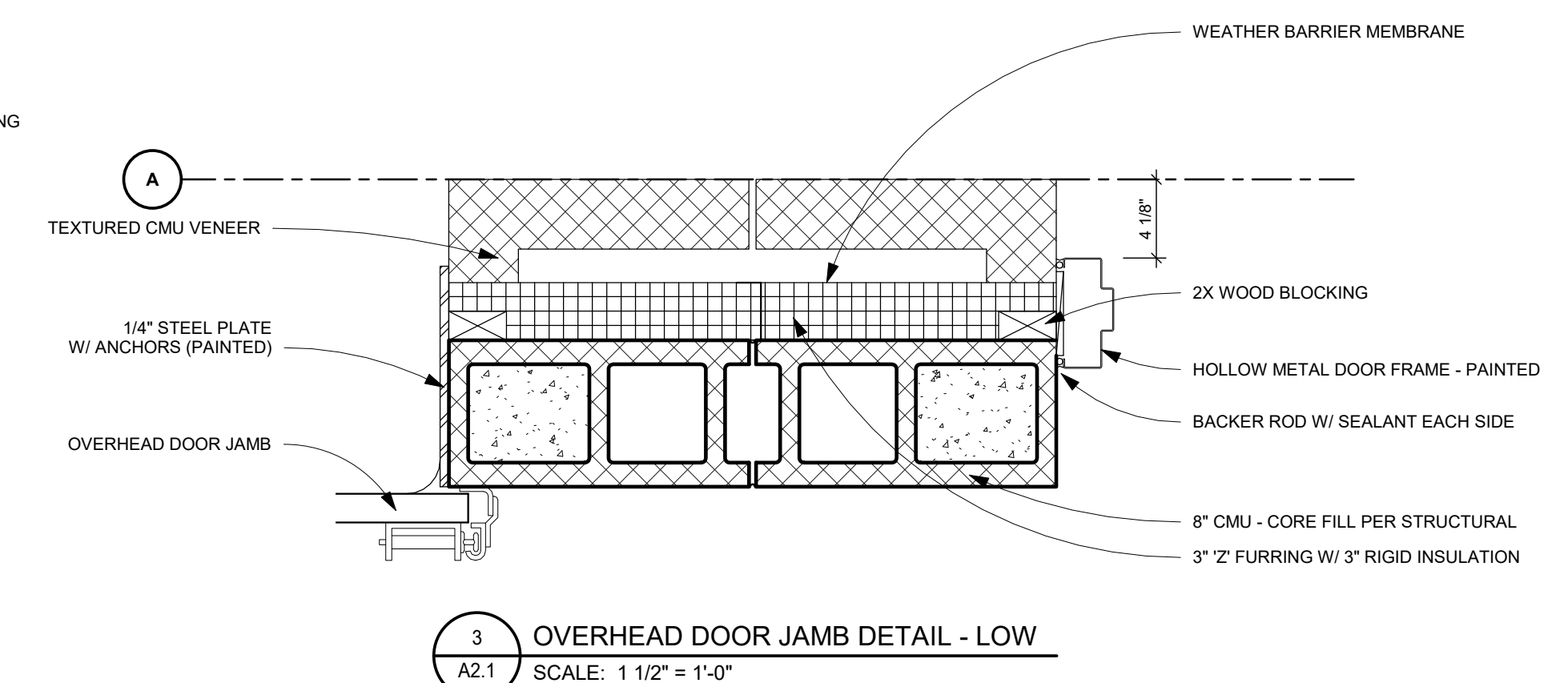
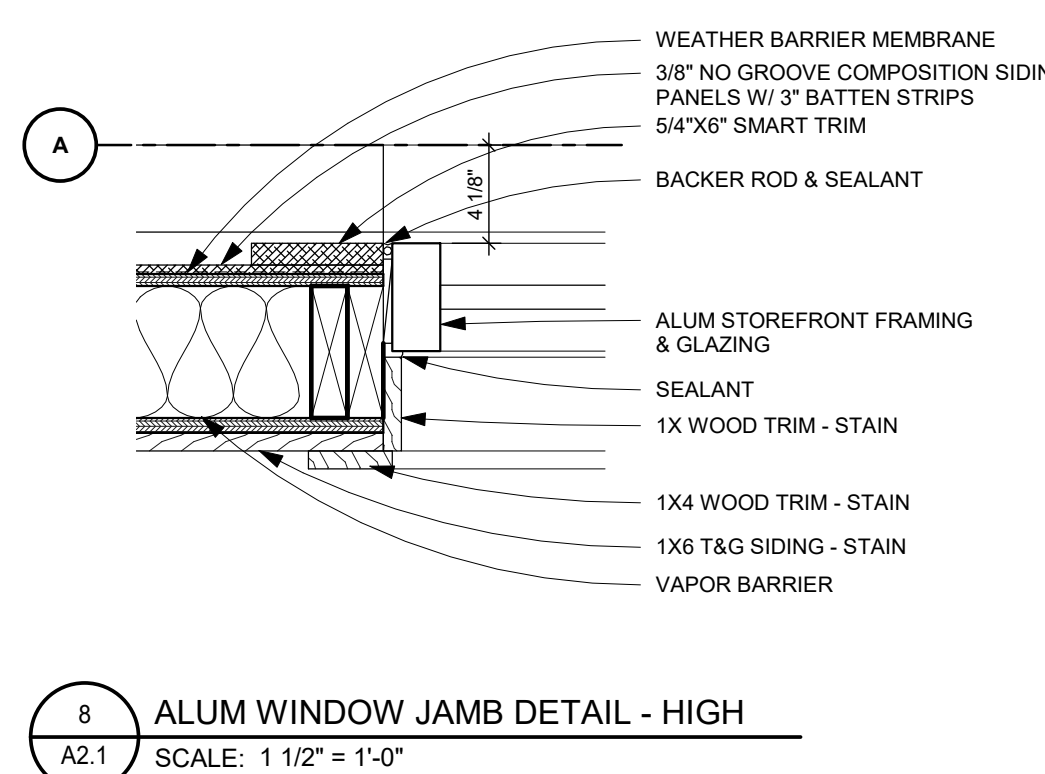
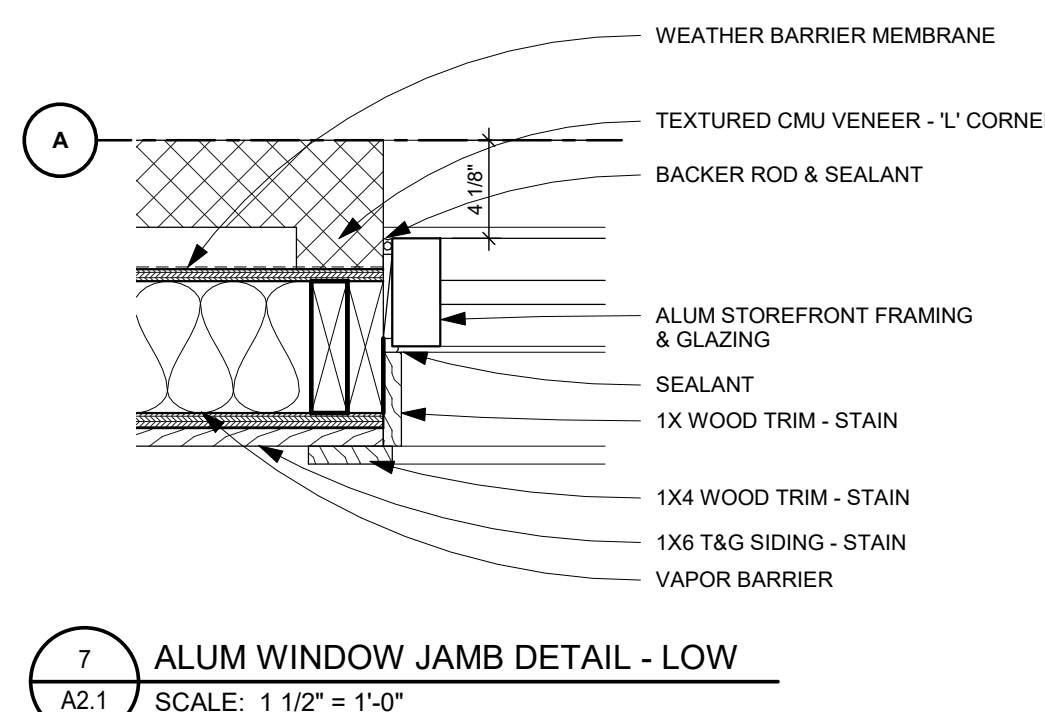
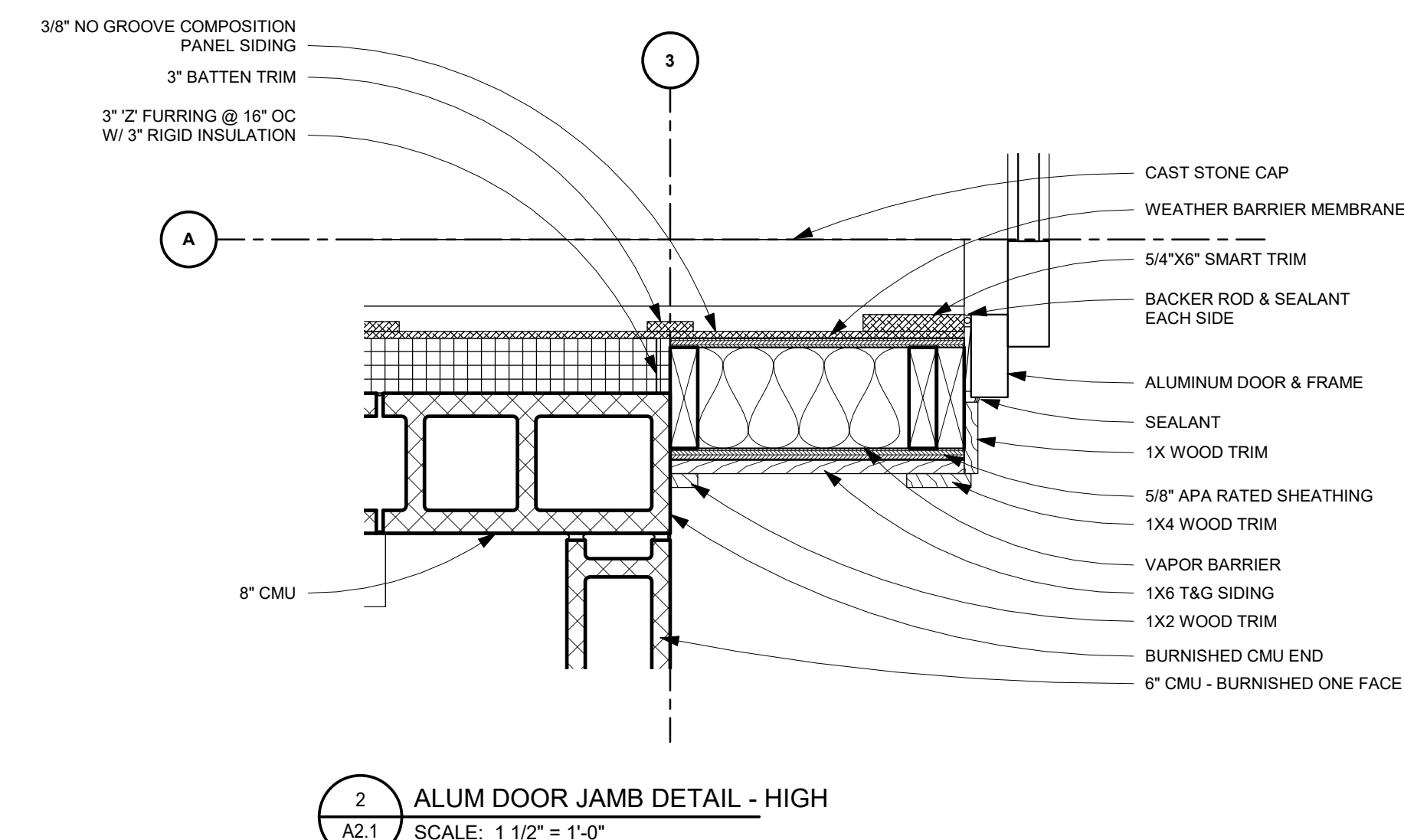
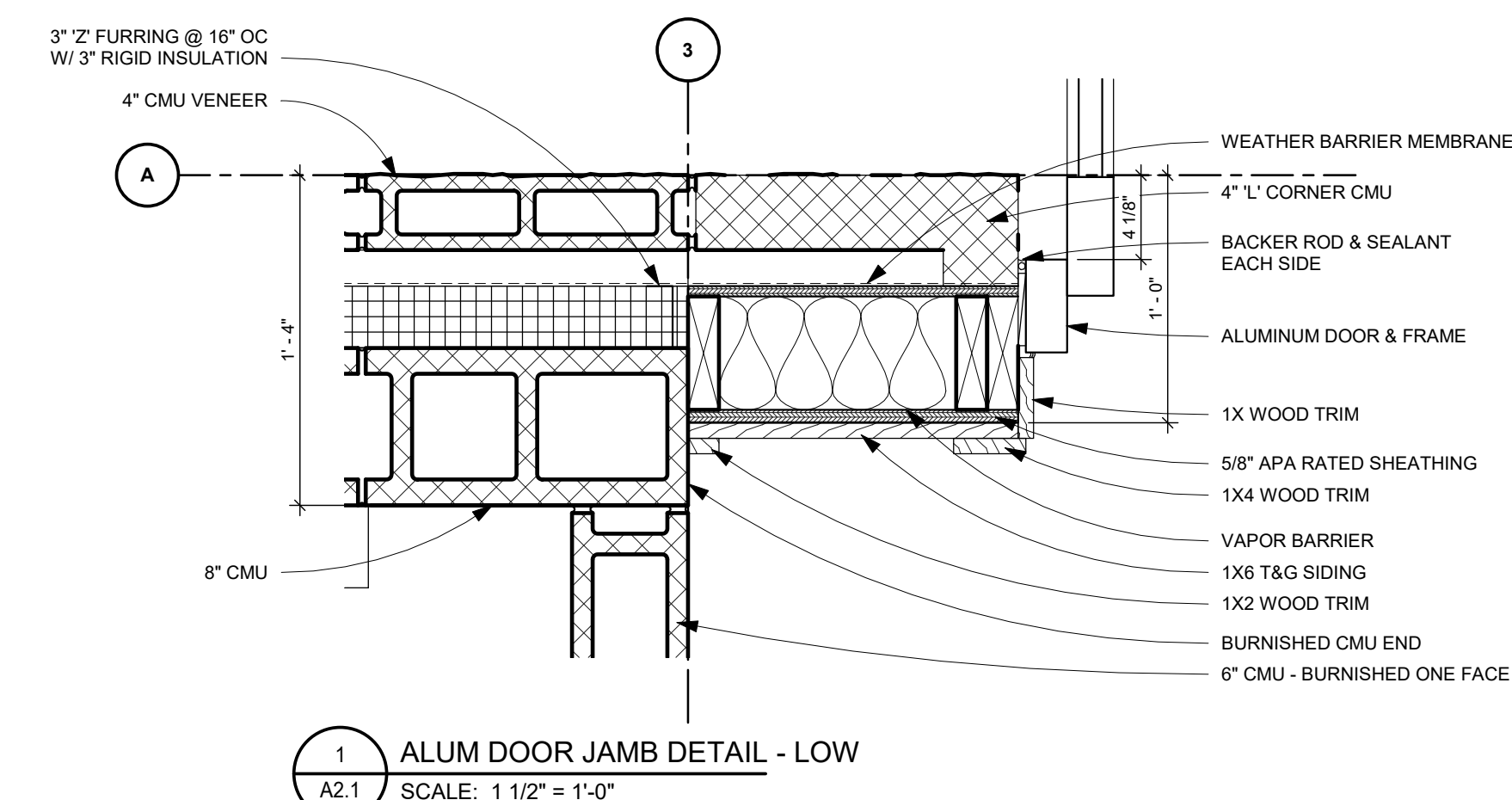
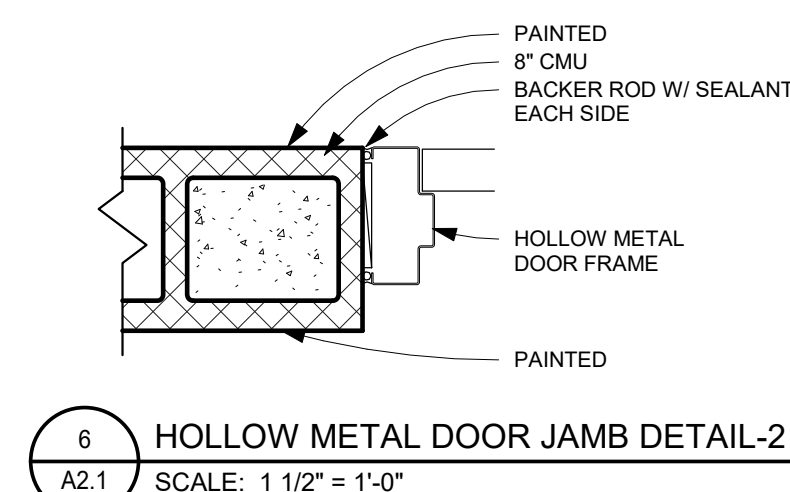
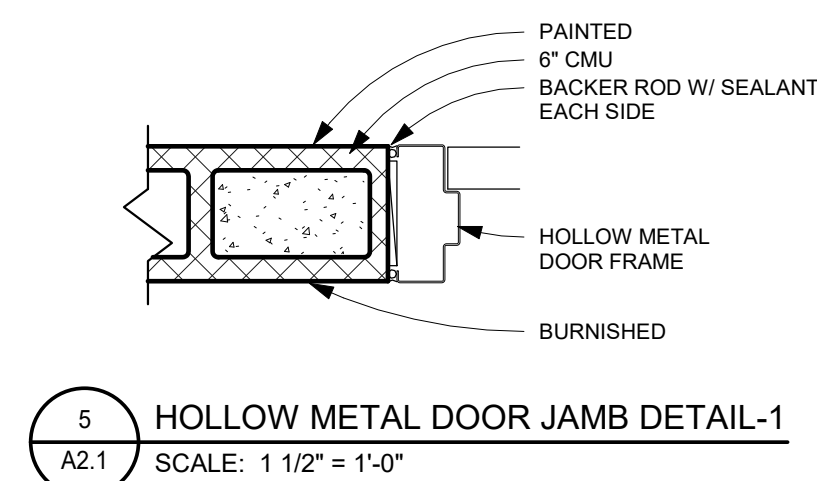
PROJECT # 19-019BP
DATE 08/01/2019
DRAWN BY DGH
CHECKED BY ELO
© 2019 OLESON+HOBBIE ARCHITECTS, LLC.

SHEET TITLE

DETAILS

SHEET

A2.1



CONSULTANT

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.

Eric L. Oleson
 Eric L. Oleson, AIA

Dated: 08.01.19 Reg. No. 42143

**HICKORY PARK
 WARMING
 HOUSE AND ICE
 RINKS**

**BELLE PLAINE,
 MN**

REVISIONS

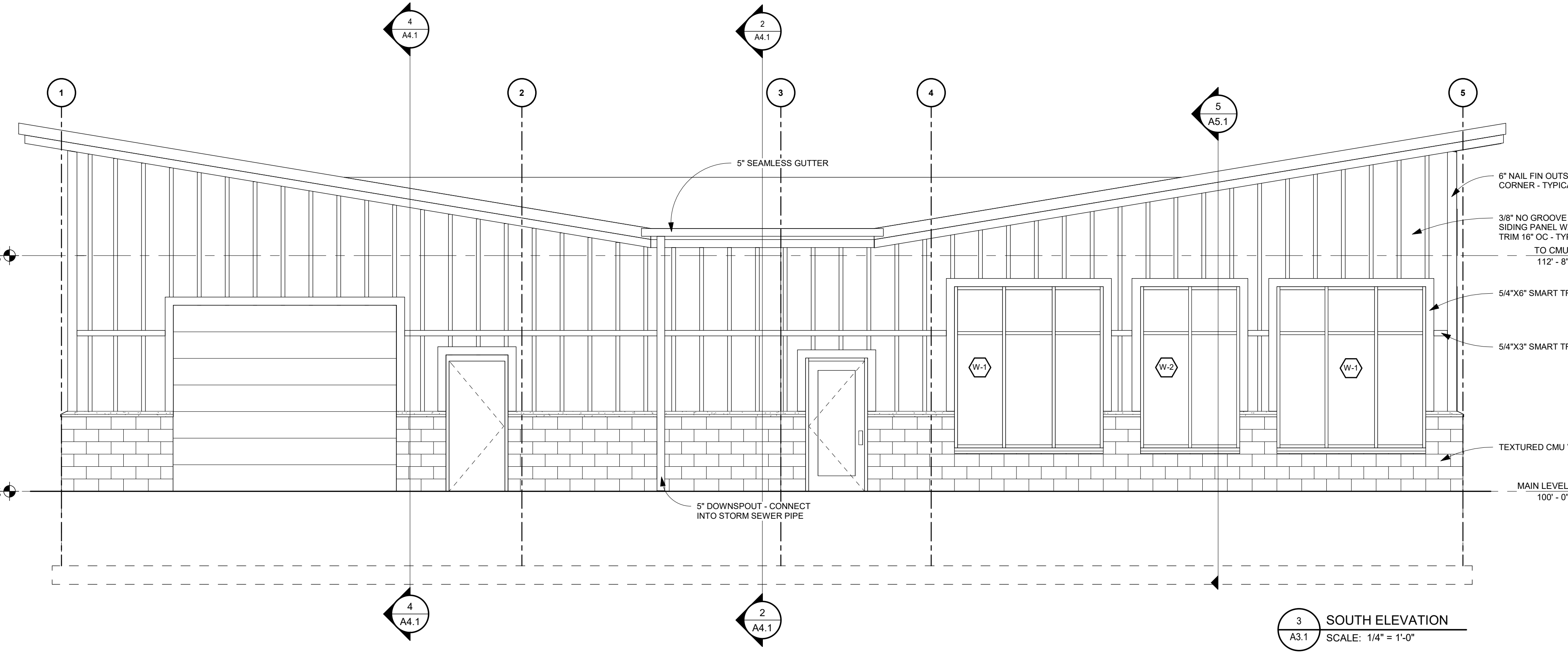
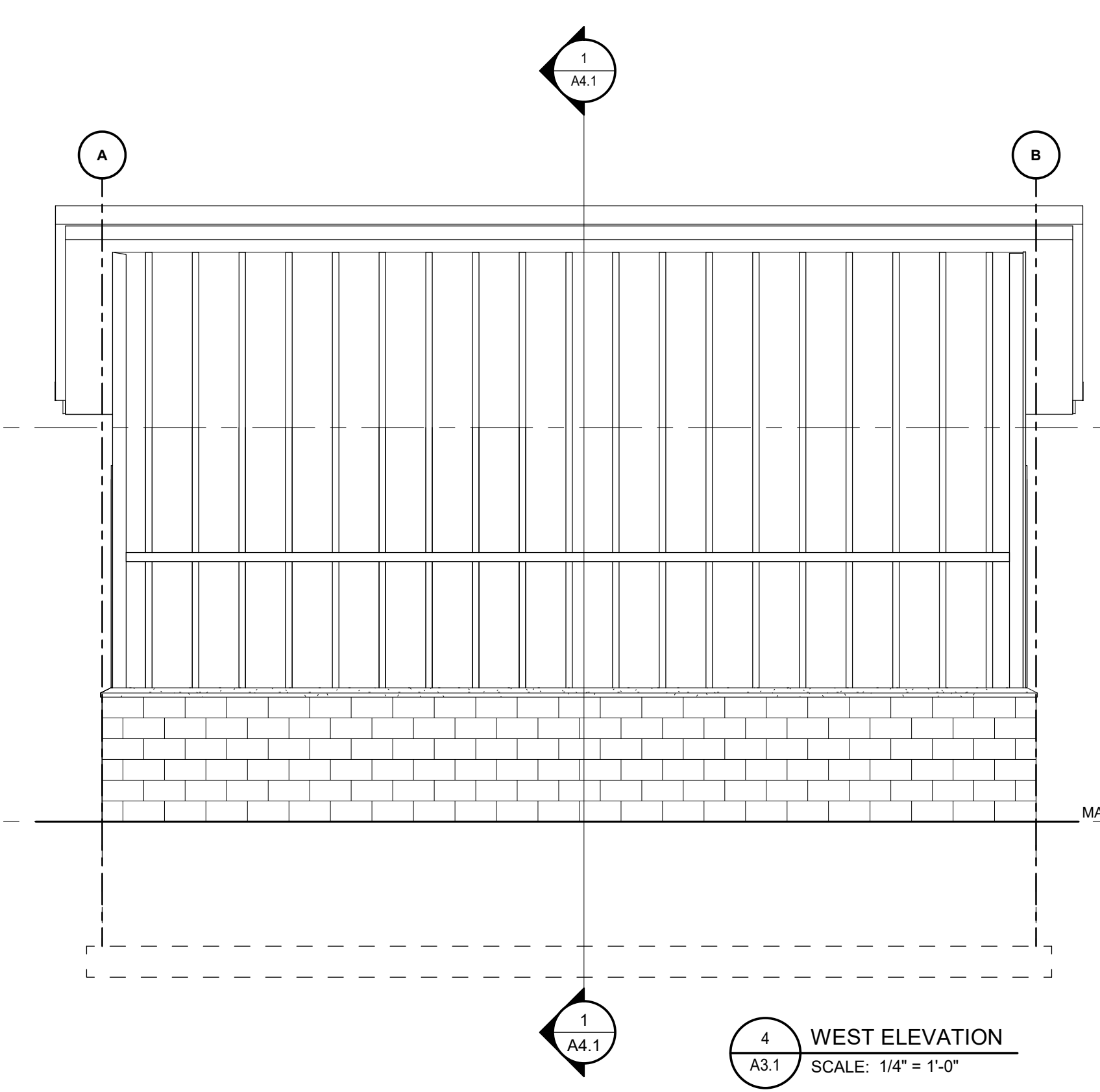
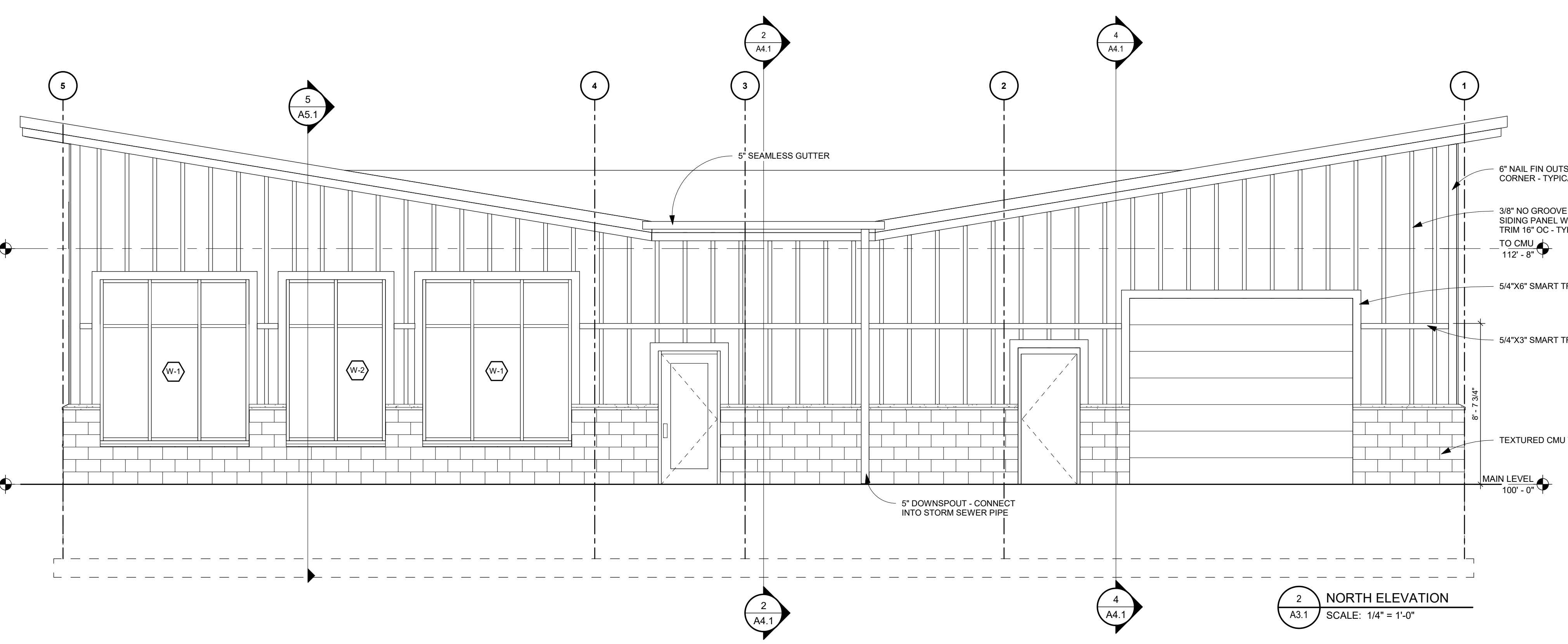
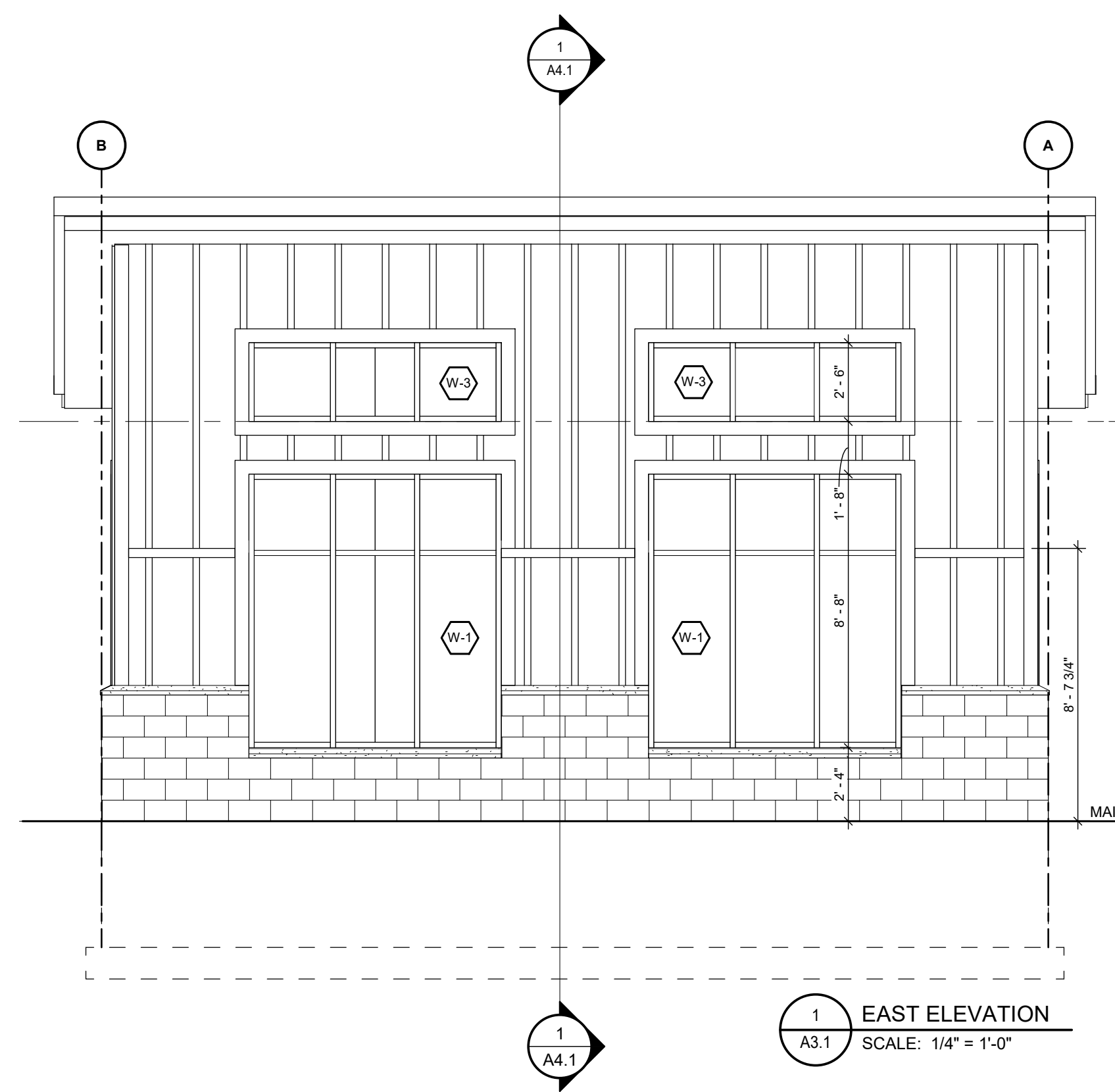
XX

PROJECT # 19-019BP
 DATE 08/01/2019
 DRAWN BY DMS
 CHECKED BY ELO
 © 2019 OLESON+HOBBIE ARCHITECTS, LLC.

SHEET TITLE
**EXTERIOR
 ELEVATIONS**

SHEET

A3.1



CONSULTANT

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.

Eric L. Oleson
Eric L. Oleson, AIA

Dated: 08.01.19 Reg. No. 42143

**HICKORY PARK
WARMING
HOUSE AND ICE
RINKS**

**BELLE PLAINE,
MN**

REVISIONS

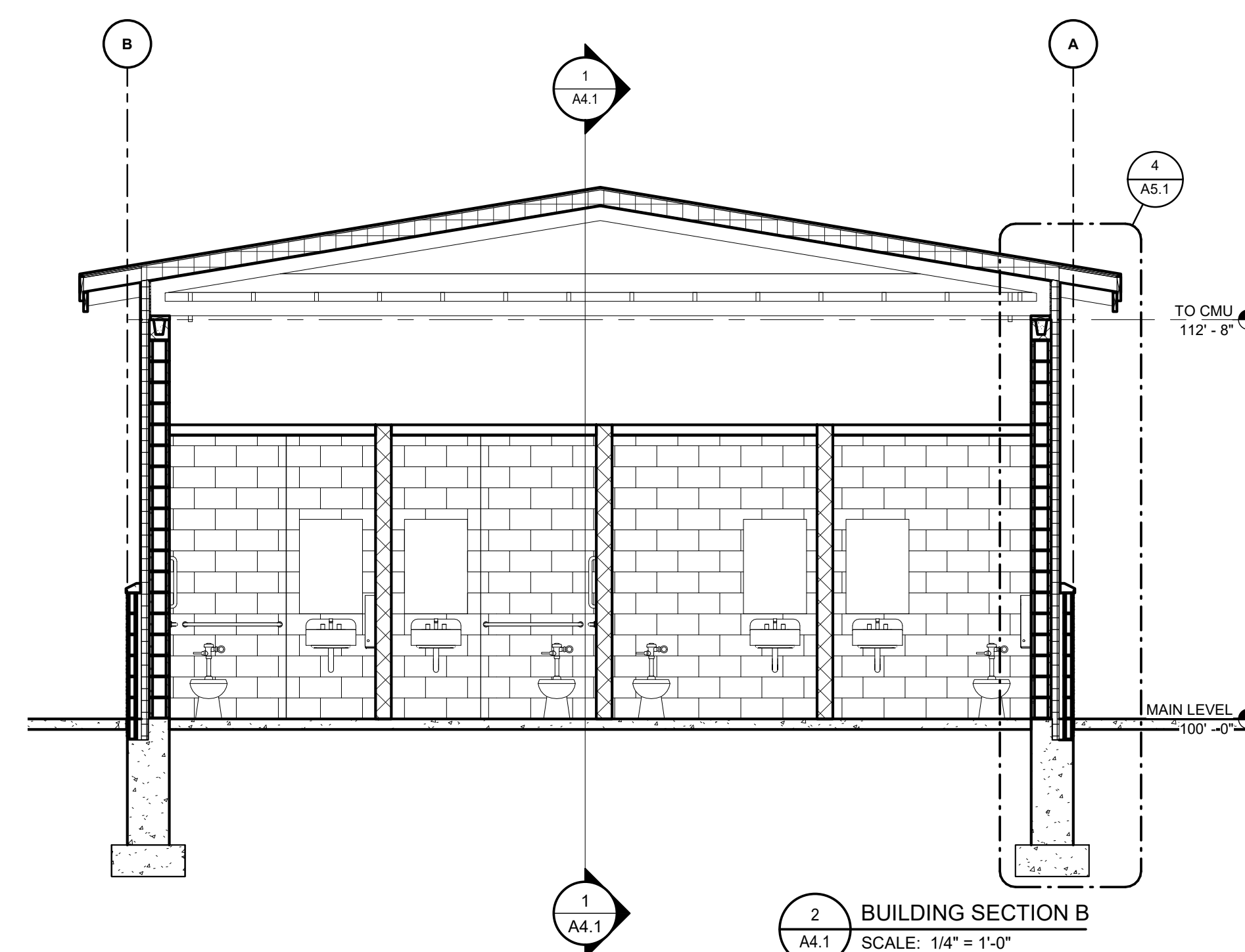
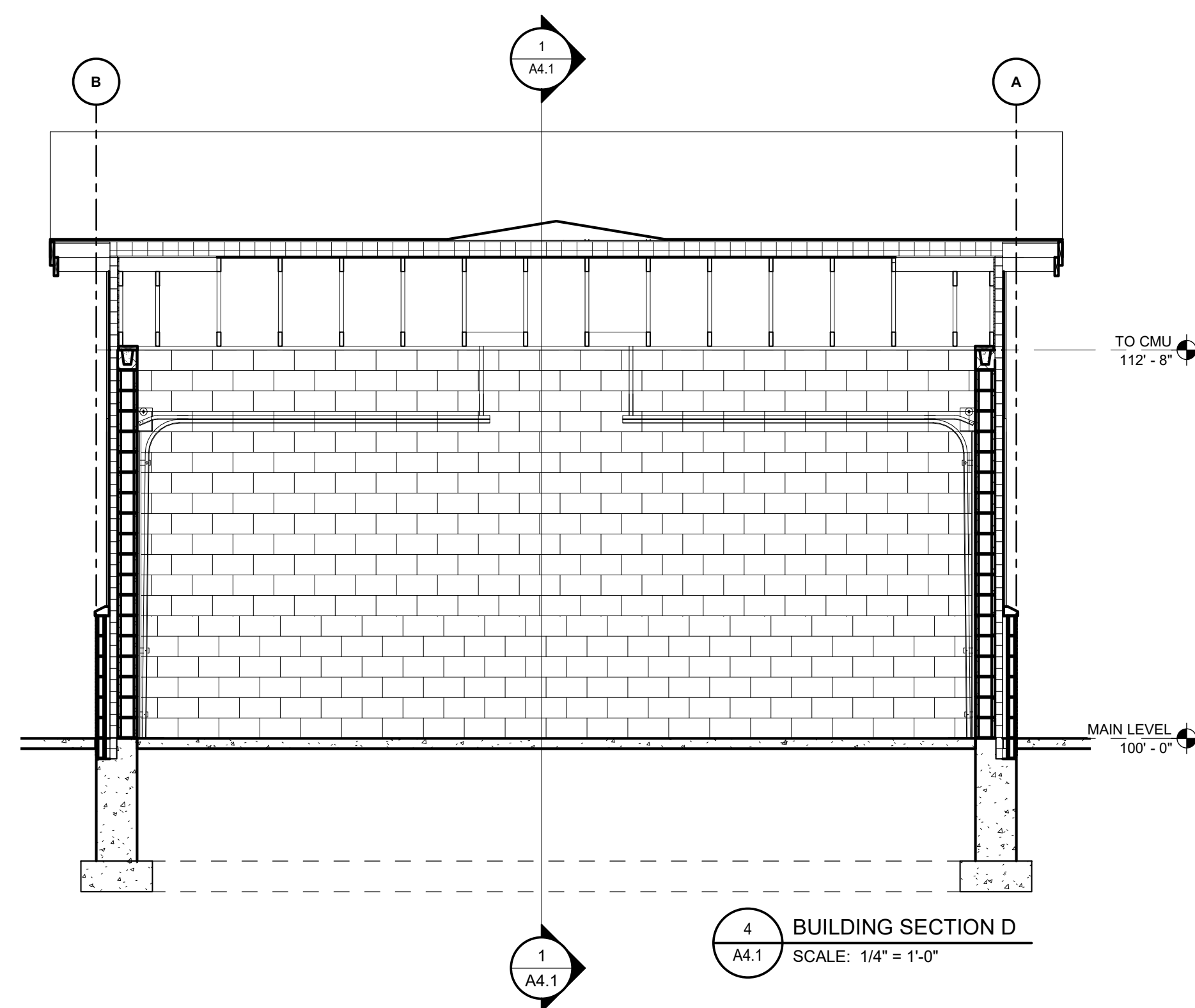
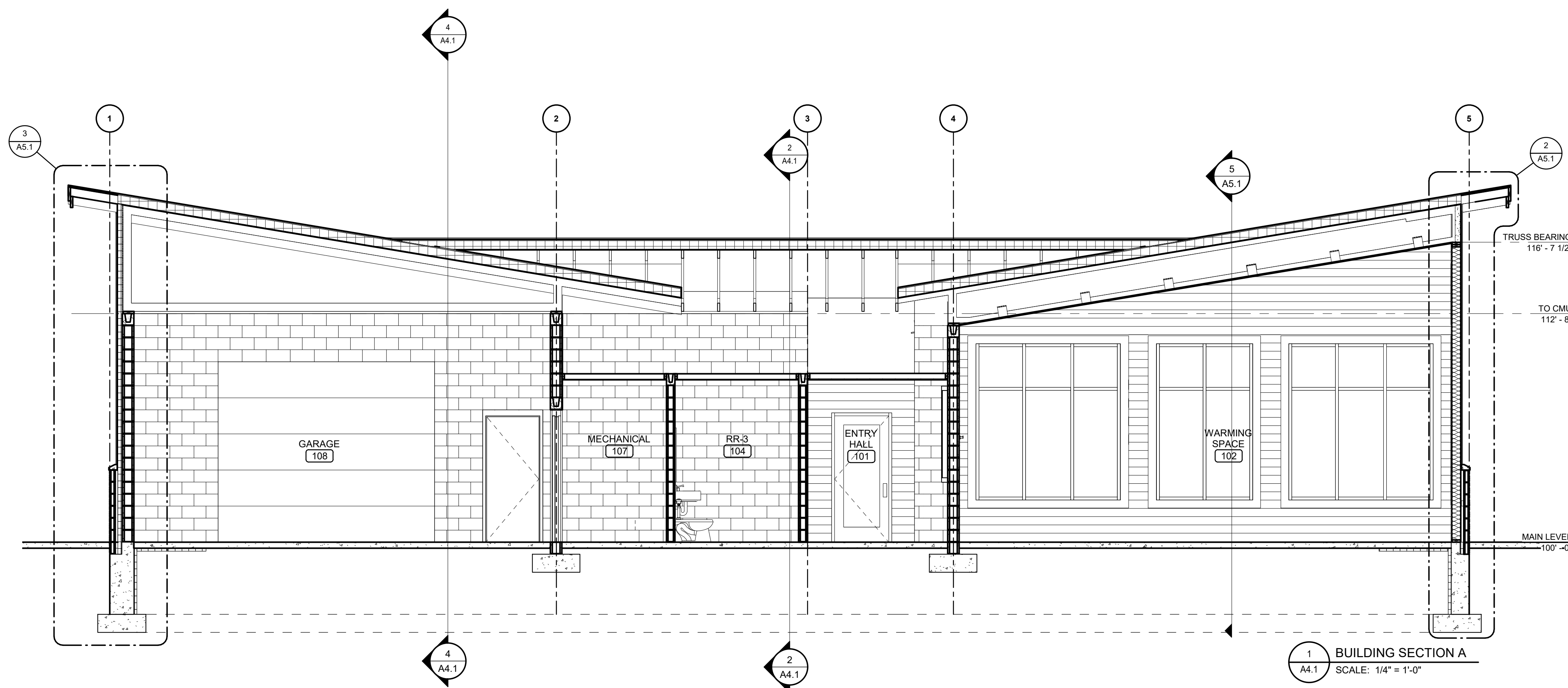
PROJECT # 19-019BP
DATE 08/01/2019
DRAWN BY DMS
CHECKED BY ELO
© 2019 OLESON+HOBBIE ARCHITECTS, LLC.

SHEET TITLE

**BUILDING
SECTIONS**

SHEET

A4.1



CONSULTANT

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.

Eric L. Oleson
 Eric L. Oleson, AIA
 Dated: 08.01.19 Reg. No. 42143

HICKORY PARK WARMING HOUSE AND ICE RINKS

BELLE PLAINE, MN

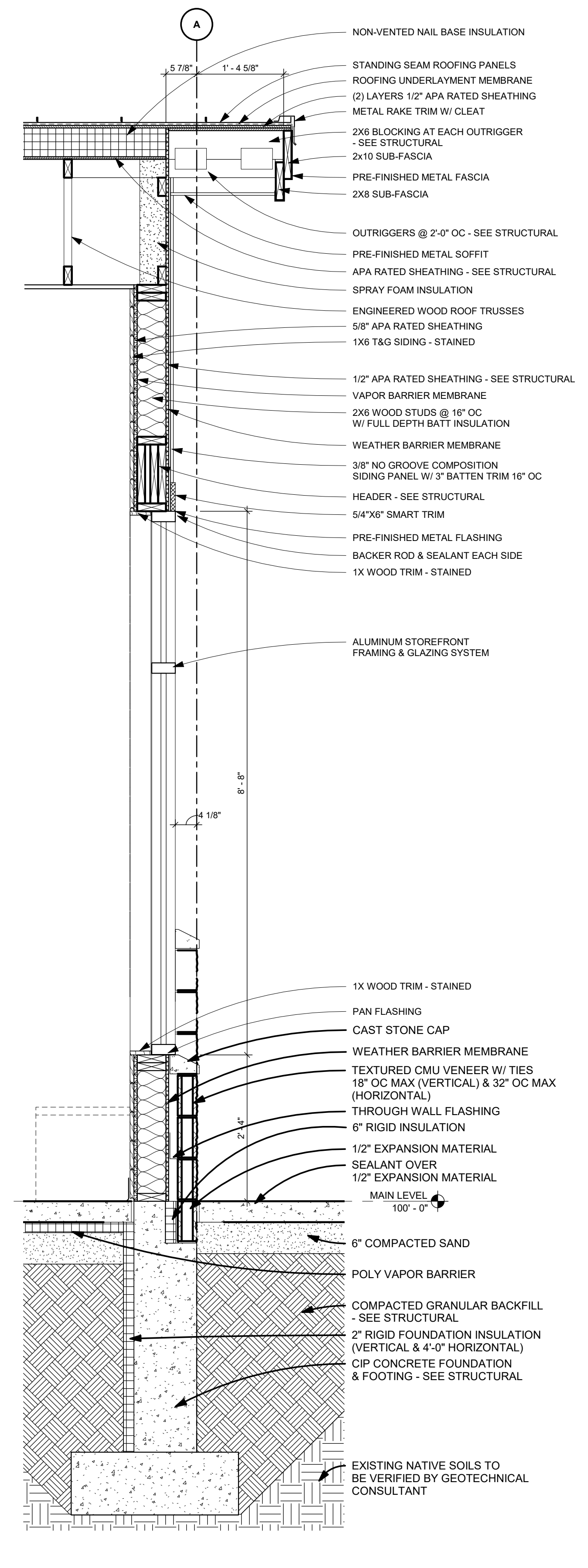
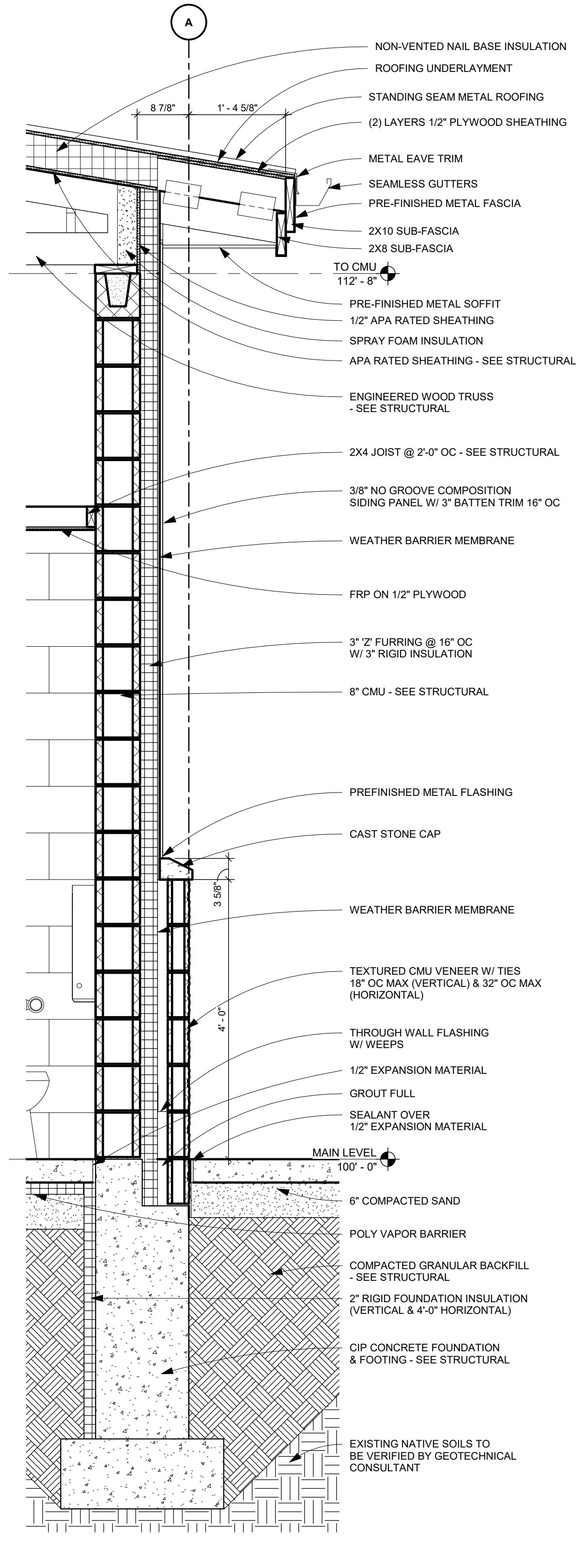
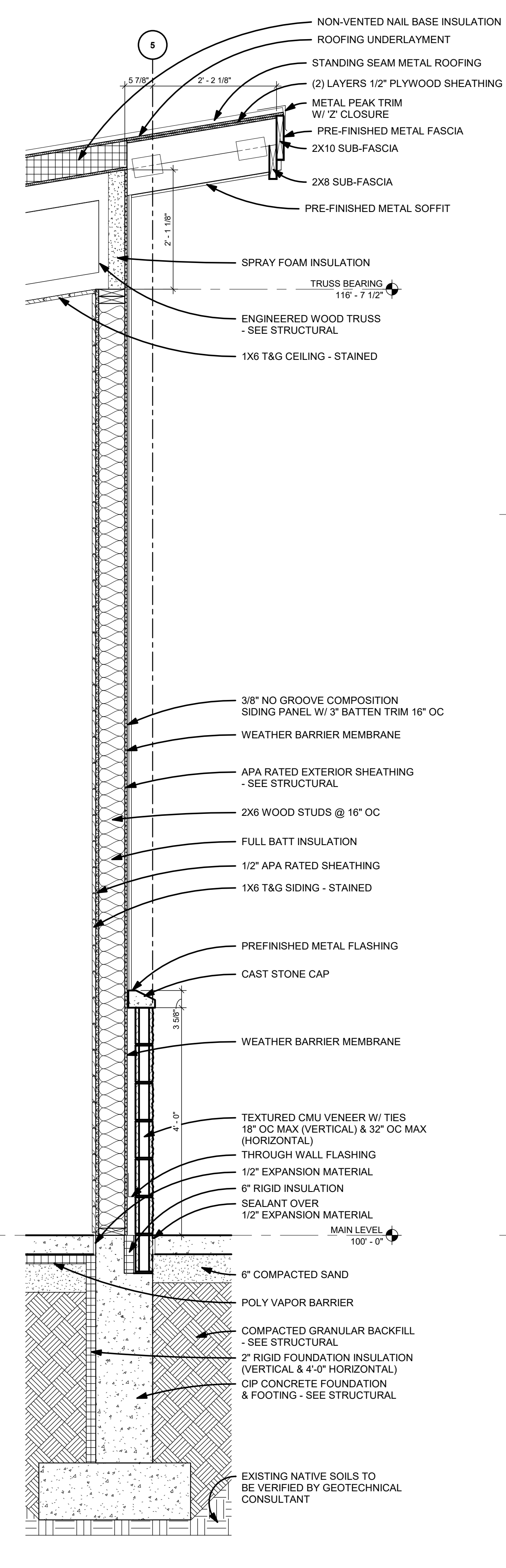
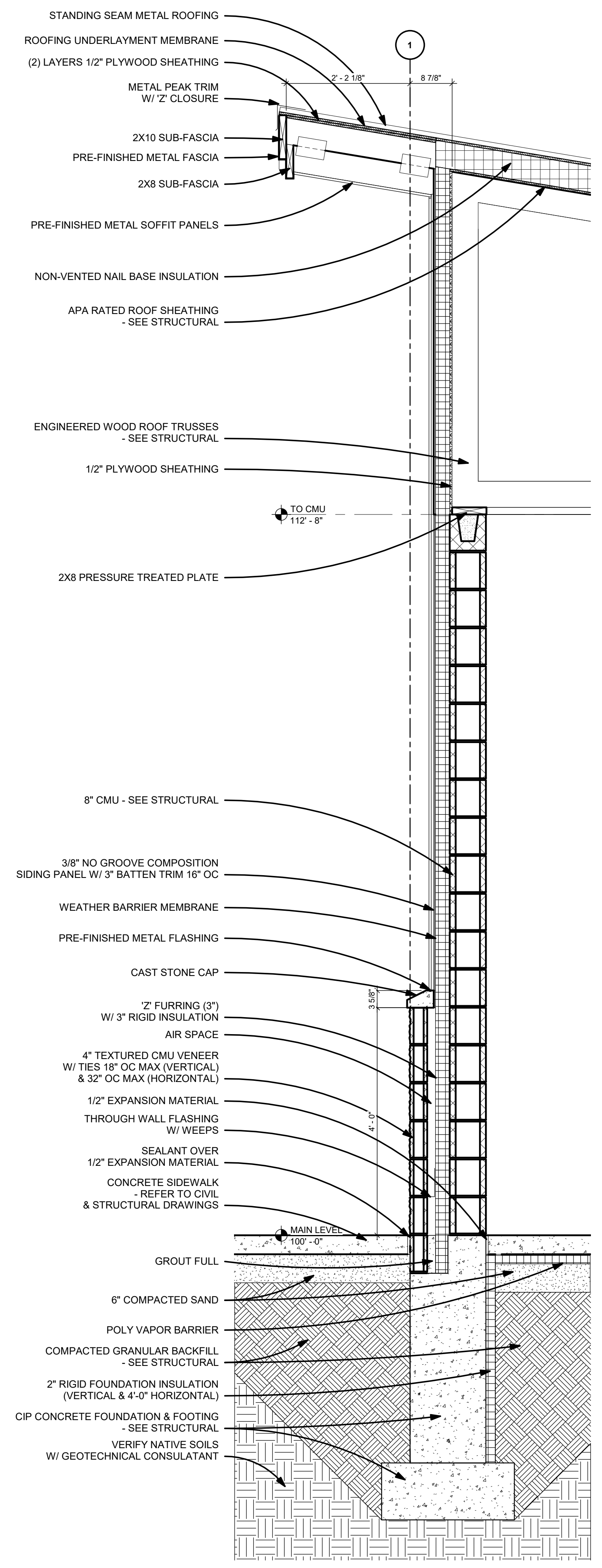
REVISIONS

PROJECT # 19-019BP
 DATE 08/01/2019
 DRAWN BY DGH
 CHECKED BY ELO
 © 2019 OLESON+HOBBIE ARCHITECTS, LLC.

SHEET TITLE
WALL SECTIONS

SHEET

A5.1



CONSULTANT

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.

Eric L. Oleson
 Eric L. Oleson, AIA

Dated: 08.01.19 Reg. No. 42143

HICKORY PARK WARMING HOUSE AND ICE RINKS

BELLE PLAINE, MN

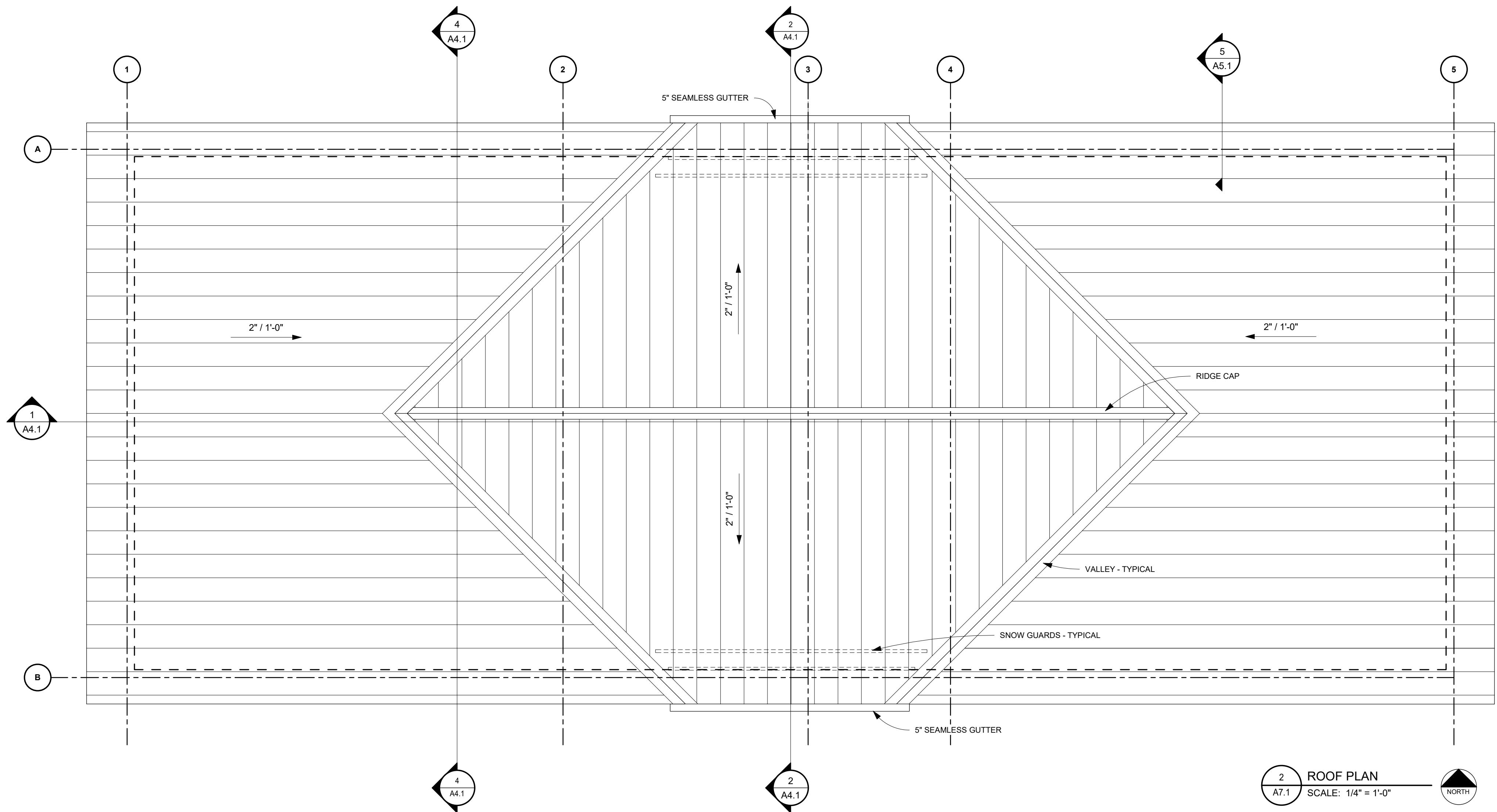
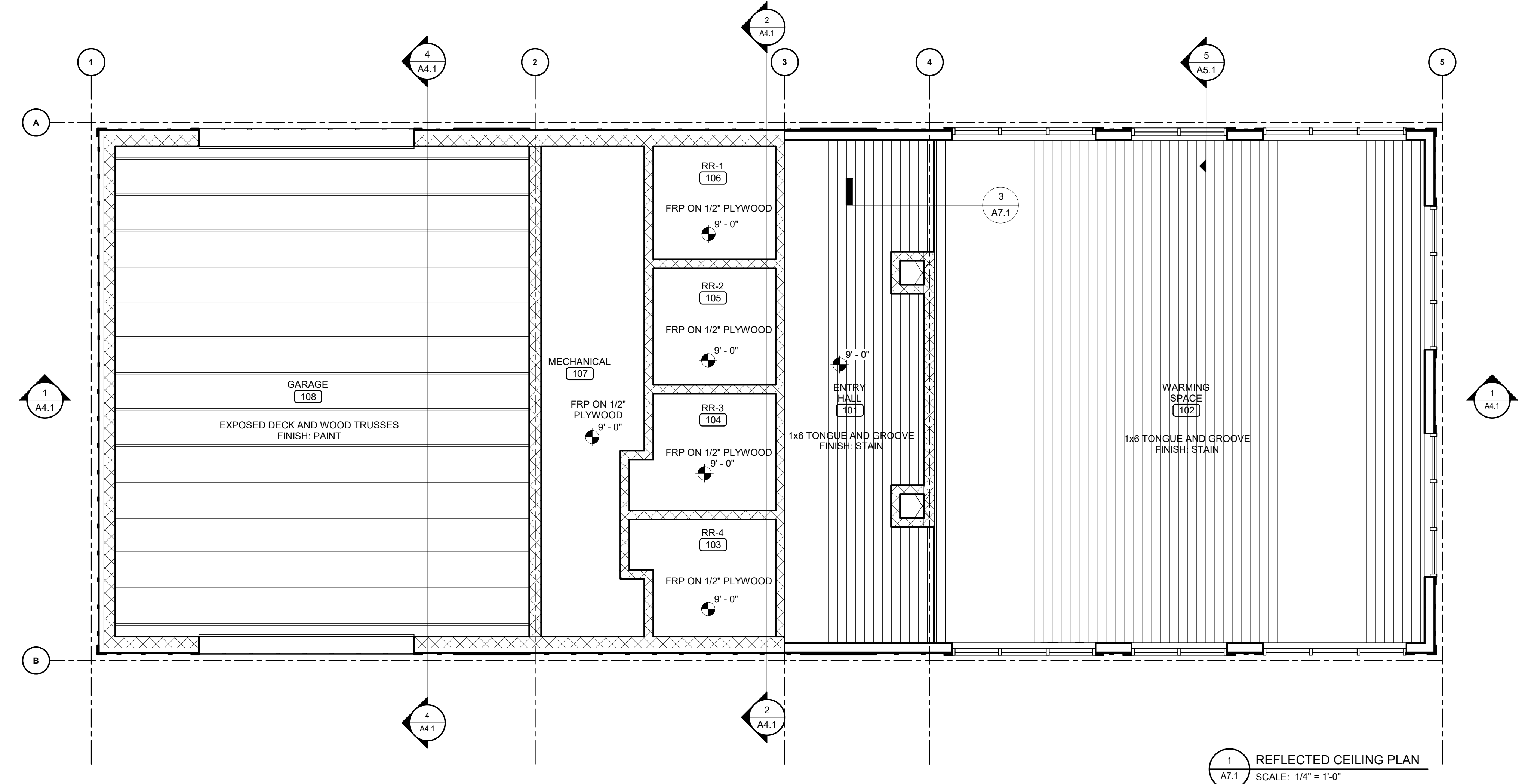
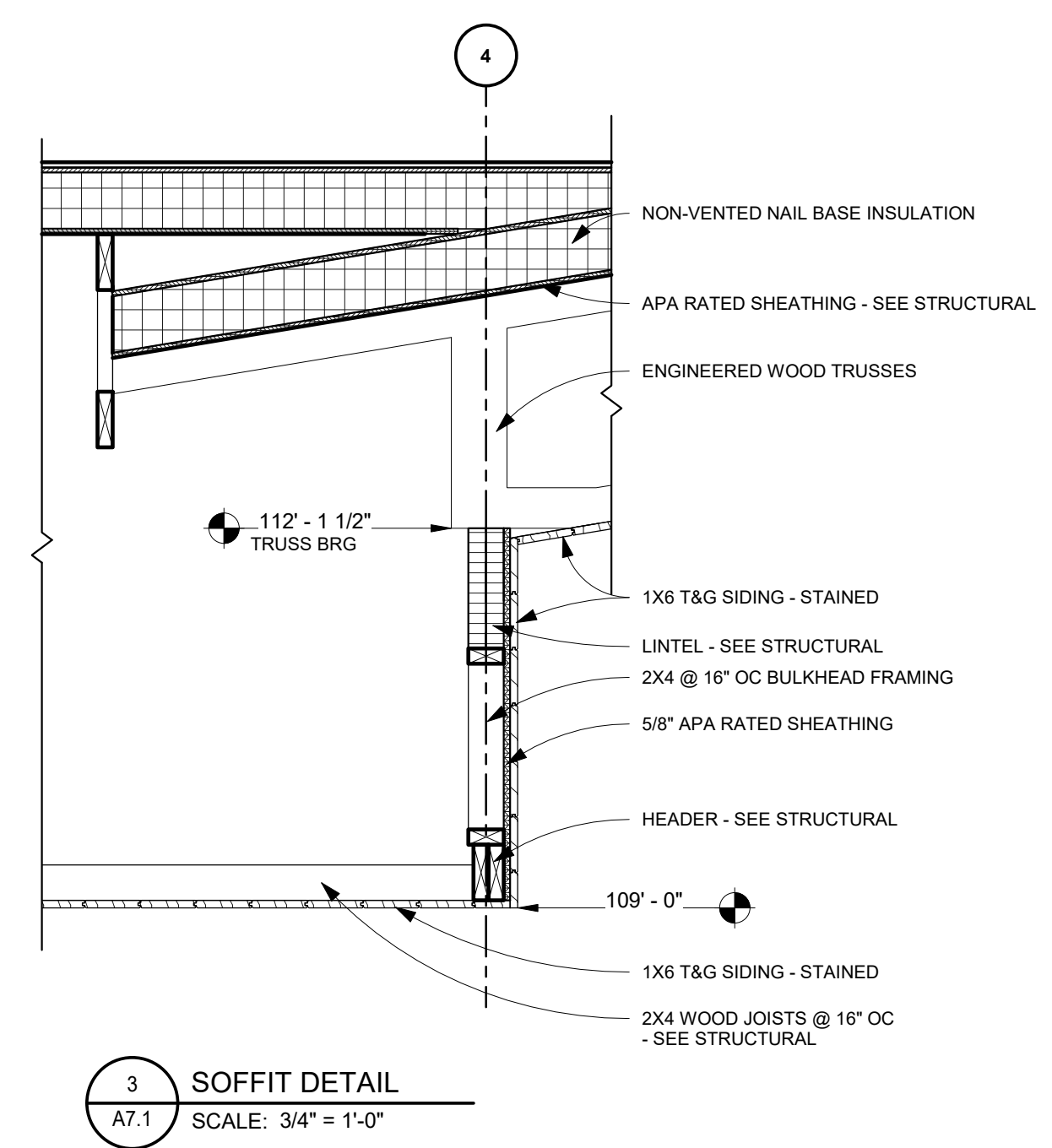
REVISIONS /XX

PROJECT # 19-019BP
 DATE 08/01/2019
 DRAWN BY DMS
 CHECKED BY ELO
 © 2019 OLESON+HOBBIE ARCHITECTS, LLC.

SHEET TITLE
REFLECTED CEILING PLAN, ROOF PLAN, & DETAILS

SHEET

A7.1



CONSULTANT

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.

Eric L. Oleson
 Eric L. Oleson, AIA

Dated: 08.01.19 Reg. No. 42143

HICKORY PARK WARMING HOUSE AND ICE RINKS

BELLE PLAINE, MN

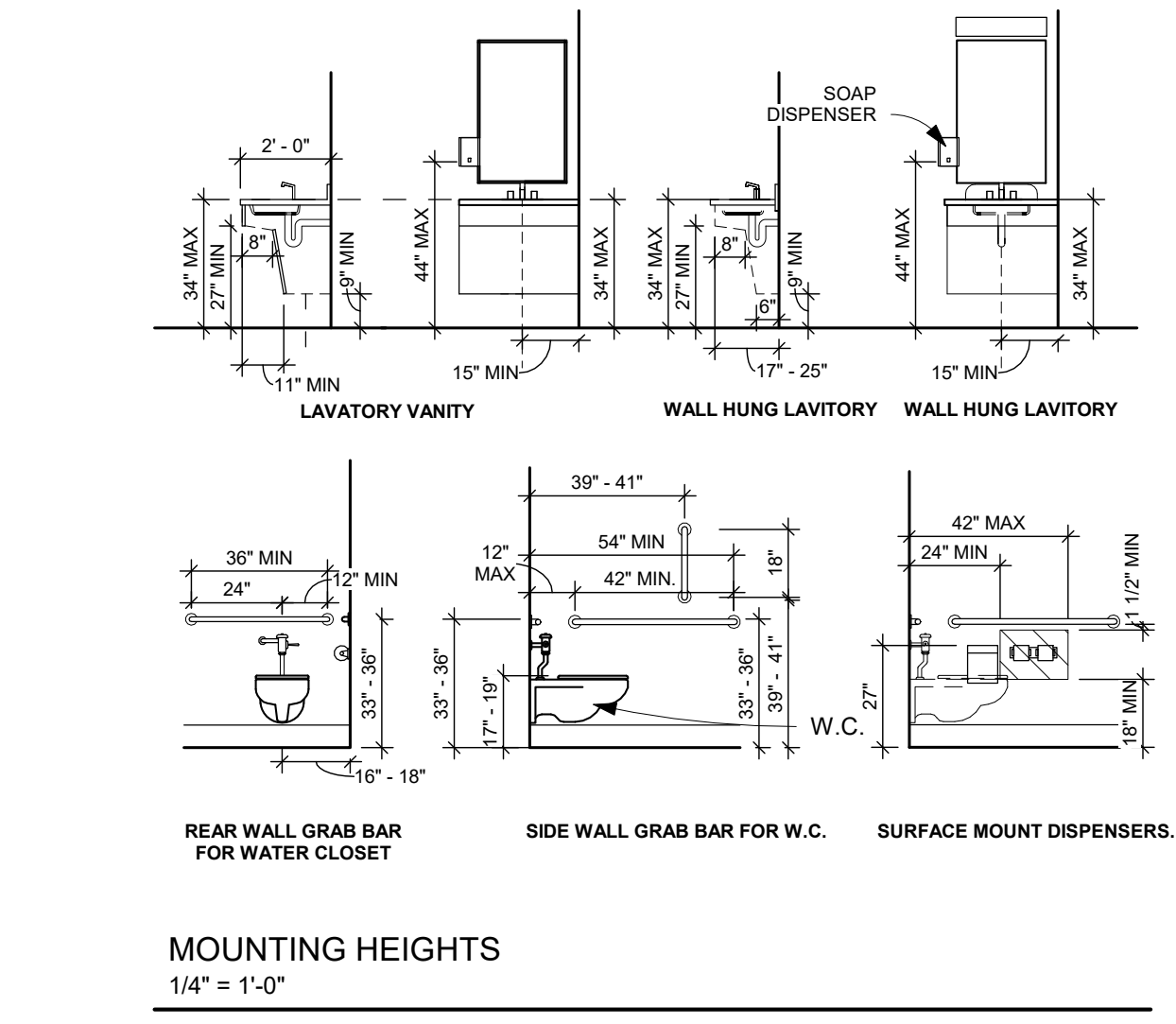
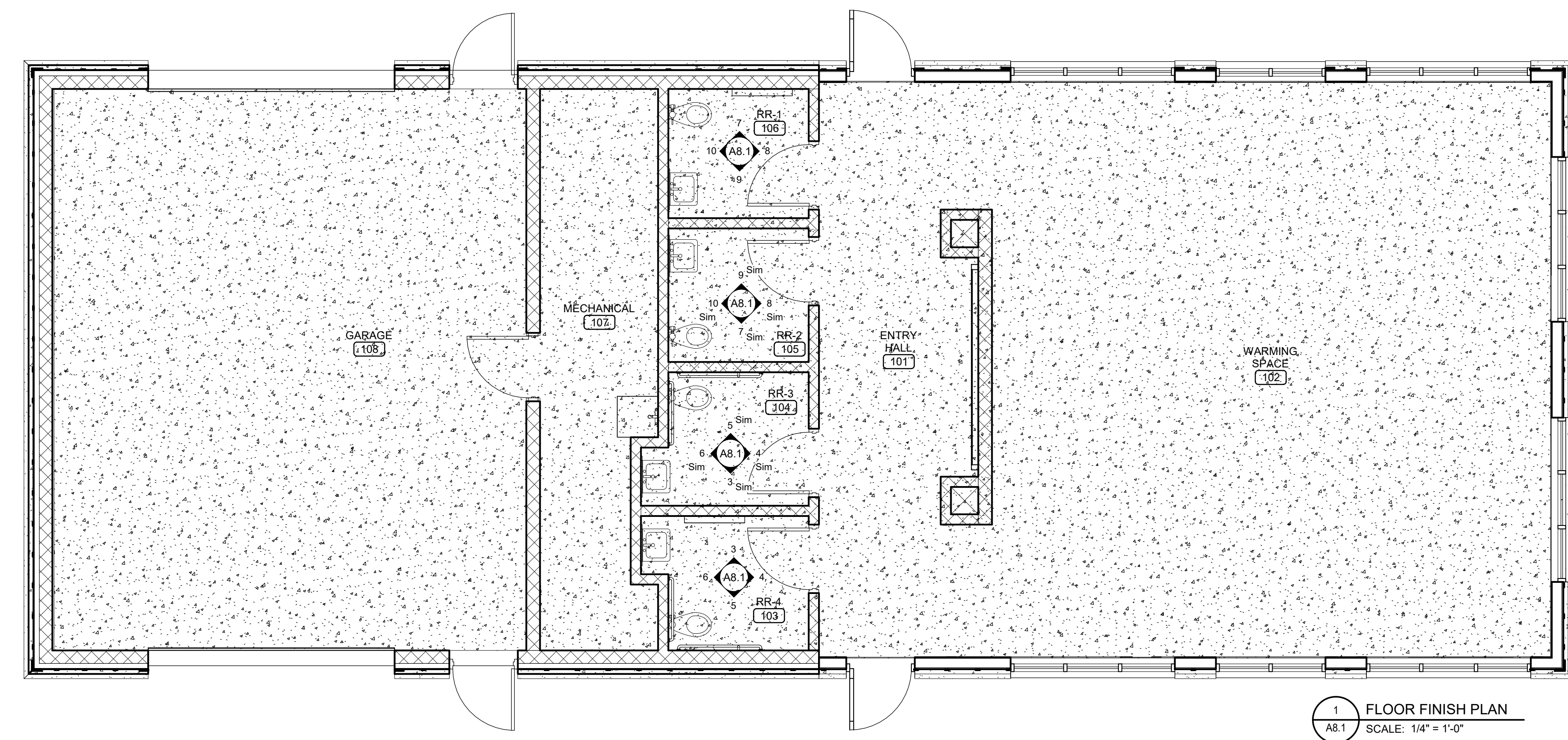
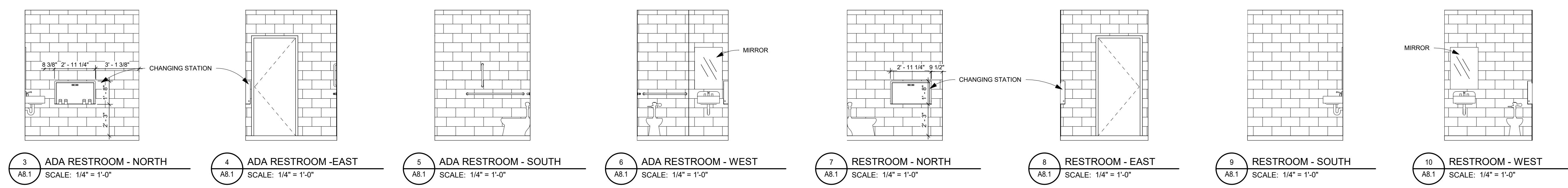
REVISIONS

PROJECT # 19-019BP
 DATE 08/01/2019
 DRAWN BY AS
 CHECKED BY ELO
 © 2019 OLESON+HOBBIE ARCHITECTS, LLC.

SHEET TITLE
INTERIOR ELEVATIONS AND FINISH PLANS

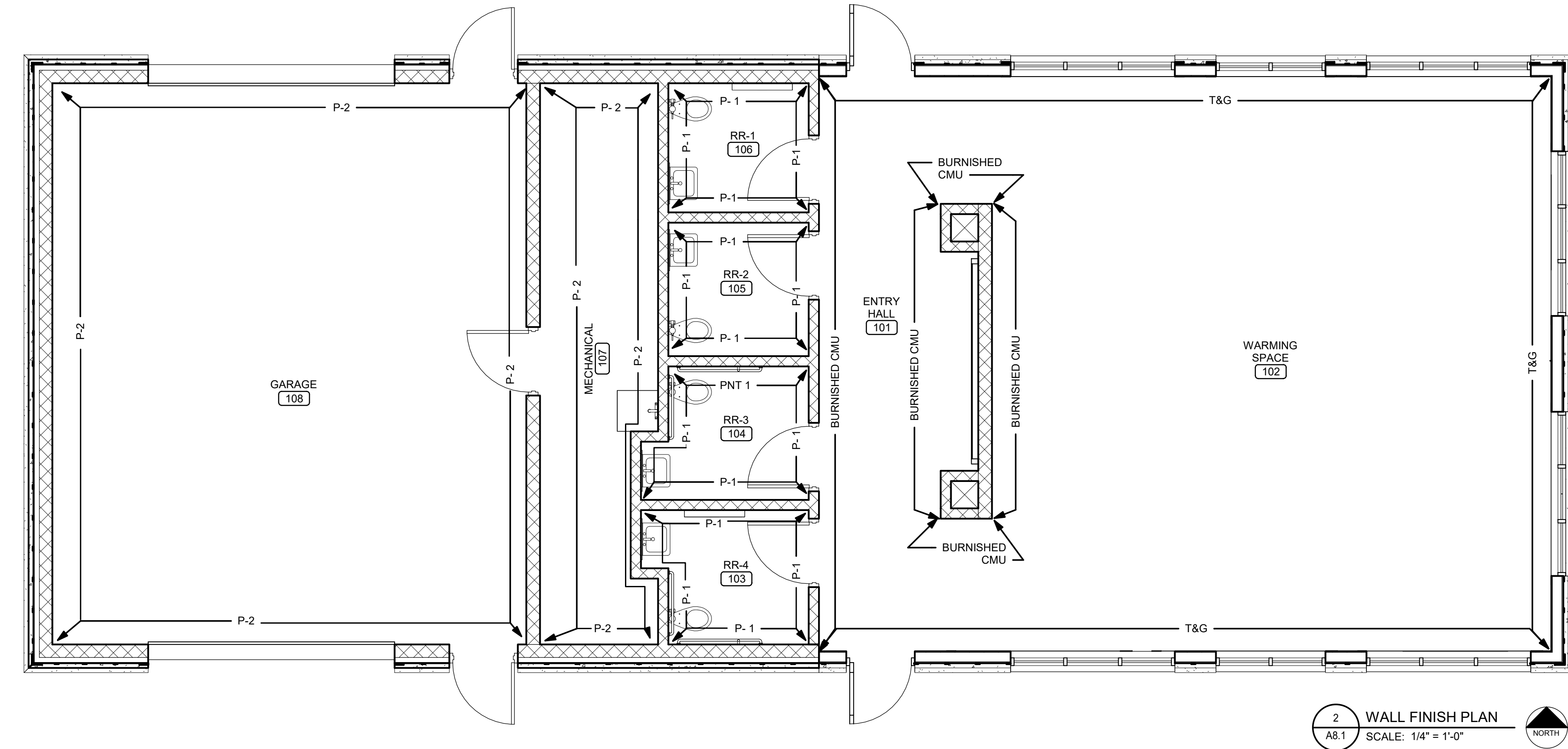
SHEET

A8.1



FLOOR FINISH LEGEND

HATCH	TYPE/ GROUP	ABBREV. / PRODUCT INFORMATION
	CONCRETE	CONC: NEW SLAB - SEALED BASE: VINYL BASE @ NON-CMU WALLS



INTERIOR FINISH LEGEND

	ABBV.	CO.	STYLE	NO.	COLOR	REMARKS
1. CEILING						
1.1	T&G	--	--	--	--	1X6 TONGUE & GROOVE SIDING (STAINED - STN-1)
2. WALL MATERIALS (TILE, WAINSCOTING, ETC.)						
2.1	P-1	SHERWIN WILLIAMS	EGGSHELL	SW6254	LAZY GRAY	--
2.2	P-2	SHERWIN WILLIAMS	EGGSHELL	SW7006	EXTRA WHITE	--
2.3	T&G	--	--	--	--	1X6 TONGUE & GROOVE SIDING (STAINED - STN-1)
3. STAIN						
3.1	STN-1	SHERWIN WILLIAMS	SOLID COLOR	SW3077	DRIFTWOOD	--

HICKORY PARK WARMING HOUSE AND ICE RINKS

BELLE PLAINE, MN

REVISIONS

PROJECT # 19-0198P
 DATE 08/01/2019
 DRAWN BY RR
 CHECKED BY MSD
 © 2019 OLESON+HOBBIE ARCHITECTS, LLC.

SHEET TITLE
H.V.A.C. SCHEDULES & DETAILS

SHEET
M2.0

FURNACE & CONDENSING UNIT SCHEDULE																									
UNIT #	CARRIER MODEL #	UNIT TYPE	FUEL	HEATING BTU		BLOWERS	CFM	ESP	HP	VOLT & PHASE	FILTERS	OUTSIDE AIR		EVAP. COIL MODEL #	COOLING TONS	UNIT #	COMP. COND. MODEL #	BTUH	SEER	AMB. TEMP.	VOLT & PHASE	M.C.A.	M.O.C.P.	REMARKS	
				INPUT	OUTPUT							%	CFM												
F-1	54TP6A080E21-20	UP-FLOW	N. GAS	80,000	78,000	11x8	1600	0.5"	3/4	240 V. 1Ø	2" PLEATED FILTER	17	280	GNPVP4821ALA	4	CC-1	1	CARRIER 24ACB148A003	48,000	13.5	95°	240 V. 1Ø	27.8	40	SET CONDENSING UNIT ON CONC. PAD.

① TWO SPEED COMPRESSOR / CONDENSER UNIT

PROPELLER UNIT HEATER SCHEDULE													
UNIT #	REZNOR MODEL #	UNIT TYPE	FUEL	HEATING BTU		BLOWERS	CFM	MOTOR BHP	HP	VOLT & PHASE	F.L.A.	M.O.C.P.	REMARKS
				INPUT	OUTPUT								
FUH-1	UDAS-75	SEPARATED COMBUSTION	N. GAS	75,000	62,250	12"Ø	461	-	0.06	120 V. 1Ø	3.3	15	-

EXHAUST FAN SCHEDULE												
UNIT #	SERVES	GREENHECK MODEL #	CFM	S.P.	WATTS	O.V.	VOLT & PHASE	RPM	MAX. CFM	SONES	CONTROL	
E.F.-1	REST ROOM EXHAUST	CSP-A390	350	3/8"	144	636	120 V. 1Ø	1950	363	3.6	DIGITAL TIME CLOCK BY DIV. 26	
E.F.-2	GARAGE EXHAUST	CSP-A710	500	3/8"	325	900	120 V. 1Ø	1080	566	2.0	CO / NO2 SENSOR PROVIDED AND INSTALLED BY MECH. CONTRACTOR	

① SPEED CONTROL IN HOUSING

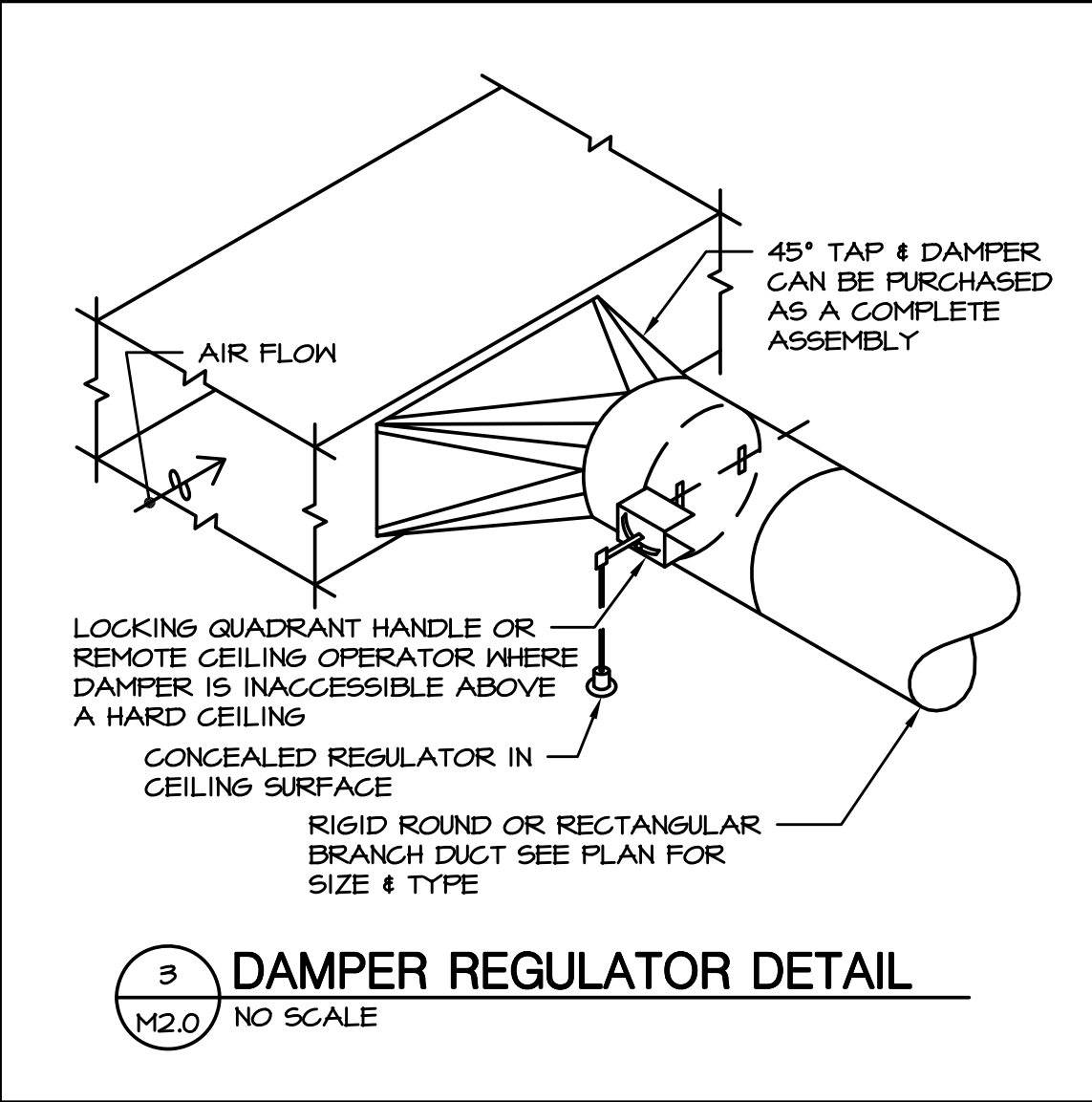
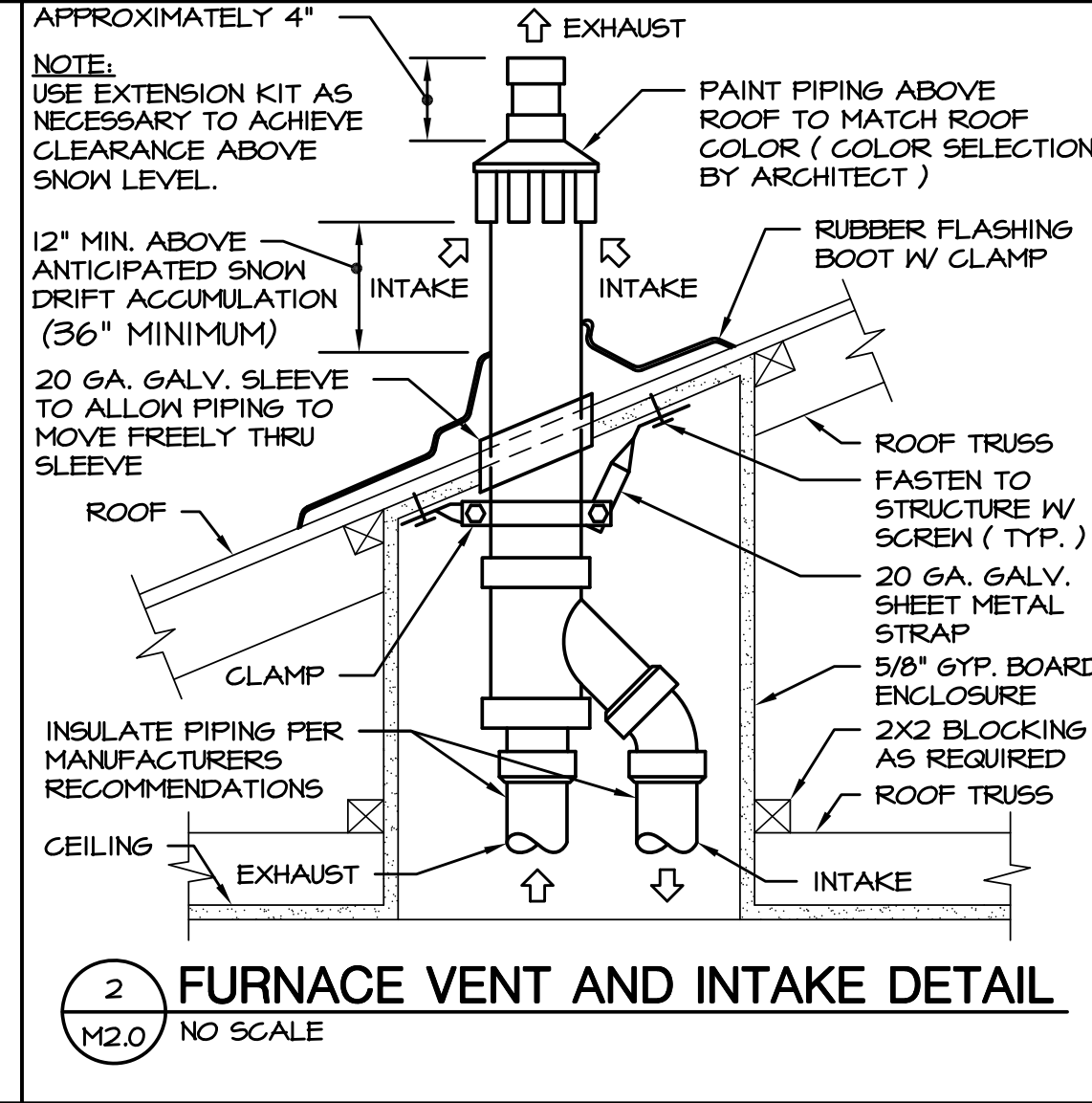
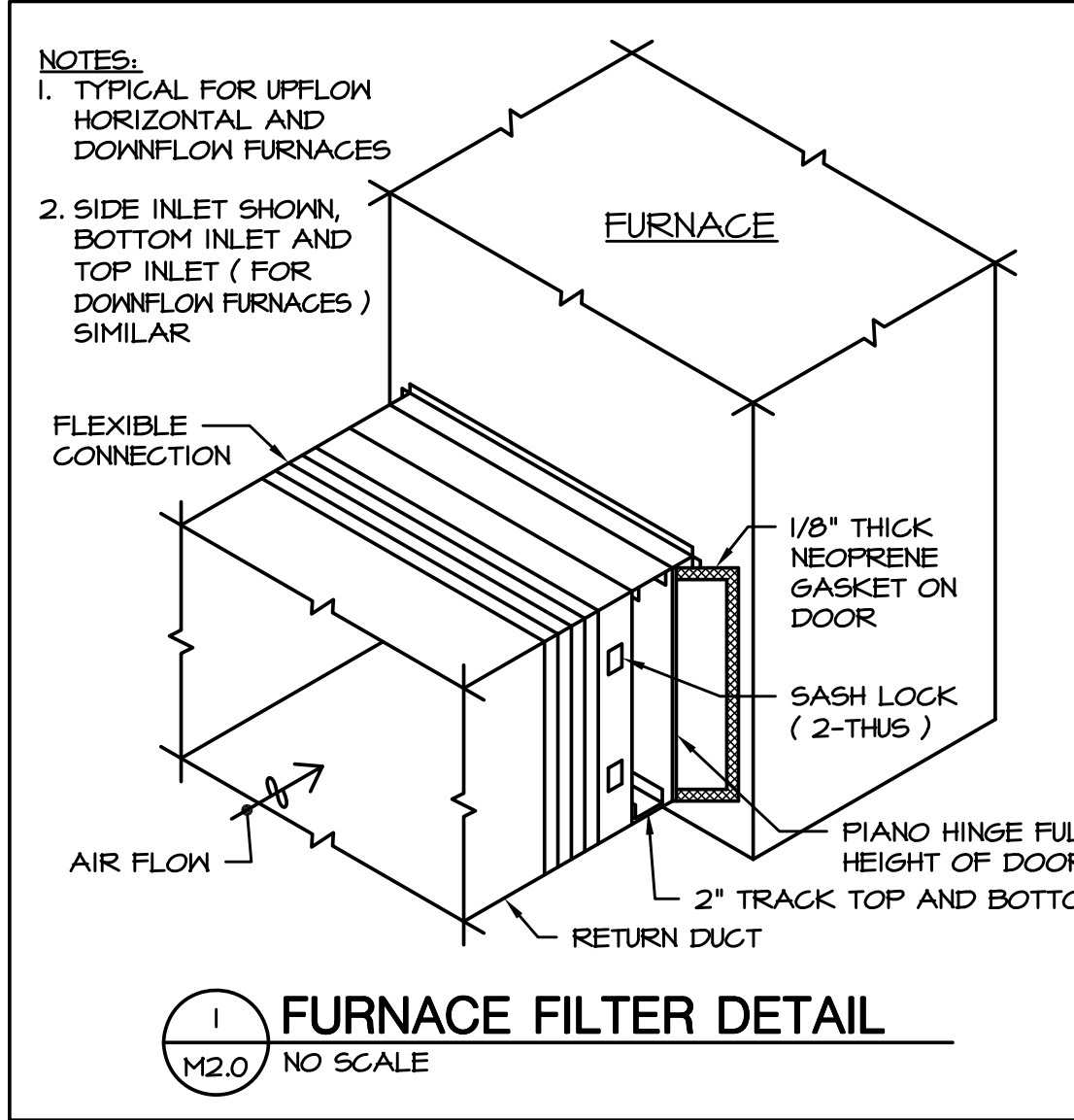
DESIGN CONDITIONS		
SEASON	OUTSIDE	INSIDE
WINTER	-15° db	72°db / 55°wb / 32% R.H.
SUMMER	86°db / 72°wb / 56% R.H.	75°db / 65°wb / 59% R.H.

GRILLE, REGISTER & DIFFUSER SCHEDULE							* COLOR SELECTION BY ARCHITECT
UNIT #	E.H. PRICE MODEL #	DUTY	VOLUME CONTROL	MATERIAL	FINISH	REMARKS	
1	LBP-16B (1-1/4" BORDER)	CEILING S.A. GRILLE W/ 15° DEFLECTION	NONE	ALUMINUM	CLEAR	2" W. LINEAR SLOT GRILLE W/ CONCEALED BRACKET MOUNT	
2	LBP-16B (1-1/4" BORDER)	CEILING S.A. GRILLE W/ 15° DEFLECTION	NONE	ALUMINUM	CLEAR	4" W. LINEAR SLOT GRILLE W/ CONCEALED BRACKET MOUNT	
3	RCDA	ROUND S.A. DIFFUSER	NONE	STEEL	WHITE	FULLY ADJUSTABLE AIR PATTERN, 4-WAY THRU DUCT MOUNTED	
4	90	WALL RETURN GRILLE	NONE	STEEL	WHITE	HEAVY DUTY FRAME W/ 0° HORIZ. VANES @ 3/8" O.C. & VERT. MULLIONS @ 8" O.C.	
5	80-F	CEILING EXHAUST GRILLE	NONE	ALUMINUM	WHITE	1/2" X 1/2" EGG GRATE, SURFACE MOUNTED	
6	90	WALL EXH. GRILLE	NONE	STEEL	WHITE	HEAVY DUTY FRAME W/ 0° HORIZ. VANES @ 3/8" O.C. & VERT. MULLIONS @ 8" O.C.	
DOWCO CO.							
* 7	DBF-04	WALL INTAKE LOUVER	NONE	STEEL	BAKED ENAMEL	40" DRAINABLE BLADES @ 3" O.C., W/ 50% FREE AREA @ 48X48 LOUVER & SILL EXTENSION	
* 8	DBF-04	WALL EXHAUST LOUVER	NONE	STEEL	BAKED ENAMEL	40" DRAINABLE BLADES @ 3" O.C., W/ 50% FREE AREA @ 48X48 LOUVER & SILL EXTENSION	

MECHANICAL SYMBOLS
 THESE SYMBOLS COMPRISE A STANDARD LIST. NOT ALL SYMBOLS MAY APPEAR ON THIS PROJECT.
H.V.A.C. SYMBOLS

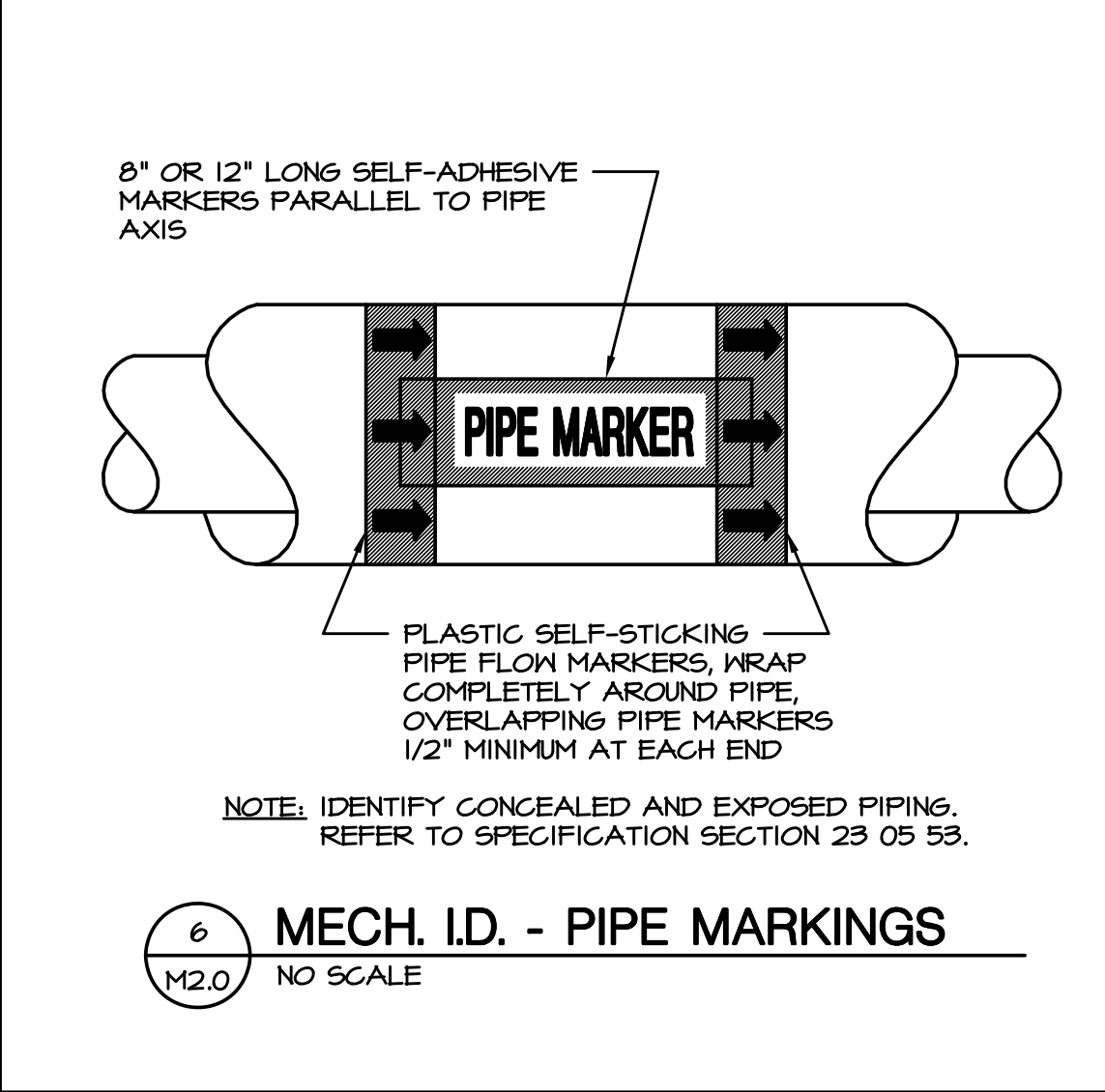
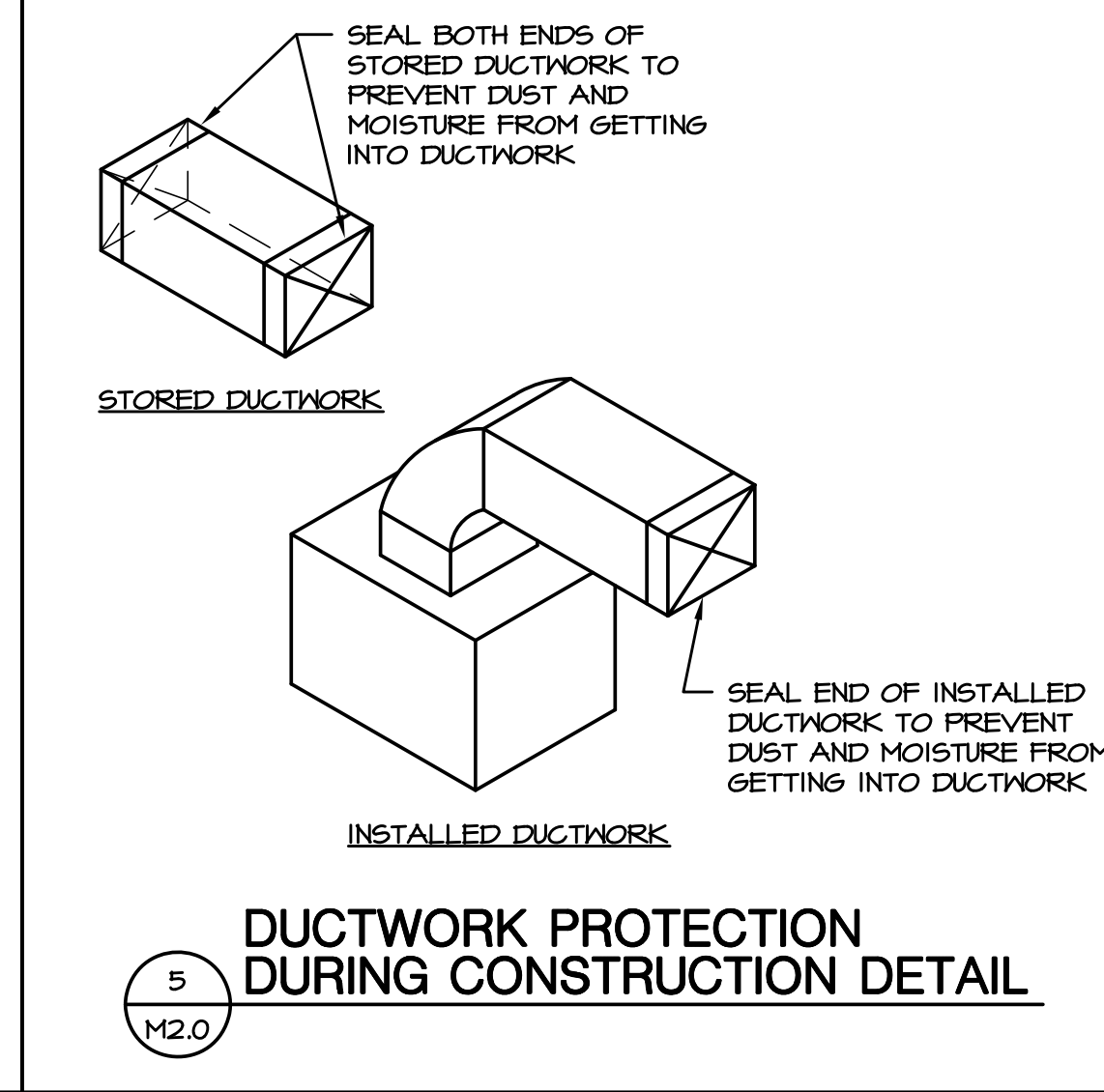
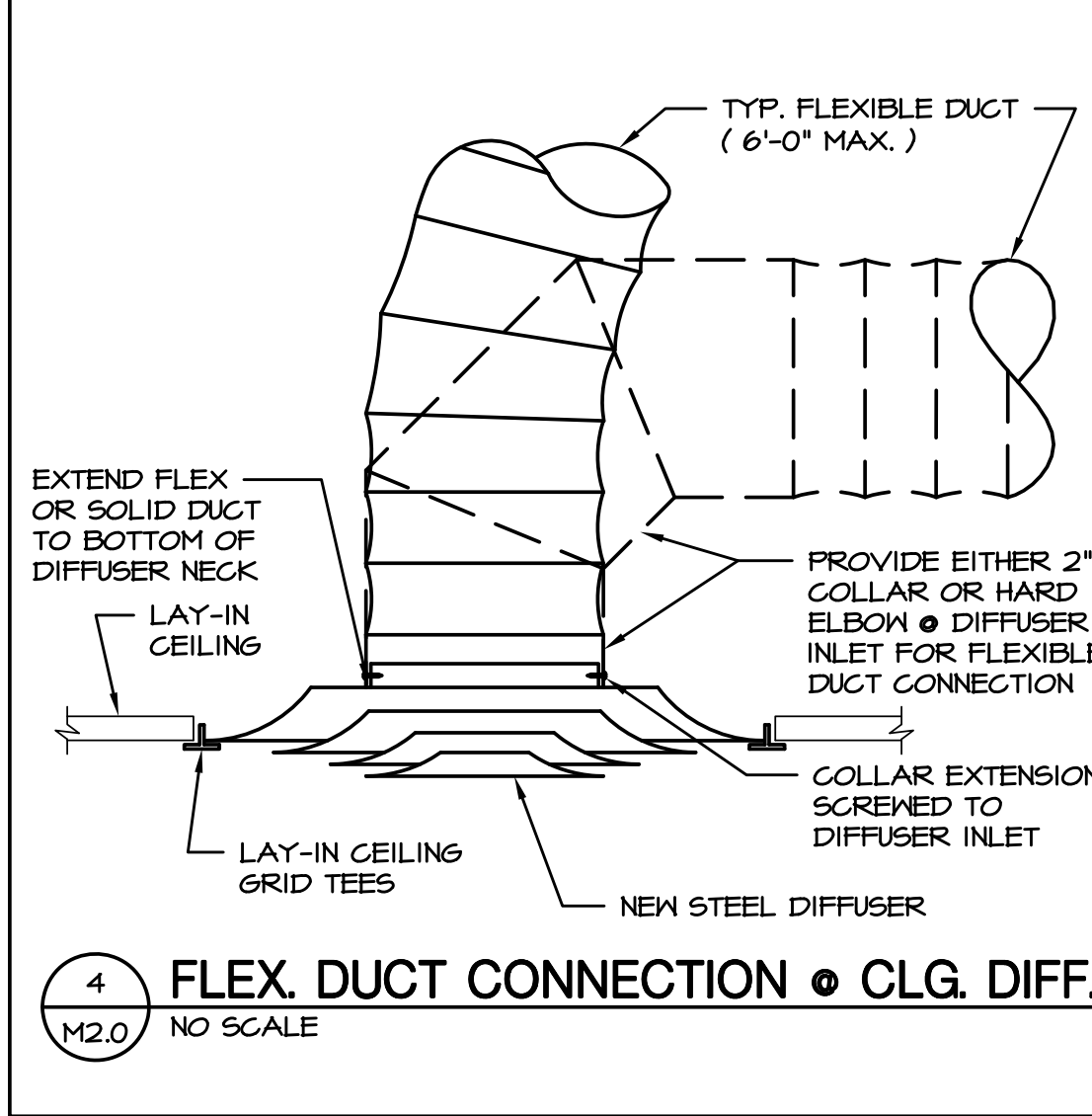
	THERMOSTATIC TRAP		SPLITTER DAMPER
	FLOAT & THERMOSTATIC TRAP		SPLITTER DAMPER
	THERMOSTAT FOR TEMP.		OPPOSED BLADE VOLUME DAMPER
	BAS SENSOR FOR TEMP. AND RH		VOLUME DAMPER
	BAS SENSOR FOR TEMP. ONLY		FIRE DAMPER = FD.
	HUMIDISTAT, ELECTRIC		TURNING VANES (DUCT TURNS)
	SUPPLY AIR DUCT UP		AIR EXTRACTOR (VECTROL)
	RETURN, EXHAUST OR FRESH AIR DUCT UP		DUCT SIZE, WIDTH X DEPTH
	SUPPLY AIR DUCT DOWN		DOUBLE WALL ROUND OR RECTANGULAR DUCT, ALL DUCT DIMENSIONS ARE ID. (INSIDE DIMENSION)
	RETURN, EXHAUST OR FRESH AIR DUCT DOWN		UNLINED DUCT WITH SHEET METAL DIMENSION, SEE SPEC. FOR INSULATION WRAP REQTS.
	FLEXIBLE CONNECTION		L = LINED DUCT WITH DIMENSION SHOWN BEING SHEET METAL DIMENSION
	SMOKE - FIRE DAMPER = SFD.		BAS SHALL USE CONTACT ON OCCUPANCY SENSOR FOR VENTILATION CONTROL, O.S. BY DIV. 26

RECTANGULAR DUCT SIZES ARE SHEET METAL DIMENSIONS
 ROUND DUCT SIZES ARE INSIDE INSULATION (FREE AREA) DIMENSIONS



MECHANICAL SYMBOLS
 THESE SYMBOLS COMPRISE A STANDARD LIST. NOT ALL SYMBOLS MAY APPEAR ON THIS PROJECT.
PLUMBING PIPING

	CW COLD WATER		FD FLOOR DRAIN
	HW HOT WATER & FLOW INDICATOR		UNDERGROUND PIPE IN TILE
	CHW CIRCULATING HOT WATER & FLOW INDICATOR		ID INDIRECT WASTE
	CSW COLD SOFT WATER		ACID UNDERGROUND ACID WASTE
	F FIRE PROTECTION		ACID ABOVE GROUND ACID WASTE
	G GAS		A AIR
	VT VENT		CD CONDENSATE DRAIN
	SAN. UNDERGROUND SANITARY		LSP LAWN SPRINKLER SYSTEM
	ST. UNDERGROUND STORM		TW TEMPERED WATER
	W WASTE ABOVE GROUND		LS LIQUID SOAP
	RWL ABOVE GROUND RAIN WATER LEADER		
	STORM / SAN. V.C.P. OR R.C.P.		



HICKORY PARK WARMING HOUSE AND ICE RINKS

BELLE PLAINE, MN

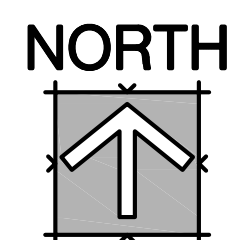
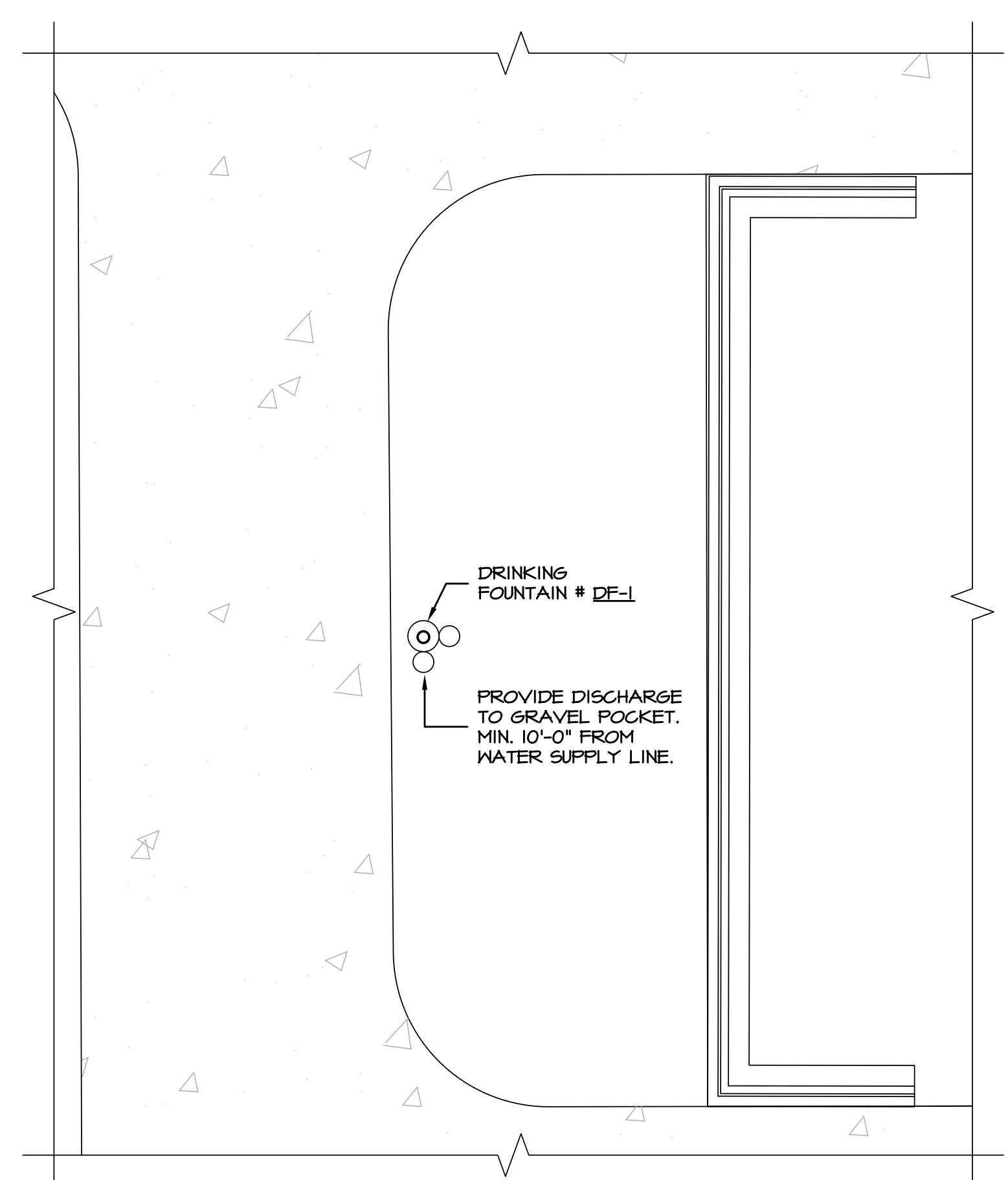
REVISIONS

PROJECT # 19-019BP
 DATE 08/01/2019
 DRAWN BY RR.JML
 CHECKED BY MSD
 © 2019 OLESON+HOBBIE ARCHITECTS, LLC.

SHEET TITLE
PLUMBING FLOOR PLANS

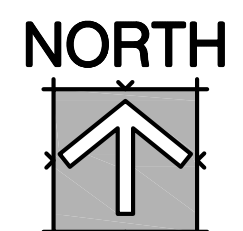
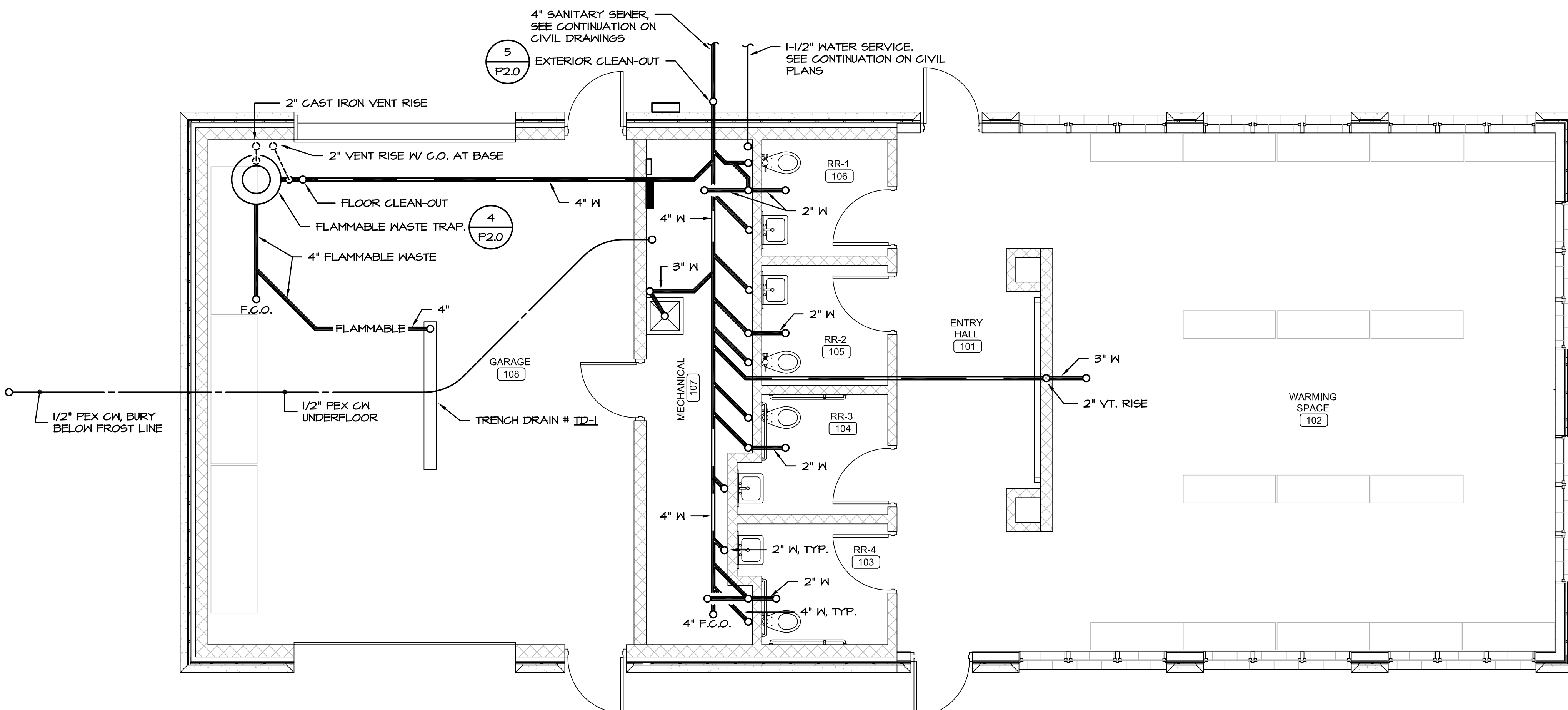
SHEET

P1.0



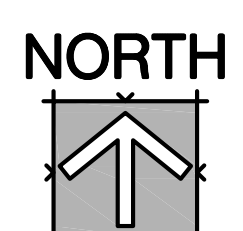
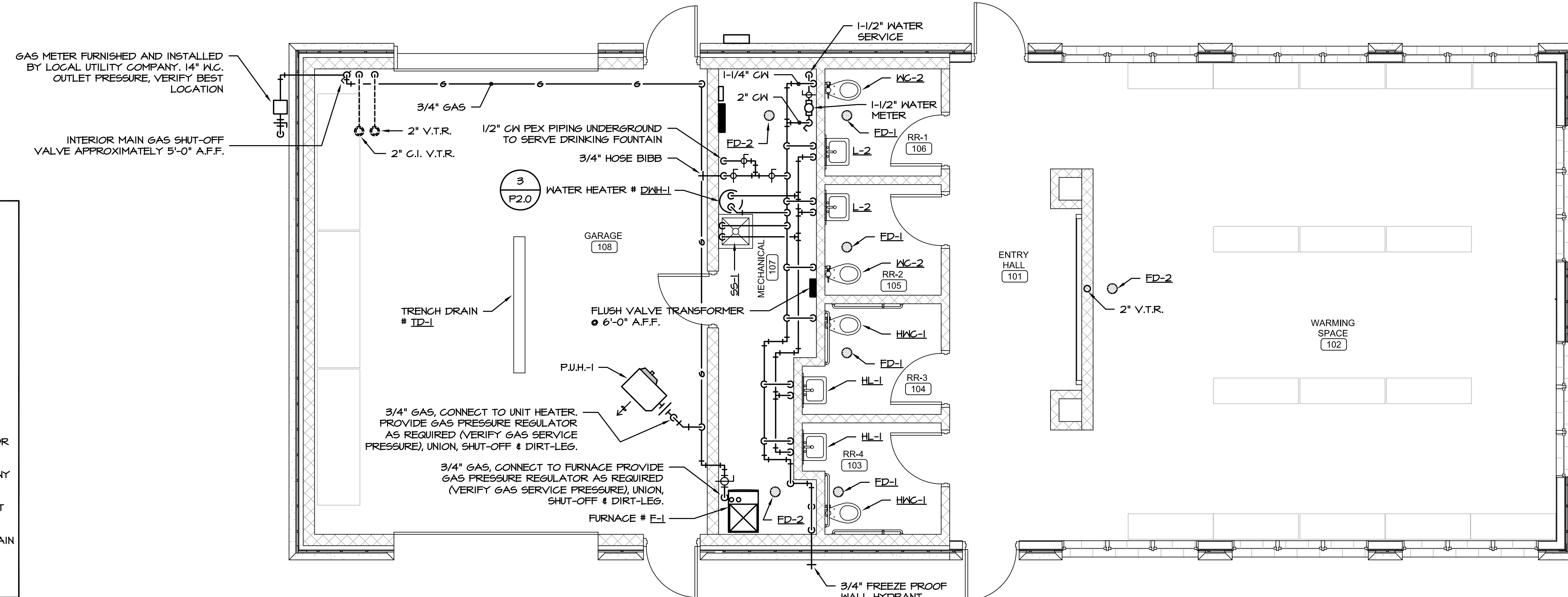
PARTIAL SITE PLAN - PLUMBING

SCALE: 1/4" = 1'-0"



UNDER FLOOR PLAN - PLUMBING

SCALE: 1/4" = 1'-0"



FLOOR PLAN - PLUMBING

SCALE: 1/4" = 1'-0"

- GENERAL PLUMBING NOTES:**
- REFER TO RISERS FOR BRANCH LINE SIZES NOT SHOWN ON FLOOR PLAN.
 - DO NOT SCALE DRAWINGS, REFER TO ARCHITECTURAL DRAWINGS FOR DIM'S.
 - FOR FIXTURE VENTING NOT SHOWN ON FLOOR PLAN, REFER TO WASTE/VENT RISERS DESIGNATED.
 - COORDINATE PIPING INSTALLATION WITH H.V.A.C. & ELECTRICAL CONTRACTORS.
 - INSTALL ALL EQUIPMENT & FIXTURES PER MANUFACTURER'S INSTRUCTIONS.
 - ALL SANITARY SEWER PIPING SHALL SLOPE AT 1/4" PER FT. MINIMUM.
 - CONTRACTOR SHALL INSTALL PIPING FOR THE DRINKING FOUNTAIN IN A CONFIGURATION THAT ALLOWS FOR DRAIN-DOWN FOR WINTERIZATION. IF ANY ADDITIONAL PIPING OR VALVES ARE REQUIRED TO ACCOMPLISH THIS DRAIN-DOWN, IT SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER. CONTRACTOR SHALL PROVIDE WINTERIZATION OF THE DRINKING FOUNTAIN FOR THE FIRST SEASON, AND SHALL DEMONSTRATE THE PROCEDURE TO THE OWNER.

HICKORY PARK WARMING HOUSE AND ICE RINKS

BELLE PLAINE, MN

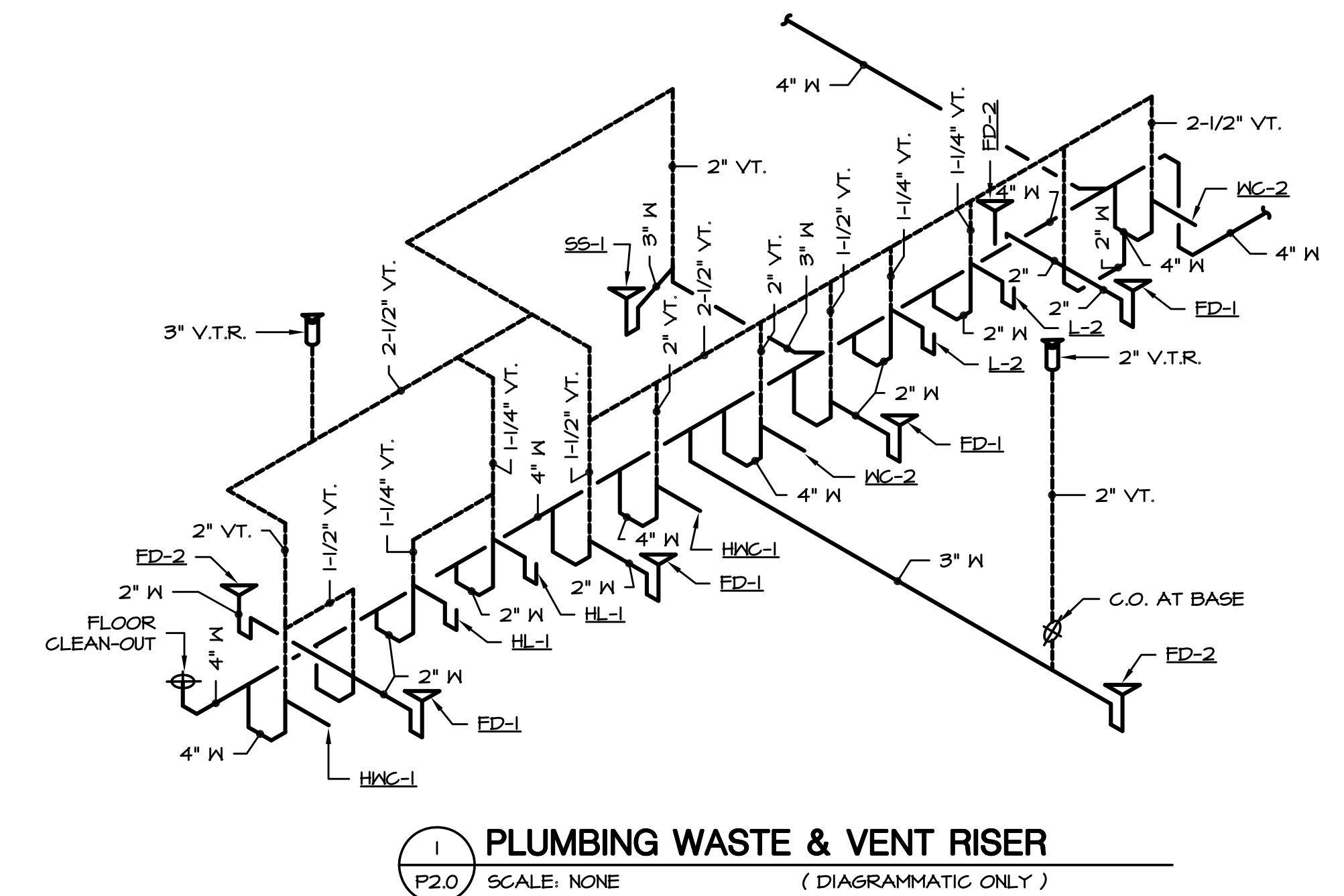
REVISIONS Δ xx

PROJECT # 19-019BP
 DATE 08/01/2019
 DRAWN BY RR JML
 CHECKED BY MSD
 © 2019 OLESON+HOBBIE ARCHITECTS, LLC.

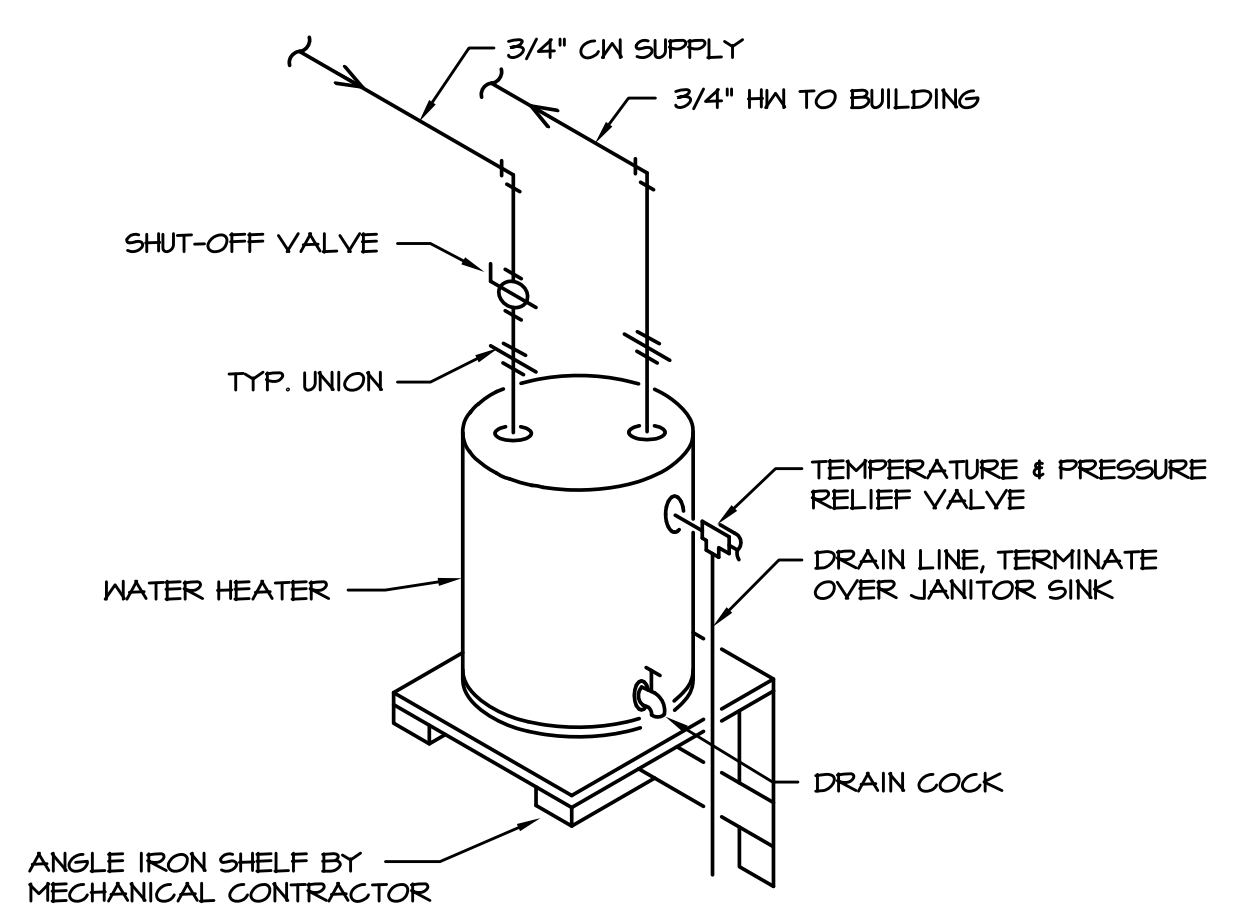
SHEET TITLE
PLUMBING RISERS DETAILS & SCHEDULES

SHEET

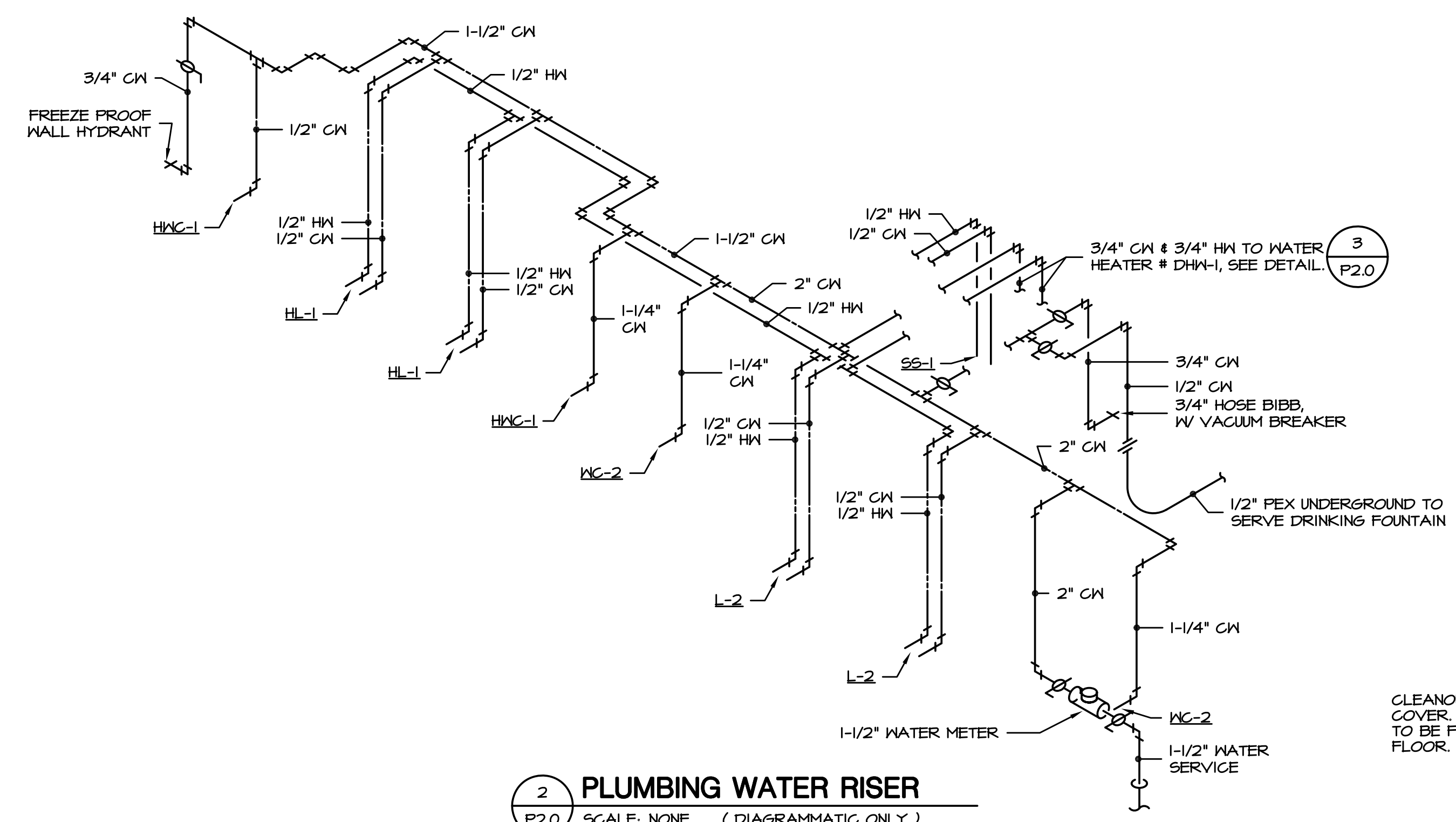
P2.0



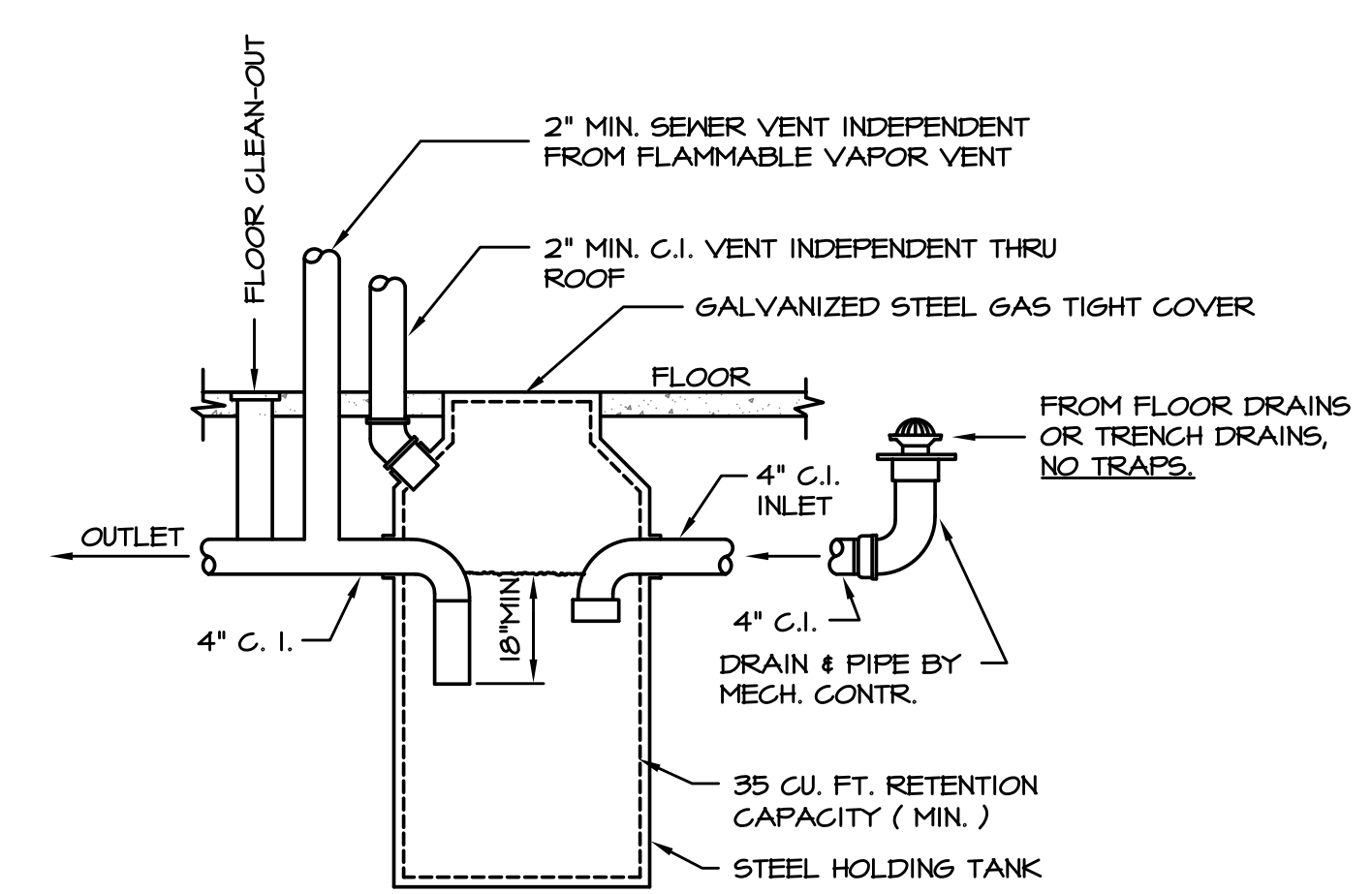
1 PLUMBING WASTE & VENT RISER
 P2.0 SCALE: NONE (DIAGRAMMATIC ONLY)



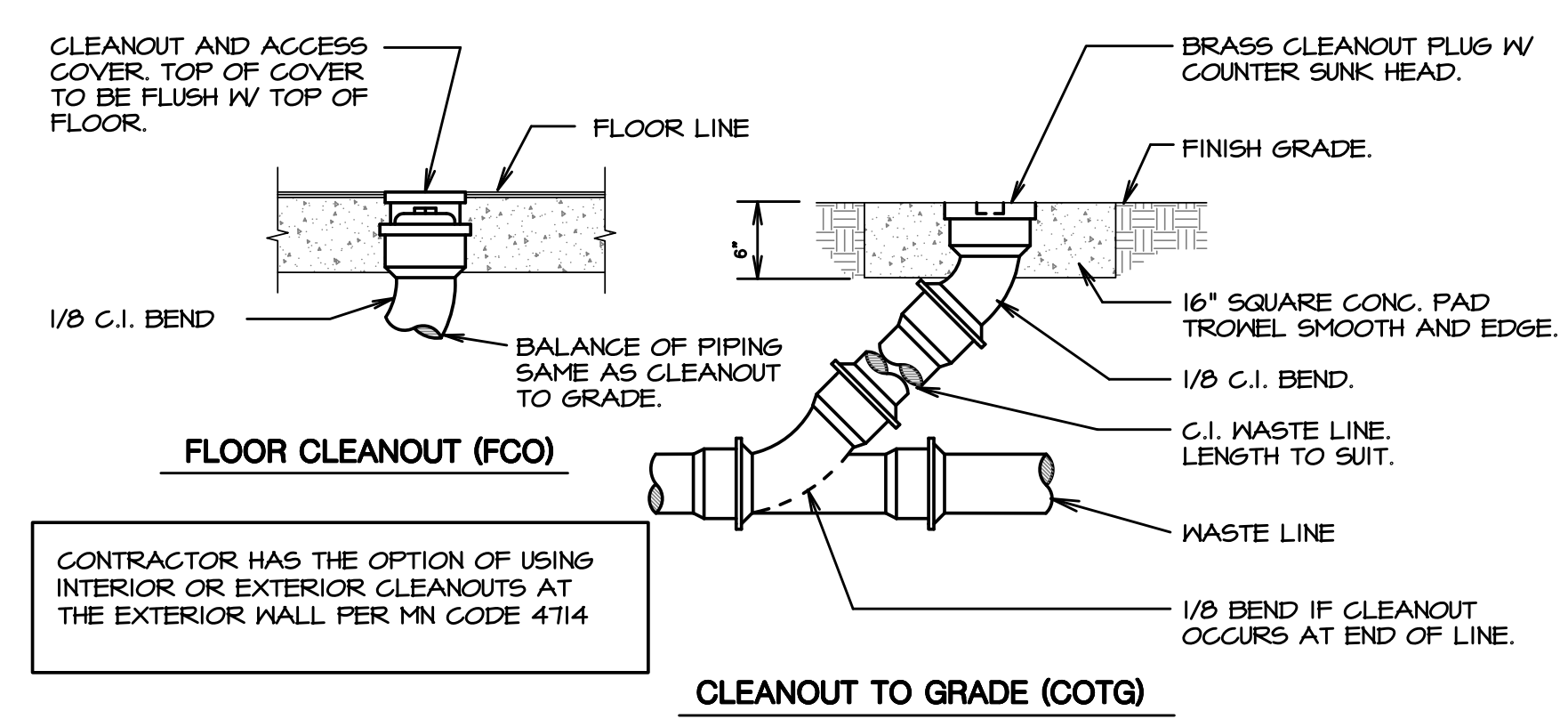
3 WATER HEATER DETAIL
 P2.0 SCALE: NONE (DIAGRAMMATIC ONLY)



2 PLUMBING WATER RISER
 P2.0 SCALE: NONE (DIAGRAMMATIC ONLY)

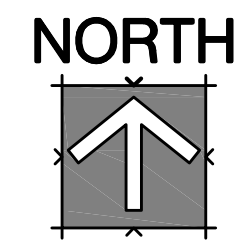
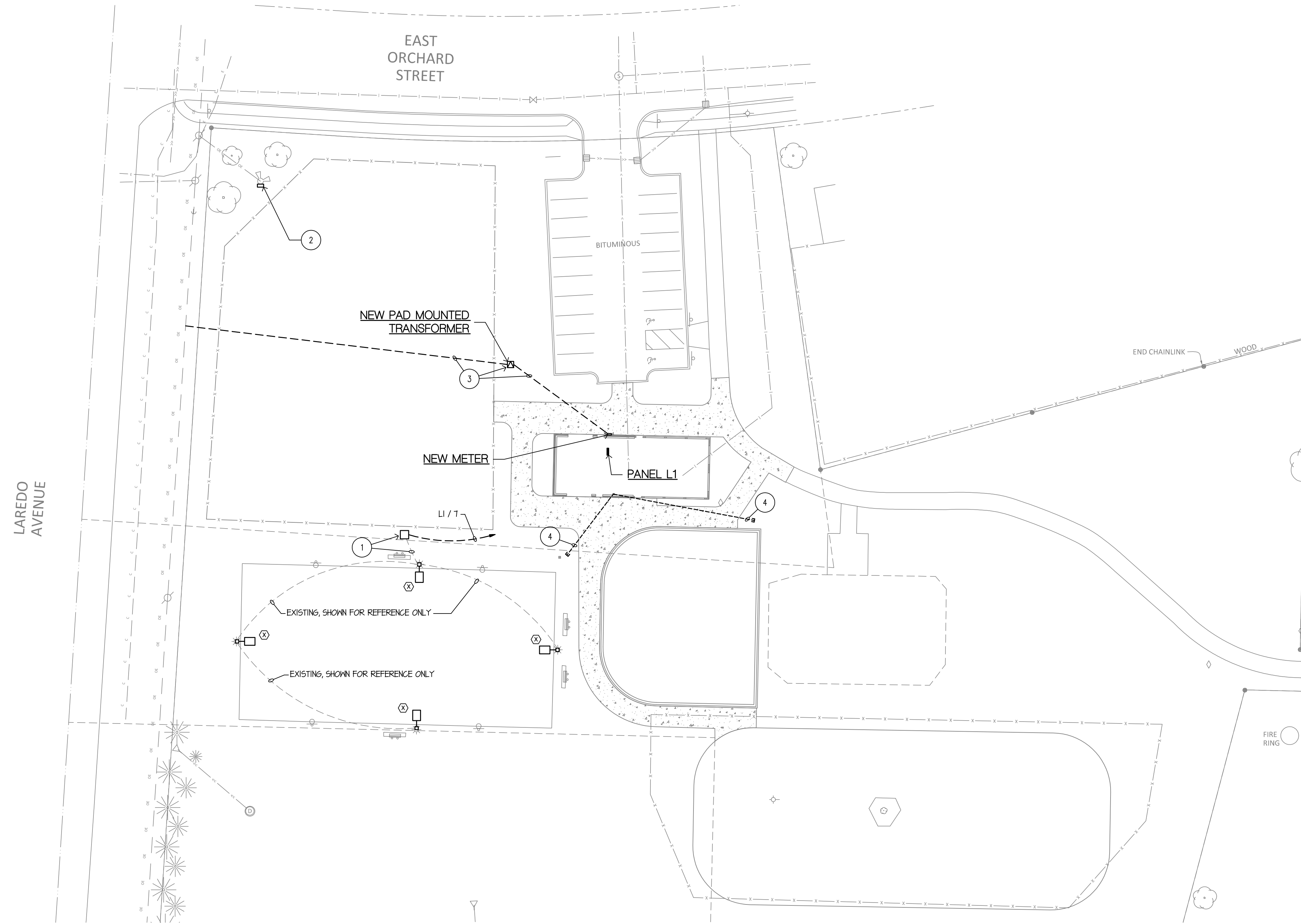


4 FLAMMABLE WASTE TRAP
 P2.0 SCALE: NONE (DIAGRAMMATIC ONLY)



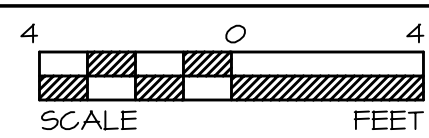
5 CLEANOUT DETAIL DETAILS
 P2.0 SCALE: NONE (DIAGRAMMATIC ONLY)

ELECTRIC DOMESTIC WATER HEATER SCHEDULE									
HEATER #	LOCATION	MFGR.	MODEL #	WATTS	VOLTAGE	IMMERSION HEATERS	FIRST HR. GALLONS	STORAGE CAPACITY	REMARKS
DWH-1	PLBG. CHASE	A.O. SMITH	EJC-10	1650	120v. 1Ø	1	N/A	10	COORDINATE W/ ELEC. CONTR. INSTALL ON WALL SHELF



SITE PLAN - ELECTRICAL

SCALE: 1/4" = 1'-0"



PLAN NOTES

1. EXISTING RACEWAYS SHOWN ARE TO REMAIN & ARE FOR REFERENCE ONLY. THIS EXISTING 120V CIRCUIT IS TO BE EXTENDED TO THE NEW PANEL L1 IN THE WARMING HOUSE. FIELD VERIFY EXACT LOCATION OF UNDERGROUND LINES AND INTERCEPT AS REQUIRED USING AN IN-GRADE J-BOX PER SPECIFICATIONS.
2. EXISTING BASKETBALL COURT LIGHTS ARE CURRENTLY FED FROM THIS LOCATION. ONCE THEY HAVE BEEN CIRCUITED TO NEW PANEL L1 IN THE WARMING HOUSE THE FEEDER BACK TO THIS LOCATION IS TO BE ABANDONED. IF ONLY THE LIGHTS ARE BEING SERVED FROM HERE THE EXISTING METER IS TO BE REMOVED, FIELD VERIFY. THESE LIGHTS ARE ALSO CONTROLLED VIA A TIMER ON THE POLE AND A SECOND TIME NEAR THE LIGHTS. THE TIMER ON THIS POLE WILL BE RELOCATED AND REINSTALLED IN THE NEW WARMING HOUSE BY THE CITY. THE TIMER NEAR THE LIGHTS WILL REMAIN.
3. EXACT LOCATION OF NEW PAD MOUNTED TRANSFORMER WILL NEED TO BE COORDINATED W/ XCEL ENERGY. THE ELECTRICAL CONTRACTOR IS TO FURNISH & INSTALL CONDUIT FOR BOTH THE PRIMARY POWER & SECONDARY POWER. PRIMARY CABLE WILL BE FURNISHED & INSTALLED BY XCEL. SECONDARY CONDUCTORS ARE BY THE ELECTRICAL CONTRACTOR.
4. FURNISH & INSTALL 2" PVC CONDUIT FOR FUTURE USE. STUB UP IN MECHANICAL ROOM & CAP & STAKE IN EASILY ACCESSIBLE GRASS AREA. TOTAL OF (2).

ARCHITECT OF RECORD



WWW.OHARCHITECTS.COM
 ARCHITECTURE • INTERIORS • PLANNING • SUSTAINABILITY
 330 Stadium Road, Suite 202, Mankato, MN 56001
 T: 507.385.1158

CONSULTANT



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 Engineer under the laws of the State of Minnesota.

M.S.D.
 MICHAEL S. DOLEJS

Dated: August 01, 2019, Reg. No. 24659

HICKORY PARK WARMING HOUSE AND ICE RINKS

BELLE PLAINE, MN

REVISIONS

PROJECT # 19-019BP
 DATE 08/01/2019
 DRAWN BY ADH
 CHECKED BY MSD
 © 2019 OLESON+HOBBIE ARCHITECTS, LLC.

SHEET TITLE
SITE PLAN - ELECTRICAL

SHEET
E1.0

HICKORY PARK WARMING HOUSE AND ICE RINKS

BELLE PLAINE, MN

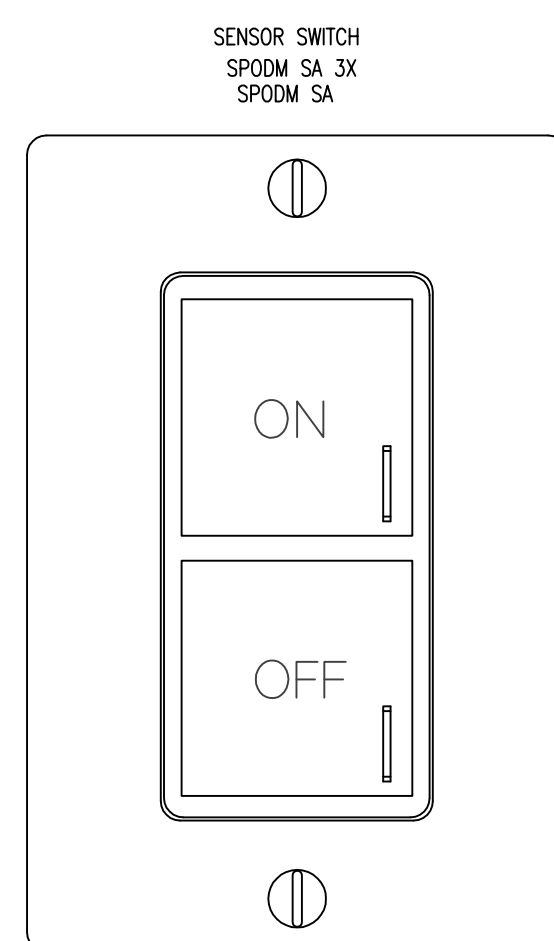
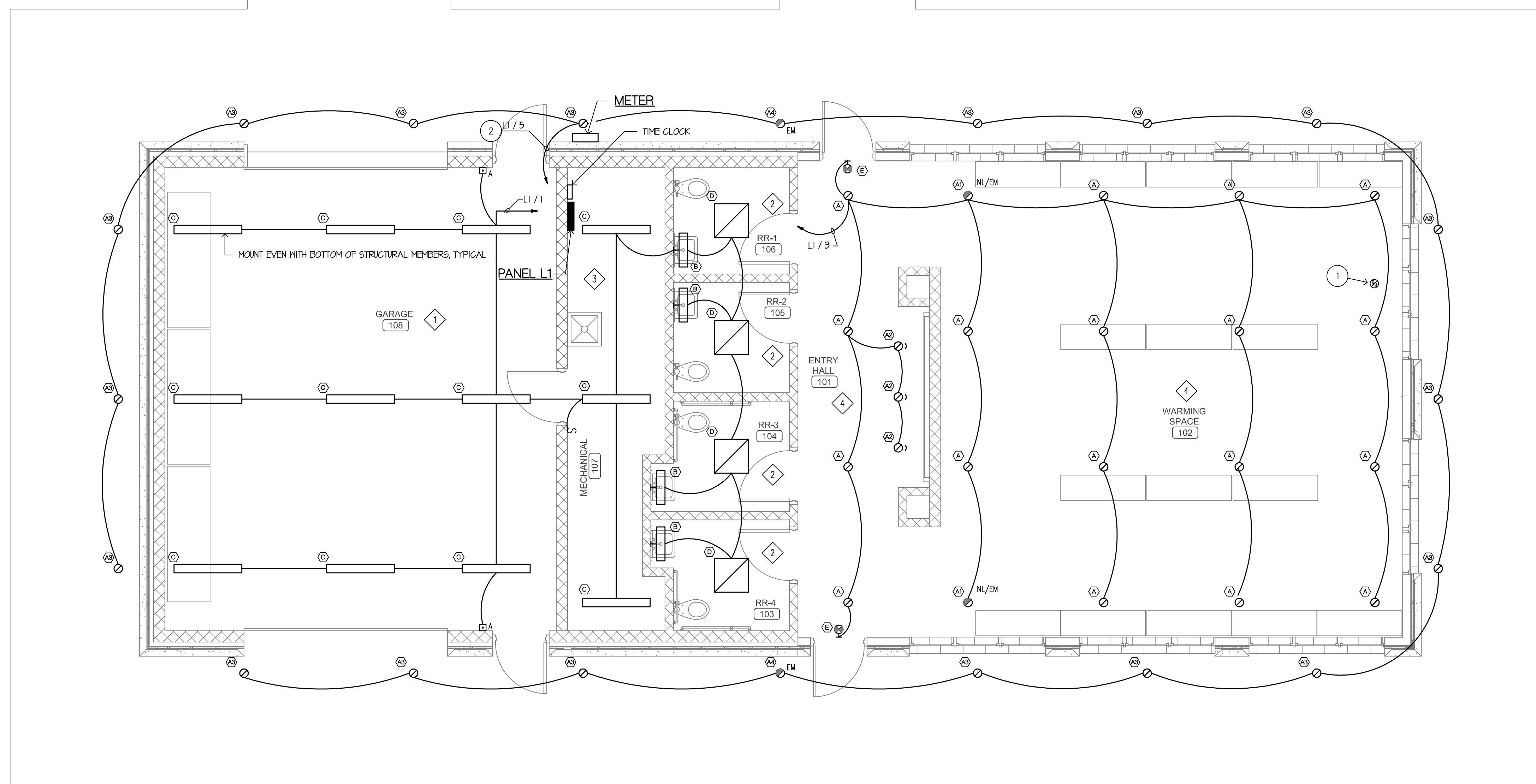
REVISIONS

PROJECT # 19-019BP
DATE 08/01/2019
DRAWN BY ADH
CHECKED BY MSD
© 2019 OLESON+HOBBIE ARCHITECTS, LLC.

SHEET TITLE
FLOOR PLAN - LIGHTING

SHEET

E2.0



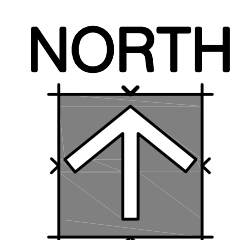
FACEPLATE A
NO SCALE

MASTER SEQUENCE OF OPERATION NOTES

- SEE FACEPLATE DETAILS ON SHEET THIS SHEET.
- ALL ROOMS WITH DAYLIGHT HARVESTING: LIGHTS LOCATED ALONG PERIMETER WALLS WITH WINDOWS WILL BE CONTROLLED WITH A DAYLIGHT SENSOR WHEN THE ROOM IS IN AN OCCUPIED STATE.
- WHEN A BUTTON IS PROGRAMMED FOR "OFF" THE BUTTON IS TO CLEARLY STATE "OFF".
- THE MANUFACTURER IS TO DETERMINE THE BEST LOCATION AND QUANTITIES OF THEIR DEVICES TO ACHIEVE THE COVERAGE AND CONTROL PER THE SEQUENCES DESCRIBED BELOW.

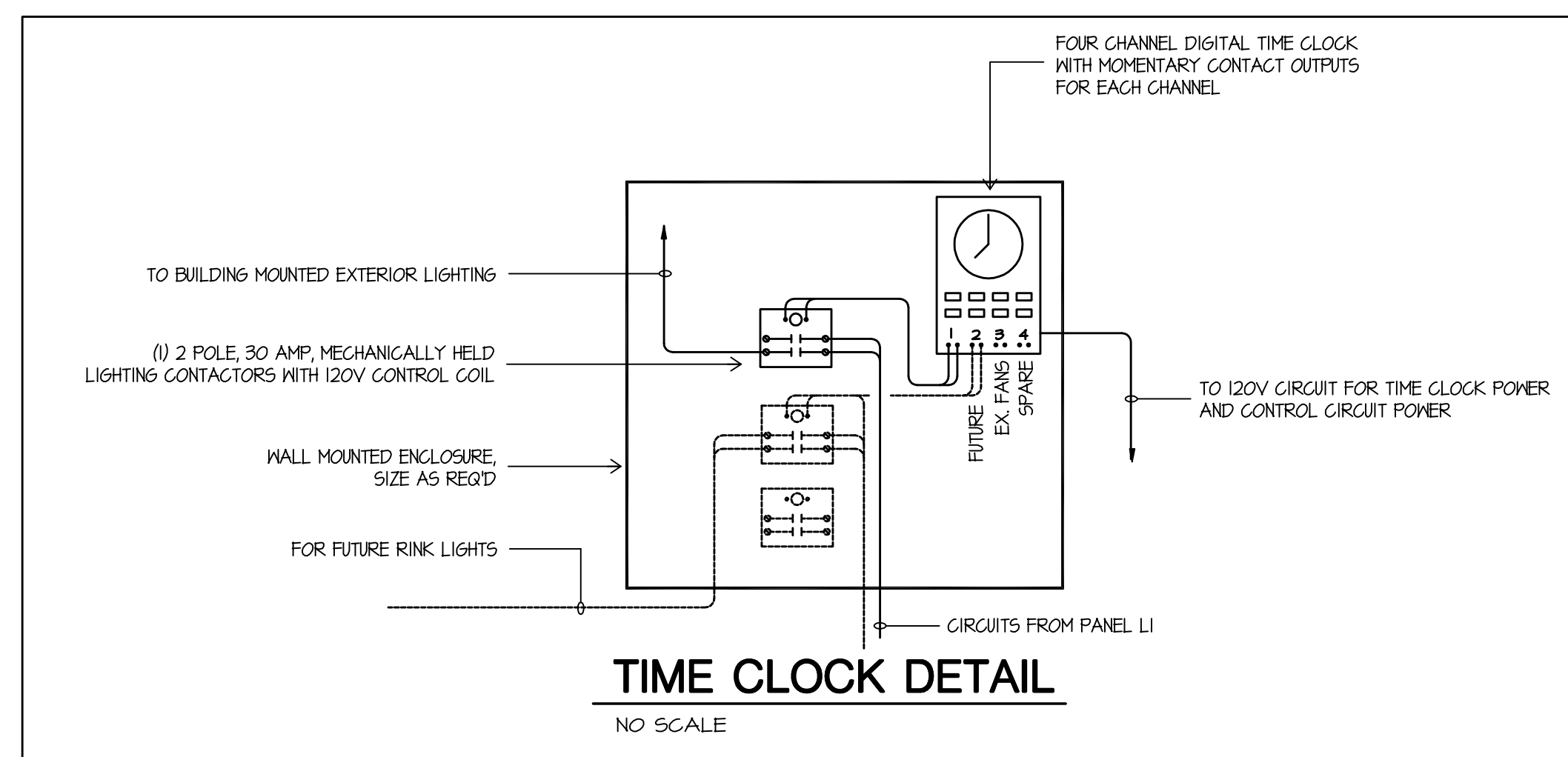
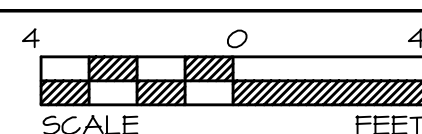
SEQUENCES:

- GARAGE**
CEILING MOUNTED DUAL TECH OCCUPANCY SENSOR & MANUAL CONTROL OF NON-DIMMED FIXTURES
SWITCH A: (ON/OFF) WILL HAVE THE FOLLOWING FUNCTIONS
1. ON BUTTON: ALL LIGHTS 100% ON
2. OFF BUTTON: ALL OFF
ROOM WILL HAVE MULTIPLE 'B' SWITCHES.
UPON EXITING ROOM, OCCUPANCY SENSOR TO TRIGGER ROOM TO 'OFF' POSITION AFTER 15-MINUTES OF NO OCCUPANCY SENSED AND RETURN SYSTEM TO A MANUAL 'ON' CONDITION.
- TOILET ROOMS**
CEILING MOUNTED DUAL TECH OCCUPANCY SENSOR CONTROL OF NON-DIMMED FIXTURES BASED UPON FOLLOWING SCHEDULE:
ALL LIGHTS 'ON' TO 100% WHEN OCCUPANCY IS SENSED. UPON EXITING ROOM, OCCUPANCY SENSOR TO TRIGGER ROOM TO 'OFF' AFTER 5-MINUTES OF NO OCCUPANCY SENSED.
- SUPPORT ROOMS WITH ELECTRICAL PANELS**
NO OCCUPANCY SENSORS PER NEC, 100% MANUAL ON/OFF WITH A STANDARD TOGGLE SWITCH.
- WARMING ROOM**
CEILING MOUNTED DUAL TECH OCCUPANCY SENSOR CONTROL OF DIMMED FIXTURES BASED UPON FOLLOWING SCHEDULE:
ALL LIGHTS 'ON' TO 100% WHEN OCCUPANCY IS SENSED. UPON EXITING ROOM, OCCUPANCY SENSOR TO TRIGGER ROOM TO 'OFF' AFTER 5-MINUTES OF NO OCCUPANCY SENSED. ROOM TO HAVE DAYLIGHT HARVESTING. FOOT CANDLE LEVEL IS TO BE DIALED INTO 30FC.



FLOOR PLAN - LIGHTING

SCALE: 1/4" = 1'-0"



TIME CLOCK DETAIL
NO SCALE

GENERAL NOTES

- PROVIDE A CONSTANT HOT TO ALL NIGHT LIGHTS, EXIT SIGNS, & EMERGENCY LIGHTS.
- REUSE EXISTING RACEWAY WHENEVER POSSIBLE.
- ELECTRICAL CONTRACTOR TO UPDATE PANEL INDEXES UPON COMPLETION.
- WHEN NOTED "EQUAL MANUFACTURERS", "OR EQUAL", "APPROVED EQUAL", OR OTHER SIMILAR TERMS, IT IS UNDERSTOOD TO MEAN THE ENGINEER'S AND ARCHITECT'S APPROVAL. HAVING PRIOR APPROVAL ON A MANUFACTURER ONLY, DOES NOT RELIEVE THE MANUFACTURER OF MEETING WHAT IS SPECIFIED. THE FINAL ACCEPTANCE OR REJECTION WILL BE BASED ON REVIEW OF THE SHOP DRAWINGS BY THE ENGINEER AND ARCHITECT.
- CONCEAL RACEWAY IN FINISHED AREAS.
- A NUMBER NEXT TO A LIGHT FIXTURE REPRESENTS THE CIRCUIT NUMBER. THE LETTER NEXT TO A LIGHT FIXTURE IS THE SWITCH DESIGNATION. SEE SEQUENCE OF OPERATION NOTES.

PLAN NOTES

- THIS ROOM TO HAVE DAYLIGHT HARVESTING CONTROL. REFER TO SEQUENCE OF OPERATION NOTES AND SPECIFICATIONS FOR REQUIREMENTS.
- ROUTE HOMERUN VIA TIME CLOCK. SEE DETAIL ON THIS SHEET.

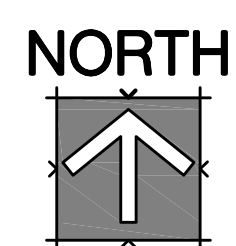
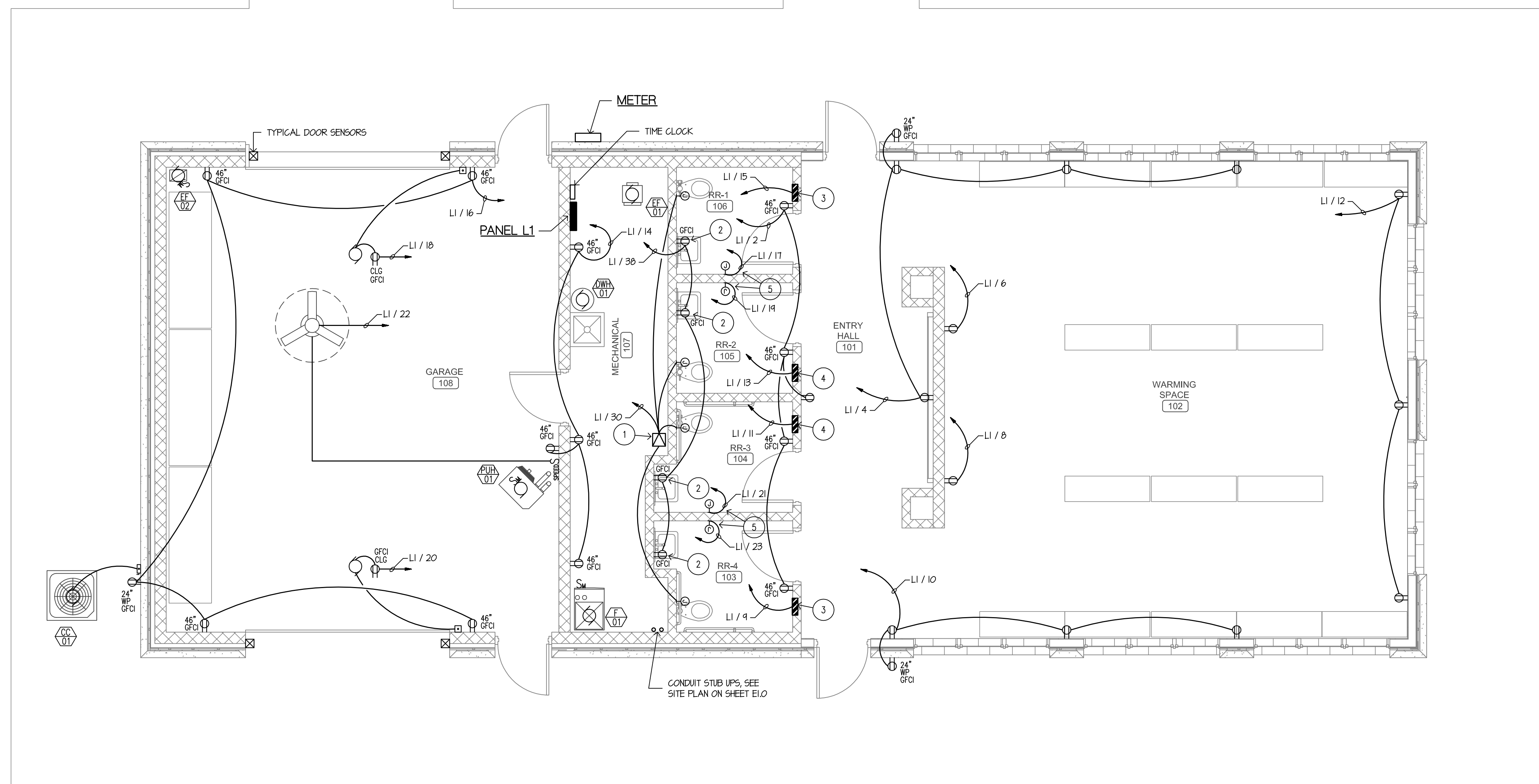
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Engineer under the laws of the State of Minnesota.

MSD
MICHAEL S. DOLEJS

Dated: August 01, 2019, Reg. No. 24659

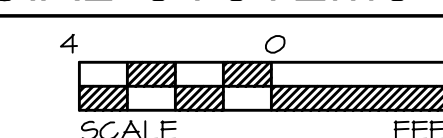
**HICKORY PARK
WARMING
HOUSE AND ICE
RINKS**

BELLE PLAINE,
MN



FLOOR PLAN - POWER & SPECIAL SYSTEMS

SCALE: 1/4" = 1'-0"



GENERAL NOTES

- A. COORDINATE RECEPTACLE HEIGHTS ABOVE OR IN CABINETS WITH ARCHITECTURAL PLANS.
- B. ELECTRICAL CONTRACTOR TO UPDATE PANEL INDEXES UPON COMPLETION.
- C. EACH RECEPTACLE DESIGNATED GFCI IS TO HAVE A TEST & RESET BUTTON ACCESSIBLE AND WITHIN SIGHT OF THE RECEPTACLE. (I.E. TOILET ROOMS, WASH FOUNTAINS AND ELECTRIC WATER COOLERS, ETC.)
- D. WHEN NOTED "EQUAL MANUFACTURER", "OR EQUAL", "APPROVED EQUAL" OR OTHER SIMILAR TERMS, IT IS UNDERSTOOD TO MEAN THE ENGINEER'S AND ARCHITECT'S APPROVAL. HAVING PRIOR APPROVAL ON A MANUFACTURER ONLY, DOES NOT RELIEVE THE MANUFACTURER OF MEETING WHAT IS SPECIFIED. THE FINAL ACCEPTANCE OR REJECTION WILL BE BASED ON REVIEW OF THE SHOP DRAWINGS BY THE ENGINEER AND ARCHITECT.
- E. CONCEAL RACEWAY IN FINISHED AREAS.
- F. IN RACEWAYS WITH MULTIPLE CIRCUITS, THE NUMBER NEXT TO THE RECEPTACLE INDICATES THE CIRCUIT NUMBER. A SEPARATE NEUTRAL IS TO BE INSTALLED FOR EACH HOMERUN.
- G. ALL SPECIAL SYSTEM CABLES TO BE RAN IN A RACEWAY.

PLAN NOTES

1. ELECTRICAL CONTRACTOR IS TO FURNISH & INSTALL 120V TO FLUSH VALVE TRANSFORMER. COORDINATE EXACT TRANSFORMER LOCATION WITH PLUMBING CONTRACTOR. ELECTRICAL CONTRACTOR IS REQUIRED TO RUN CONDUCTORS FROM TRANSFORMER TO EACH VALVE FOR LOW VOLTAGE WIRING. COORDINATE EXACT LOCATION OF FLUSH VALVE ROUGH-IN & NUMBER OF CONDUCTORS WITH PLUMBING CONTRACTOR PRIOR TO INSTALLATION. FIELD COORDINATE.
2. DUPLEX RECEPTACLE FOR LAVATORY. COORDINATE EXACT LOCATION WITH PLUMBING CONTRACTOR PRIOR TO INSTALLATION AS REQUIRED. THE GFCI RESET NEEDS TO BE ACCESSIBLE.
3. ELECTRICAL CONTRACTOR IS TO FURNISH & INSTALL A RECESSED ELECTRIC HEATER AT THIS LOCATION. HEATER TO BE BY KING ELECTRIC, #LPMV1215-W-TP-CB, 120VOLTS, 1500 WATTS, 12.5 AMPS, WITH FACTORY INSTALLED TAMPER-PROOF THERMOSTAT, DISCONNECT, WHITE FINISH AND RECESSED WALL CAN PART RUNCV. HEATER COMES WITH HEAVY 3/16" THICK PLATE & TAMPER-PROOF SCREWS.
4. ELECTRICAL CONTRACTOR IS TO FURNISH & INSTALL A RECESSED ELECTRIC HEATER AT THIS LOCATION. HEATER TO BE BY KING ELECTRIC, #LPMV1215-W-TP-CB, 120VOLTS, 1250 WATTS, 10.4 AMPS, WITH FACTORY INSTALLED TAMPER-PROOF THERMOSTAT, DISCONNECT, WHITE FINISH AND RECESSED WALL CAN PART RUNCV. HEATER COMES WITH HEAVY 3/16" THICK PLATE & TAMPER-PROOF SCREWS.
5. ELECTRICAL CONTRACTOR IS TO FURNISH & INSTALL ADA HAND DRYER, EXCEL TA-ABS, 120V, 450 WATTS, 1.1 AMPS IN A WHITE FINISH. COORDINATE EXACT MOUNTING LOCATION W/ ARCHITECT PRIOR TO ROUGH-IN.

REVISIONS

PROJECT # 19-019BP
DATE 08/01/2019
DRAWN BY ADH
CHECKED BY MSD
© 2019 OLESON+HOBBIE ARCHITECTS, LLC.

SHEET TITLE
**FLOOR PLAN -
POWER &
SPECIAL
SYSTEMS**

SHEET

E3.0

*** FIXTURE SCHEDULE**

TYPE	DESCRIPTION	MANUFACTURER	SERIES	VOLT	CROSS SECTION LAMPS	BALLAST/ DRIVER	OPTICS	EQUAL MFGRS	NOTES
A	LED 4" RECESSED DOWNLIGHT	LITHONIA	LDN4 40/30 L04AR LSS E210 SC44	120	LED 2862 LUMENS 40K, 35W	LED	SPECULAR REFLECTOR	INFINITY, PRESCOLITE PORTFOLIO	edgeLED DIMMING TO 10%, 10 DEG. SLOPE ADAPTER, DAMP LOCATION, WHITE FLANGE, 1 1/2" THICK CEILINGS
A1	LED 4" RECESSED DOWNLIGHT (EMERGENCY)	LITHONIA	LDN4 40/30 L04AR LSS E210 EL SC44	120	LED 2862 LUMENS 40K, 35W	LED	SPECULAR REFLECTOR	INFINITY, PRESCOLITE PORTFOLIO	edgeLED DIMMING TO 10%, 10 DEG. SLOPE ADAPTER, DAMP LOCATION, W/ EMERG., WHITE FLANGE, EMERG. BATTERY, 1 1/2" THICK CEILINGS
A2	LED 4" RECESSED ADJUSTABLE DOWNLIGHT	LITHONIA	4J8K ADJ 40K MW	120	LED 635 LUMENS 40K, 8.2W	LED	SPECULAR REFLECTOR	INFINITY, PRESCOLITE PORTFOLIO	DIMMING TO 10%, IC RATED, WHITE FINISH, WIDE BEAM, MAX 1 1/2" THICK CEILINGS, DAMP LOCATION
A3	LED 4" RECESSED DOWNLIGHT	LITHONIA	LDN4 40/30 L04AR LSS E210	120	LED 2862 LUMENS 40K, 35W	LED	SPECULAR REFLECTOR	INFINITY, PRESCOLITE PORTFOLIO	edgeLED DIMMING TO 10%, WHITE TRIM, DAMP LOCATION, 1 1/2" THICK CEILINGS
A4	LED 4" RECESSED DOWNLIGHT (EMERGENCY)	LITHONIA	LDN4 40/30 L04AR LSS E210	120	LED 2862 LUMENS 40K, 35W	LED	SPECULAR REFLECTOR	INFINITY, PRESCOLITE PORTFOLIO	edgeLED DIMMING TO 10%, WHITE TRIM, DAMP LOCATION, EMERG. BATTERY, 1 1/2" THICK CEILINGS
B	LED 2" WALL BRACKET	LUMINAIRE LIGHTING	AEL 24 W 4000K DP WOP DIM	MULTI	40K - LED 20W, 1634 LUMENS	LED	ACRYLIC DUST COVER	METALUX	DOWN LIGHT, ALUM HOUSING, WHITE FINISH, GASKETED, DIMMABLE
C	LED 4" STRIP	LITHONIA	ZLIN L46 5000LM FST 40K N100 WH, CHAIN HANGER	120	40K - LED 42W, 485.3 LUMENS	LED	FROSTED DIFFUSER	METALUX	10' CHAIN HANGER KIT, WHITE FINISH, DIMMABLE
D	LED 2x2 LAY-IN LENS TROFFER	LITHONIA	ZVRTL F L24 3000LM ICW AP250FL	120	40K - LED 27W, 2699 LUMENS	LED DRIVER	.25" ACRYLIC LENS	COLUMBIA, WILLIAMS, METALUX	WHITE ALUMINUM DOOR FRAME, DIMMABLE, FROSTED LENS W/ POLYCARB CLEAR LENS
E	L.E.D. EXIT SIGN SINGLE SIDED	EVENLITE	RZR EM R 1 WW W RS SECURITY COVER	MULTI	L.E.D.	LED			UNIVERSAL MOUNT, SECURITY COVER, WHITE THERMOPLASTIC HOUSING NICKEL CADMIUM BATTERY
X	EXISTING LIGHT FIXTURE TO REMAIN								

WHEN NOTED "EQUAL MANUFACTURER", IT IS UNDERSTOOD TO MEAN THE ENGINEERS AND ARCHITECTS APPROVAL OF THE MANUFACTURER ONLY. HAVING PRIOR APPROVAL ON A MANUFACTURER ONLY, DOES NOT RELIEVE THE MANUFACTURER OF MEETING WHAT IS SPECIFIED. THE FINAL ACCEPTANCE OR REJECTION WILL BE BASED ON REVIEW OF THE SHOP DRAWINGS BY THE ENGINEER AND ARCHITECT.

* FIXTURES ARE TO BE DIMMABLE/SWITCHED PER SEQUENCE OF OPERATION SCHEDULE ON DRAWINGS.

EQUIPMENT SCHEDULE

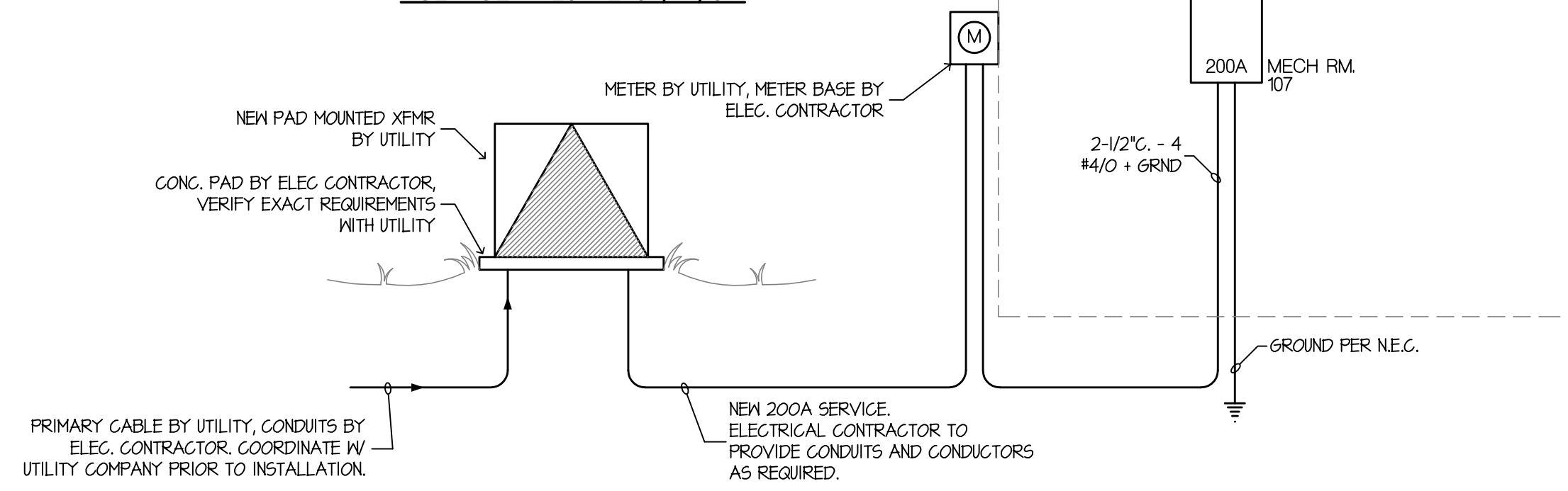
PREFIX	SUFFIX	EQUIPMENT DESCRIPTION	ROOM	DEVICE DATA			STARTER	DISCONNECT	DISCONNECT LOCATION		CIRCUIT	FEEDER	CONTROL	REMARKS
				HP	V	PH			IN COMBO	ON UNIT				
CC	01	COMPRESSOR CONDENSOR	EXT.	27.8 MCA	240	1	NA	60A, 2P, 2F BY DIV. 26 WEATHERPROOF		X	L1 / 24,26	3/4". 2 # 8 + GRND	BY OTHERS	40A MAX OVERCURRENT PROTECTION
DWH	01	WATER HEATER	MECH ROOM	1650 W	120	1	NA	C.B. IN PANEL		--	L1 / 28	3/4". 2 # 12 + GRND	BY OTHERS	
EF	01	EXHAUST FAN	TOILETS	144 W	120	1	NA	C.B. IN PANEL		--	L1 / 40	3/4". 2 # 12 + GRND	TIME CLOCK BY DIV. 26	CIRCUIT VIA TIME CLOCK.
EF	02	EXHAUST FAN	GARAGE 108	325 W	120	1	NA	MOTOR SW BY DIV. 26		X	L1 / 42	3/4". 2 # 12 + GRND	BY OTHERS	
F	01	FURNACE	MECH ROOM	3/4 HP	240	1	NA	MOTOR SW BY DIV. 26		X	L1 / 32,34	3/4". 2 # 12 + GRND	BY OTHERS	
OH	01	OVERHEAD DOOR OPERATOR	GARAGE 108	1/2 HP	120	1	NA	CORD AND PLUG PROVIDED W/UNIT		X	SEE PLANS	3/4". 2 # 12 + GRND	BY DIV. 26	PROVIDE DUPLEX RECEPTACLE ON CEIL. NEAR UNIT, WIRE PUSHBUTTON AND BEAM SENSORS
PUH	01	PROPELLER UNIT HEATER	GARAGE 108	3.3 FLA	120	1	NA	MOTOR SW BY DIV. 26		X	L1 / 36	3/4". 2 # 12 + GRND	BY OTHERS	15A MAX OVERCURRENT PROTECTION

PANEL SCHEDULE

PANEL NAME		L1				120 / 240 VOLTS				MAINS 200A						
LOCATION		MECH 107				1 PHASE				A.I.C. RATING 22000						
MOUNTING SURFACE		3 WIRE				OPTIONS				MAIN CB.						
RM. NO.	LOAD	BRKR	CKT	BUS	CKT	BRKR	LOAD	RM. NO.	LOAD	BRKR	CKT	BUS	CKT	BRKR	LOAD	RM. NO.
GARAGE	LIGHTING	20/1	1	X		2	20/1	RECEPTACLES	TOILETS							
WARNING	LIGHTING	20/1	3		X	4	20/1	RECEPTACLES	WARNING							
EXT.	LIGHTING - HOOPS	20/1	5	X	X	6	20/1	RECEPTACLES	WARNING							
103	ELEC. HEATER	20/1	7	X	X	8	20/1	RECEPTACLES	WARNING							
104	ELEC. HEATER	20/1	9	X	X	10	20/1	RECEPTACLES	WARNING							
104	ELEC. HEATER	20/1	11	X	X	12	20/1	RECEPTACLES	WARNING							
105	ELEC. HEATER	20/1	13	X	X	14	20/1	RECEPTACLES	MECH.							
106	ELEC. HEATER	20/1	15	X	X	16	20/1	RECEPTACLES	GARAGE							
106	HAND DRYER	20/1	17	X	X	18	20/1	OVERHEAD DOOR	GARAGE							
105	HAND DRYER	20/1	19	X	X	20	20/1	OVERHEAD DOOR	GARAGE							
104	HAND DRYER	20/1	21	X	X	22	20/1	FAN	GARAGE							
103	HAND DRYER	20/1	23	X	X	24	40/2	COMP. COND. CC-01	EXT.							
SPARE		20/1	25	X	X	26	--	--	--							
SPARE		20/1	27	X	X	28	20/1	DWH-01	MECH.							
SPARE		20/1	29	X	X	30	20/1	FLUSH VALVE	TOILETS							
SPARE		20/1	31	X	X	32	15/2	FURN F-01	MECH.							
SPARE		20/1	33	X	X	34	--	--	--							
PROVISIONS		20/1	35	X	X	36	15/1	PUH-01	GARAGE							
PROVISIONS		20/1	37	X	X	38	20/1	SINKS	TOILETS							
PROVISIONS		20/1	39	X	X	40	15/1	EX. FANS	TOILETS							
PROVISIONS		20/1	41	X	X	42	15/1	EX. FANS	GARAGE							

UTILITY COMPANY
XCEL ENERGY
STEVE SANDEY
210 LIME ST.
MANKATO, MINNESOTA 56001
507-387-9671

VOLTAGE = 120 / 240V, 1P, 3W



POWER DISTRIBUTION RISER DIAGRAM

NO SCALE

ELECTRICAL SYMBOLS

LIGHTING FIXTURES
LIGHT FIXTURE TYPE - REFER TO SCHEDULE
SURFACE FIXTURE
SURFACE FIXTURE, NIGHT LIGHT AND/OR EMERGENCY
RECESSED DOWNLIGHT
RECESSED DOWNLIGHT, NIGHT LIGHT AND/OR EMERGENCY
WALL MOUNTED FIXTURE
WALL MOUNTED FIXTURE NIGHT LIGHT AND/OR EMERGENCY
RECESSED FIXTURE
RECESSED FIXTURE, NIGHT LIGHT AND/OR EMERGENCY
SURFACE FIXTURE
SURFACE FIXTURE, NIGHT LIGHT AND/OR EMERGENCY
TRACK LIGHTING UNIT
RECESSED DOWNLIGHT WALLWASH / FLOOD
CEILING MOUNTED EXIT SIGN
WALL MOUNTED EXIT SIGN
EMERGENCY LIGHTING UNIT W/ HEADS
RECESSED REMOTE HEAD
WALL MOUNTED REMOTE HEAD
EMERGENCY LIGHTING UNIT W/ HEADS

CONDUITS
SINGLE POLE TOGGLE SWITCH
3-WAY TOGGLE SWITCH
4-WAY TOGGLE SWITCH
DOUBLE POLE TOGGLE SWITCH
SWITCH WITH TIMER
SWITCH WITH PILOT
KEYED SWITCH
MOTOR SWITCH
MOMENTARY CONTACT SWITCH
SPEED CONTROL SWITCH
PUSH BUTTON
DIMMER
3-WAY DIMMER
ELECTRIC THERMOSTAT
PHOTO ELECTRIC CONTROL
NURSE CALL
INTERCOM
CARD READER
OCCUPANCY SENSOR
DAYLIGHT HARVESTING DEVICE

DEVICES
DUPLEX RECEPTACLE
QUAD-PLEX RECEPTACLE
HALF SWITCHED DUPLEX RECEPTACLE
WEATHER PROOF & WEATHER RESISTANT DUPLEX RECEPTACLE
SPECIAL PURPOSE RECEPTACLE
FLOOR OUTLET / DEVICES AND SHOWN
KITCHEN FLOOR OUTLET / DEVICES AND SHOWN
RANGE RECEPTACLE
DUPLEX RECEPTACLE W/ (2) USB
JUNCTION BOX
WALL MOUNTED JUNCTION BOX
CLOCK OUTLET (UNLESS SPECIFIED AS WIRELESS)
WALL SPEAKER*
RECESSED CEILING SPEAKER
MICROPHONE OUTLET*
VOLUME CONTROL*
TELEVISION OUTLET*
COMMUNICATIONS*
WALL MOUNTED TELEPHONE OUTLET*
BELL / BUZZER
WIRELESS ACCESS POINT
SECURITY CAMERA

FIRE ALARM
PHOTOELECTRIC SMOKE DETECTOR
CARBON MONOXIDE DETECTOR
THERMAL HEAT DETECTOR - RATE OF RISE
THERMAL HEAT DETECTOR - FIXED TEMPERATURE
DUCT SMOKE DETECTOR
DUCT MOUNTED SMOKE DETECTOR / DAMPER CONTROL
BEAM DETECTOR TRANSMITTER/RECEIVER
SMOKE DETECTOR - RESIDENTIAL
HORN STROBE UNIT (AUDIBLE & VISBLE)
STROBE UNIT (VISBLE ONLY)
HORN UNIT (AUDIBLE ONLY)
GUEST ROOM DEVICE - HORN / STROBE / SMOKE DETECTOR
GUEST ROOM DEVICE - HORN / SMOKE DETECTOR
FULL STATION
FIRE ALARM CONTROL PANEL
ALARMINGATOR
SPRINKLER FLOW SWITCH
SPRINKLER TAMPER SWITCH
MAGNETIC DOOR HOLD OPEN
SMOKE DAMPER
CONTROL MODULE

MISCELLANEOUS
DEVICES MOUNTED IN COMMON OUTLET
MOTOR CONTROLLER
COMBINATION MOTOR CONTROLLER / DISCONNECT
DISCONNECT SWITCH
PANEL - REFER TO SCHEDULE
MOTOR
MOTOR DESIGNATION - REFER TO SCHEDULE
PLAN NOTE
DEMOLITION OR REVISION NOTE

HOME RUNS
CIRCUIT NO. (S)
L-1 / 3, 5, 7 - 1" C, 3 # 8 + GRND
PANEL DESIGNATION
RACEWAY SIZE AND CONDUCTORS

RACEWAY / CIRCUITS
CONCEALED BRANCH CIRCUIT - WALL OR CEILING
CONCEALED BRANCH CIRCUIT - UNDER FLOOR OR GROUND
AUXILIARY SYSTEM AS NOTED OR INDICATED
MULTI OUTLET ASSEMBLY / DEVICES AS SHOWN
SURFACE MOUNTED RACEWAY / DEVICES AS SHOWN

ALL DEVICES TO BE INSTALLED IN A J-BOX, ALL RACEWAYS TO TERMINATE IN A J-BOX
RACEWAY MAY BE FURTHER DESIGNATED BY ONE OR MORE OF THE FOLLOWING DESIGNATIONS:
E - EXPOSED RACEWAY WM - WIREMOLD / SURFACE METAL RACEWAY

* 1% EMT STUBBED UP TO ABOVE ACCESSIBLE CEILING WITH A BUSHING, DEVICES, NIBBS, & COVERPLATES ARE AS SPECIFIED.

ABBREVIATIONS (STANDARD)

THESE ABBREVIATIONS COMPRISE A STANDARD LIST: NOT ALL ABBREVIATIONS APPEAR IN THIS PROJECT

A OR AMP	AMPERE	KV	KILOVOLT
AC	ALTERNATING CURRENT	KVA	KILOVOLT-AMPERE
A/C	AIR CONDITIONING	KW	KILOWATT
AFCI	ARCH FAULT CIRCUIT INTERRUPTER		
A.F.F.	ABOVE FINISHED FLOOR	LCP	LOCAL CONTROL PANEL
AFG	ABOVE FINISHED GRADE	LCS	LOCAL CONTROL STATION
A.I.C.	AMPERE INTERRUPTING CAPACITY	LTG	LIGHTING
AL	ALUMINUM		
ALT	ALTERNATE	MCA	MAX. CIRCUIT AMPACITY
AS	ABOVE STEEL	MCB	MAIN CIRCUIT BREAKER
		MCC	MOTOR CONTROL CENTER
BLDG	BUILDING	MFR	MANUFACTURER
BSC	BARE STRANDED COPPER	MH	METAL HALIDE
		MLO	MAIN LUGS ONLY
		MTD	MOUNTED
		MTR	MOTOR
C	CONDUIT	NEC	NATIONAL ELECTRIC CODE
CB	CIRCUIT BREAKER	NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
CEIL	CEILING	NL	NIGHT LIGHT
CHN	CHAIN	N.T.S.	NOT TO SCALE
CKT	CIRCUIT		
CONV	CONVEYOR		
C/T	CURRENT TRANSFORMER		
CU	COPPER		
		P	PULL
		PA	PUBLIC ADDRESS
DC	DIRECT CURRENT	PH	PHASE
DIP	DISCONNECT	PLMG	PLUMBING
DISC	DISCONNECT	PNL	PANEL
DW	DIVISION	PTR	PRINTER
DN	DOWN	PVC	PLASTIC CONDUIT
D/S	DISCONNECT SWITCH	QZ	QUARTZ
DWG	DRAWING		
E	EXPOSED	RECEPT	RECEPTACLE
EG	ENCLOSED & GASKETED	RM	ROOM
EL OR ELEV	ELEVATION		
ELEC	ELECTRIC	SHT	SHEET
EM	EMERGENCY	SN	SOLID NEUTRAL
EMT	ELECTRICAL METALLIC TUBING	SST	SOLID STATE
EQ	EQUAL	SW	SWITCH (ELECTRICAL-LTG)
F	FUSED		
FACP	FIRE ALARM ANNUNCIATOR PANEL	TEL	TELEPHONE
FACP	FIRE ALARM CONTROL PANEL	TYP	TYPICAL
FBO	FURNISHED BY OTHERS		
FLA	FULL LOAD AMPS	UG	UNDERGROUND
FLUOR	FLUORESCENT		
FVR	FULL VOLTAGE REVERSING	V	VOLT
FVNR	FULL VOLTAGE NON-REVERSING	VFC	VARIABLE FREQUENCY CONTROLLER
GEN	GENERATOR	VFD	VARIABLE FREQUENCY DRIVE
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	VFY	VERIFY
GRND	GROUND	W	WATT OR WIRE
		WC	WITH WATER COOLER
HPF	HIGH POWER FACTOR	WG	WIREGUARD
HPS	HIGH PRESSURE SODIUM	WM	WIREMOLD
HTG	HEATING	WP	WEATHER PROOF
HVAC	HEATING VENTILATING/ AIR CONDITIONING	XP	EXPLOSION PROOF
HZ	HERTZ (CYCLES)		
		XFMR	TRANSFORMER
IC	INTERRUPTING CURRENT		
I.C.	ISOLATED GROUND		
INC	INCANDESCENT		
JB	JUNCTION BOX		

ABBREVIATIONS (DEMOLITION)

THESE ABBREVIATIONS COMPRISE A STANDARD LIST: NOT ALL ABBREVIATIONS APPEAR IN THIS PROJECT

X	EXISTING TO REMAIN
XR	EXISTING TO BE RELOCATED
R	EXISTING TO BE REMOVED
RR	EXISTING TO BE REMOVED & REPLACED

CITY OF BELLE PLAINE

CONSTRUCTION PLANS FOR HICKORY PARK ICE RINKS

GRADING, BASE, CONCRETE SURFACING, CONCRETE CURB & GUTTER
JULY, 2019

RESOURCE LIST

CITY OF BELLE PLAINE

GOVERNMENT CENTER
218 NORTH MERIDIAN ST.
PO BOX 129
BELLE PLAINE, MN 56011
(952) 873-5553

City Administrator:
DAWN MEYER

Mayor: CHRISTOPHER MEYER

City Council Members:
PAUL CHARD
CARY COOP
RENEE LEMIEUX
BEN STIER

City Engineer:
(Consultant)
D. JOSEPH DUNCAN II, P.E.
Bolton & Menk, Inc.
1960 PREMIER DRIVE
MANKATO, MN 56001
(507) 625-4171

Utility Superintendent:
AL FAHEY

UTILITIES

GAS
CENTERPOINT ENERGY
2400 NORTH RIVERFRONT DRIVE
MANKATO, MN 56001
(507) 625-5611

TELEPHONE
FRONTIER COMMUNICATIONS
62 WEST MINNESOTA STREET
LE CENTER, MN 56057
(507) 357-2220

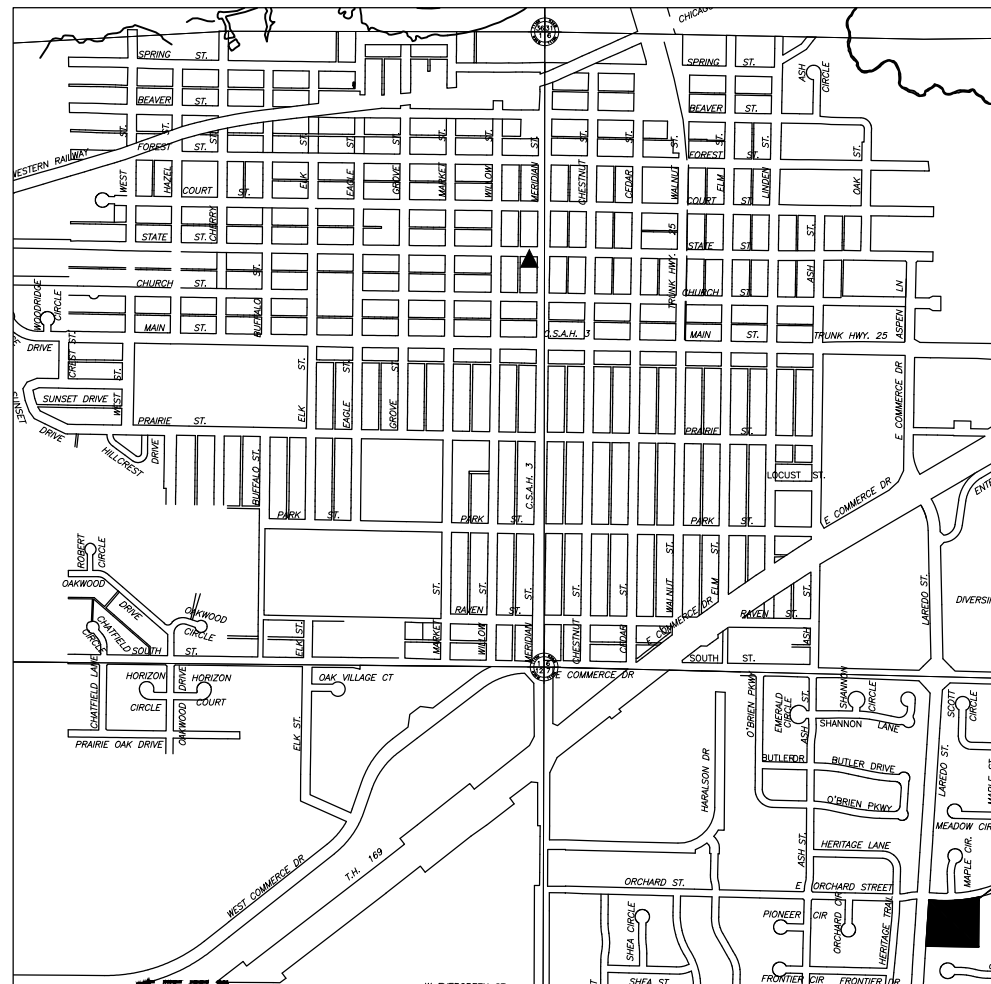
CABLE
MEDIACOM
1504 2ND STREET SE
WASECA, MN 56093
1-800-221-2603

ELECTRIC
XCEL ENERGY
PO BOX 1090, 210 LIME ST.
MANKATO, MN 56001
(612) 470-3321

NOTE: EXISTING UTILITY INFORMATION SHOWN ON THIS PLAN HAS BEEN PROVIDED BY THE UTILITY OWNER. THE CONTRACTOR SHALL FIELD VERIFY EXACT LOCATIONS PRIOR TO COMMENCING CONSTRUCTION AS REQUIRED BY STATE LAW. NOTIFY GOPHER STATE ONE CALL, 1-800-252-1166 OR 651-454-0002.

THE SUBSURFACE UTILITY INFORMATION IN THIS PLAN IS UTILITY QUALITY LEVEL D UNLESS OTHERWISE NOTED. THIS UTILITY LEVEL WAS DETERMINED ACCORDING TO THE GUIDELINES OF CI/ASCE 38-02, ENTITLED "STANDARD GUIDELINES FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA."

MAP OF THE
CITY OF BELLE PLAINE
SCOTT COUNTY, MN



SHEET NUMBER	SHEET TITLE
GENERAL	
G0.01 - G0.03	TITLE SHEET, LEGEND, GENERAL NOTES
CIVIL	
C0.01	EXISTING CONDITIONS & REMOVALS
C1.01	DETAILS & TYPICAL SECTIONS
C3.01 - C3.02	PROPOSED SITE PLAN & GRADING PLAN
THIS PLAN SET CONTAINS 7 SHEETS.	



MAP LEGEND

- PROJECT LIMITS
- BID LOCATION

PROJECT LOCATION



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.

D. Joseph Duncan II
D. JOSEPH DUNCAN II
LIC. NO. 26100 DATE 7/19/2019



1960 PREMIER DRIVE
MANKATO, MINNESOTA 56001
Phone: (507) 625-4171
Email: Mankato@bolton-menk.com
www.bolton-menk.com

DESIGNED	NO.	ISSUED FOR	DATE
DJD			
DRAWN			
MAJ			
CHECKED			
DJD			
CLIENT PROJ. NO.	M15-118762		

+ BM=857.44 TOP NUT HYDRANT NE CORNER OF SITE ORCHARD STREET	PROJECT DATUM: SCOTT COUNTY COORDINATES	RECORD DRAWING INFORMATION OBSERVER: CONTRACTOR: DATE:
	HORIZONTAL: HARN 2011	
	VERTICAL: NAVD 1988	
BELLE PLAINE, MINNESOTA HICKORY PARK ICE RINKS		SHEET G0.01
TITLE SHEET		

CONSTRUCTION NOTES

1. COORDINATE WITH UTILITY OWNERS (PHONE, GAS, ELECTRIC, TV, ETC..) TO RELOCATE PRIVATE UTILITIES AS NECESSARY FOR CONSTRUCTION (INCIDENTAL).
2. VERIFY THE SIZE, LOCATION AND ELEVATION OF ALL EXISTING UTILITIES. DISCREPANCIES IN LOCATION AND ELEVATION SHALL BE DIRECTED TO THE ENGINEER.
3. REPAIR OR PROTECTION OF EXISTING UTILITIES NOT DESIGNATED FOR REPLACEMENT IS INCIDENTAL TO THE UTILITY PIPELINE BEING INSTALLED. REMOVE AND REPLACE OR PROTECT AS NECESSARY.
4. LANDSCAPE RESTORATION WITHIN THE RIGHT OF WAY WILL BE THE RESPONSIBILITY OF THE PROPERTY OWNER. COORDINATE WITH THE PROPERTY OWNERS PRIOR TO REMOVAL OF LANDSCAPING.
5. SEED & HYDROMULCH ALL DISTURBED TURF AREAS. SEE SPECIFICATIONS. SALVAGE IN-PLACE TOPSOIL FOR REUSE IN TURF RESTORATION AREAS (INCIDENTAL).
6. ALL UNSUITABLE MATERIAL SHALL BE DISPOSED OF BY THE CONTRACTOR. SUITABLE MATERIALS ARE GENERALLY CONSIDERED SANDS AND CLAYS SUITABLE FOR EMBANKMENT CONSTRUCTION. UNSUITABLE MATERIALS ARE GENERALLY DEFINED AS TOPSOIL, MUCK, PEAT, ALLUVIUM OR SATURATED SOILS THAT CANNOT BE PROPERLY MOISTURE CONDITIONED TO BE CONSIDERED SUITABLE FOR EMBANKMENT.
7. THE SUBGRADE, EMBANKMENTS AND SUBCUTS SHALL BE COMPACTED USING THE QUALITY COMPACTION METHOD.
8. SIGNS NOT DESIGNATED FOR REPLACEMENT SHALL BE REMOVED & REINSTALLED AS NECESSARY FOR CONSTRUCTION (INCIDENTAL).

© Bolton & Menk, Inc. 2019. All Rights Reserved. M:\BELLE\1518762\CAD\CSD\118762001.dwg 8/7/2019 10:49:38 AM

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.

D. Joseph Duncan
D. JOSEPH DUNCAN
 LIC. NO. 26100 DATE 7/19/2019



1960 PREMIER DRIVE
 MANKATO, MINNESOTA 56001
 Phone: (507) 625-4171
 Email: Mankato@bolton-menk.com
 www.bolton-menk.com

DESIGNED	NO.	ISSUED FOR	DATE
DJD			
DRAWN			
MAJ			
CHECKED			
DJD			
CLIENT PROJ. NO.			
M15-118762			

BELLE PLAINE, MINNESOTA

HICKORY PARK ICE RINKS

GENERAL NOTES

SHEET

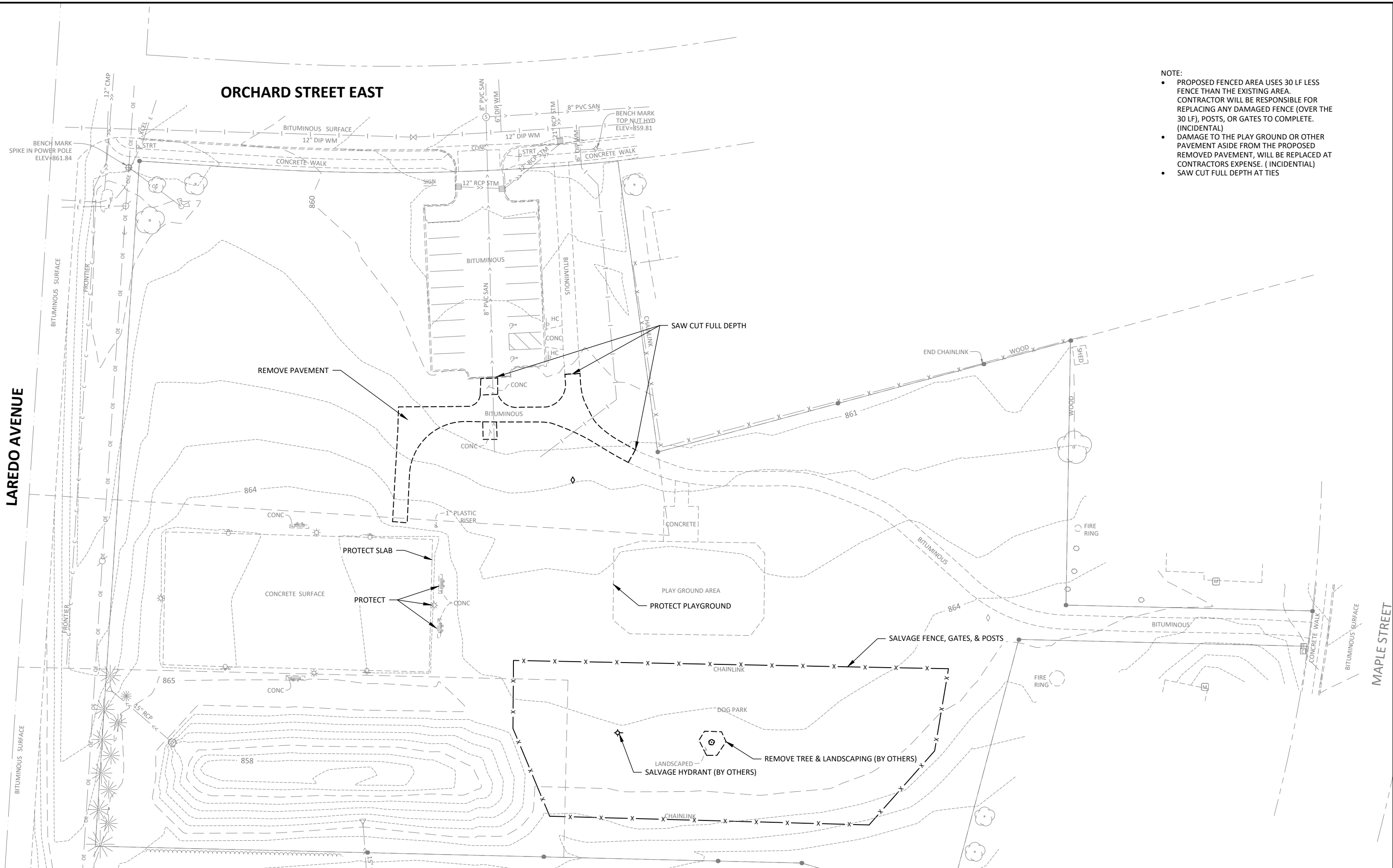
G0.03

ORCHARD STREET EAST

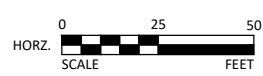
LAREDO AVENUE

MAPLE STREET

- NOTE:**
- PROPOSED FENCED AREA USES 30 LF LESS FENCE THAN THE EXISTING AREA. CONTRACTOR WILL BE RESPONSIBLE FOR REPLACING ANY DAMAGED FENCE (OVER THE 30 LF), POSTS, OR GATES TO COMPLETE. (INCIDENTAL)
 - DAMAGE TO THE PLAY GROUND OR OTHER PAVEMENT ASIDE FROM THE PROPOSED REMOVED PAVEMENT, WILL BE REPLACED AT CONTRACTORS EXPENSE. (INCIDENTAL)
 - SAW CUT FULL DEPTH AT TIES



© Bolton & Menk, Inc. 2019. All Rights Reserved. M15-118762-01 (SHEET) 8/17/2019 10:49:39 AM



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.

D. Joseph Duncan
D. JOSEPH DUNCAN
 LIC. NO. 26100 DATE 7/19/2019

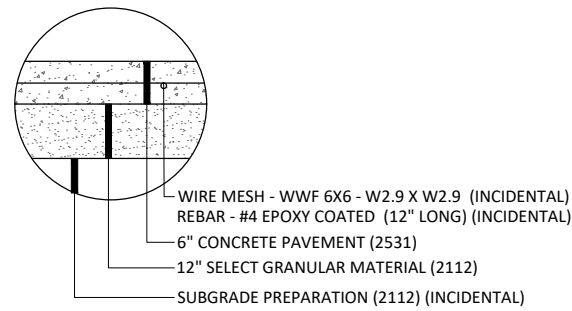


1960 PREMIER DRIVE
 MANKATO, MINNESOTA 56001
 Phone: (507) 625-4171
 Email: Mankato@bolton-menk.com
 www.bolton-menk.com

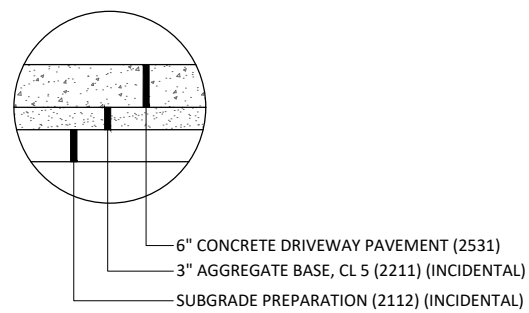
DESIGNED	NO.	ISSUED FOR	DATE
DJD			
DRAWN			
MAJ			
CHECKED			
DJD			
CLIENT PROJ. NO.	M15-118762		

BELLE PLAINE, MINNESOTA
HICKORY PARK ICE RINKS
 EXISTING CONDITIONS & REMOVALS

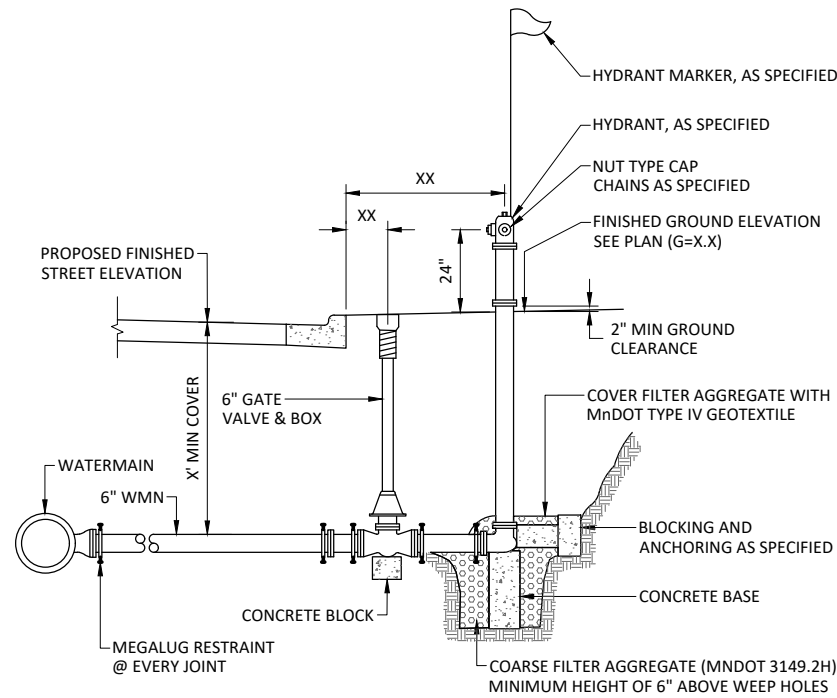
SHEET
C0.01



ICE RINK TYPICAL SECTION
NOT TO SCALE

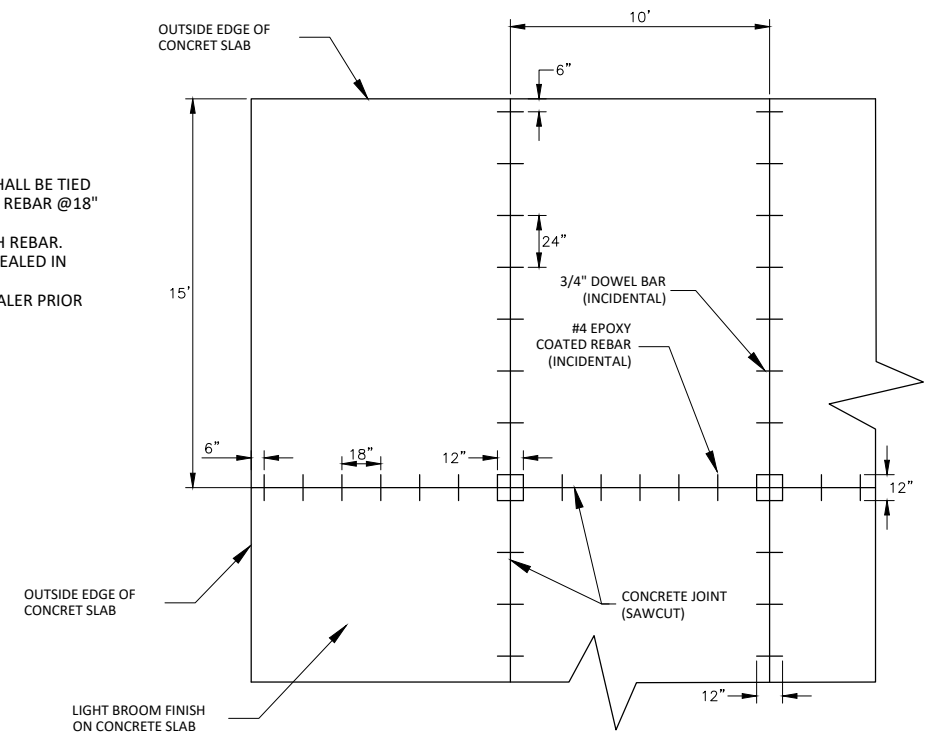


6\"/>

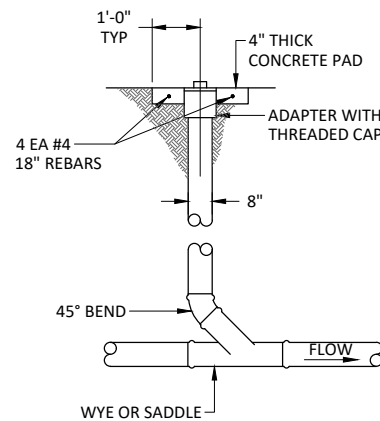


HYDRANT INSTALLATION, MEGALUGS
NOT TO SCALE

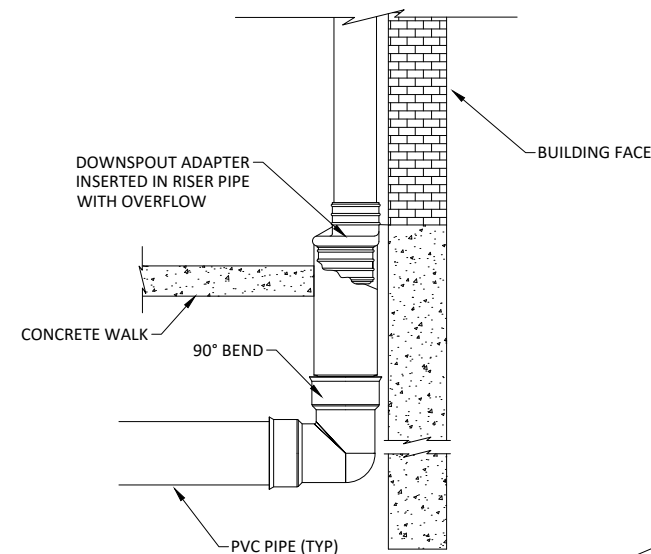
- NOTE:
- IF APPLICABLE, THE B412 CURB SHALL BE TIED TO SLAB WITH #4 EPOXY COATED REBAR @18" OC, START 6" IN FROM EDGE
 - DO NOT TIE EAST CURB LINE WITH REBAR.
 - SAW JOINTS & JOINTS SHALL BE SEALED IN HOCKEY RINK & SKATING RINK
 - ENGINEER MUST APPROVE OF SEALER PRIOR TO CONSTRUCTION



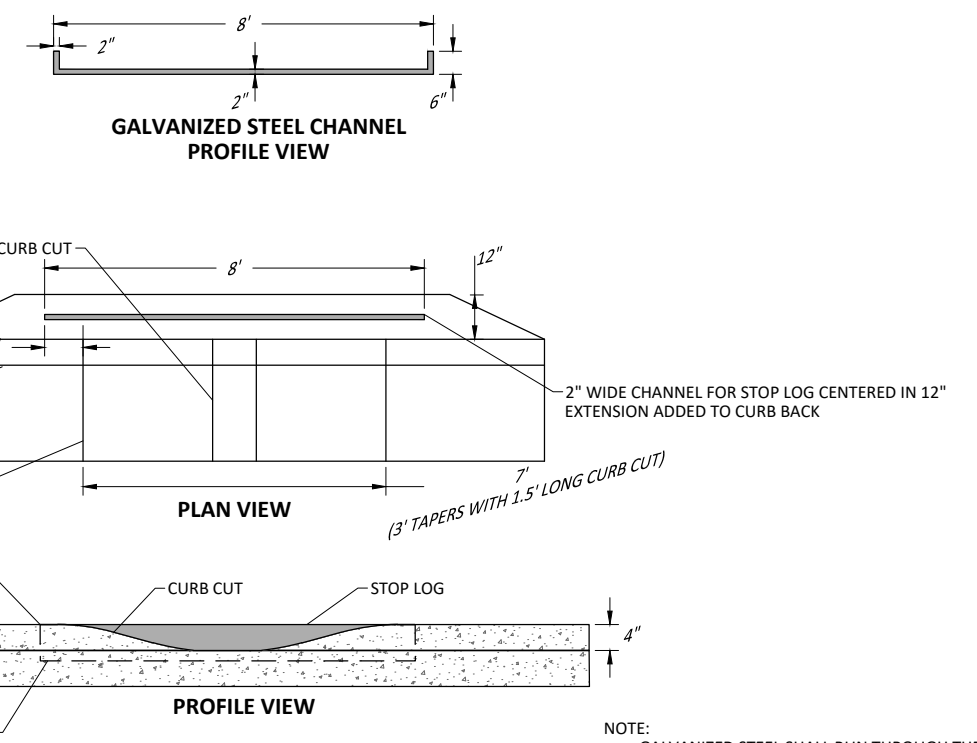
CONCRETE JOINT/REBAR LAYOUT
NOT TO SCALE



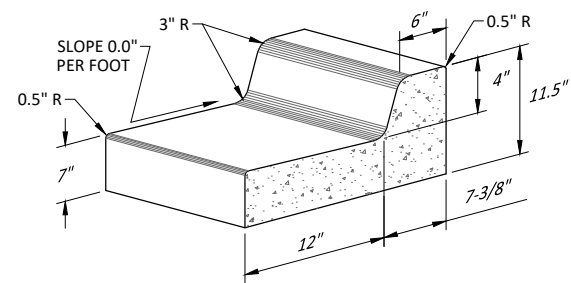
STORM SEWER CLEANOUT
NOT TO SCALE



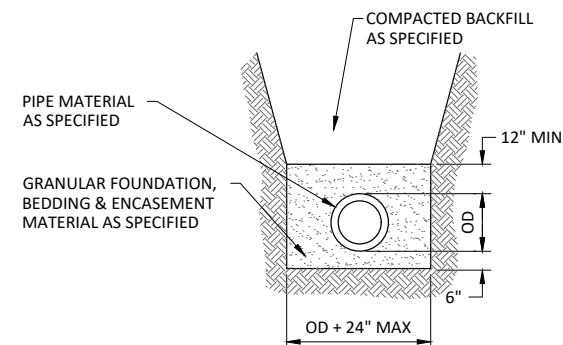
ROOF DRAIN CONNECTION



- NOTE:
- GALVANIZED STEEL SHALL RUN THROUGH THE BOTTOM AND UP THE SIDES TO SEPARATE THE STOP LOG FROM THE CONCRETE.
 - 2"X6" STOP LOG WHEN INSTALLED, SHALL BE FLUSH WITH TOP OF BACK OF CURB.
 - ENGINEER MUST APPROVE OF THE GALVANIZED STEEL PRIOR TO CONSTRUCTION.



CONCRETE CURB & GUTTER DESIGN B412
NOT TO SCALE



NON-RIGID STORM SEWER TRENCH
NOT TO SCALE

© Bolton & Menk, Inc. 2019. All Rights Reserved. BELLE PLAIN 1518762 CAD/CDL/1518762/101100W 8/17/2019 10:49:39 AM

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.

D. Joseph Duncan
D. JOSEPH DUNCAN
LIC. NO. 26100 DATE 7/19/2019



1960 PREMIER DRIVE
MANKATO, MINNESOTA 56001
Phone: (507) 625-4171
Email: Mankato@bolton-menk.com
www.bolton-menk.com

DESIGNED	NO.	ISSUED FOR	DATE
DJD			
DRAWN			
MAJ			
CHECKED			
DJD			
CLIENT PROJ. NO.			
M15-118762			

BELLE PLAINE, MINNESOTA
HICKORY PARK ICE RINKS
DETAILS & TYPICAL SECTIONS

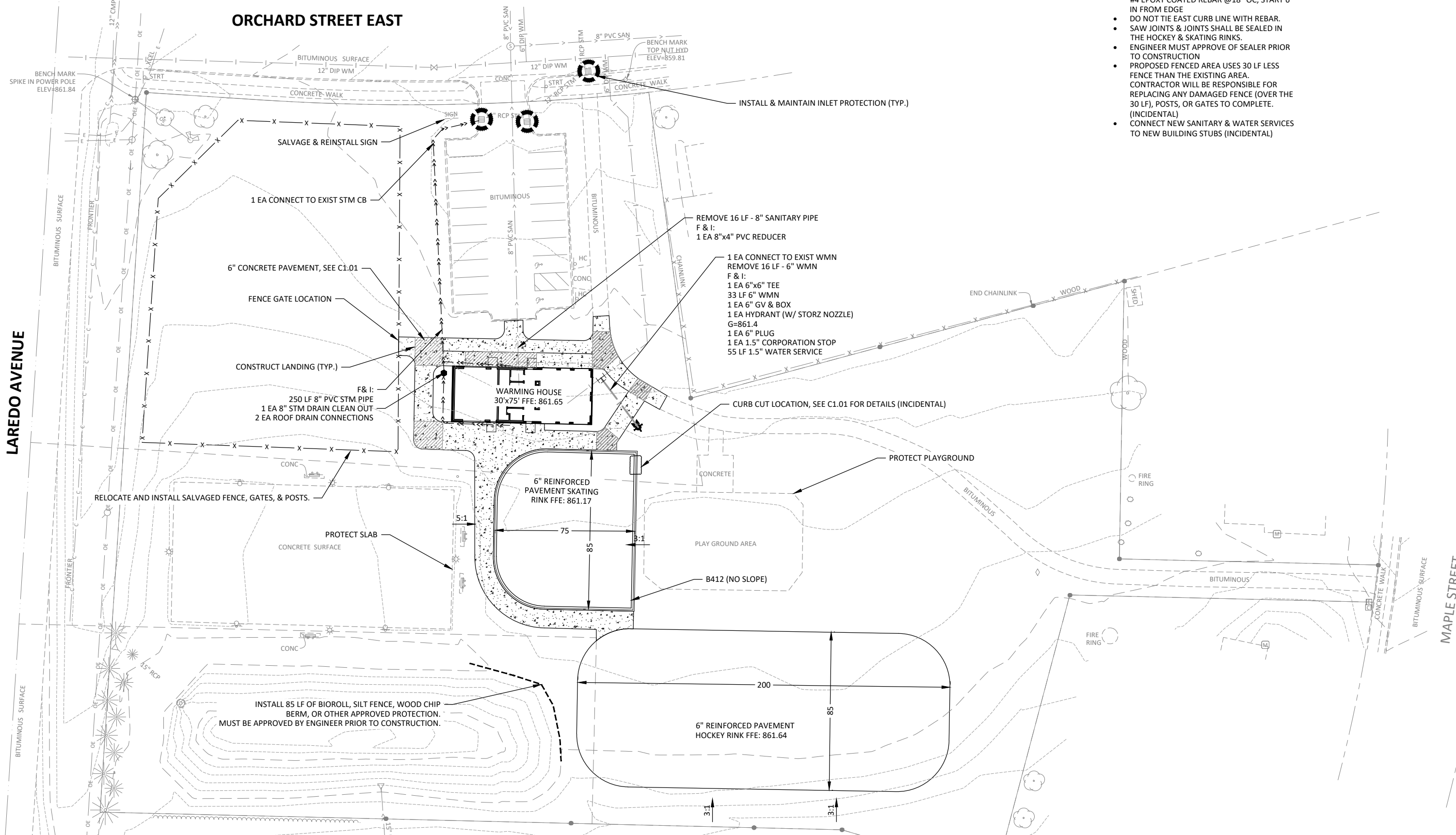
SHEET
C1.01

ORCHARD STREET EAST

LAREDO AVENUE

MAPLE STREET

- NOTE:**
- FOR JOINTING & REBAR PLAN, SEE C1.01
 - THE B412 CURB SHALL BE TIED TO SLAB WITH #4 EPOXY COATED REBAR @18" OC, START 6" IN FROM EDGE
 - DO NOT TIE EAST CURB LINE WITH REBAR.
 - SAW JOINTS & JOINTS SHALL BE SEALED IN THE HOCKEY & SKATING RINKS.
 - ENGINEER MUST APPROVE OF SEALER PRIOR TO CONSTRUCTION
 - PROPOSED FENCED AREA USES 30 LF LESS FENCE THAN THE EXISTING AREA. CONTRACTOR WILL BE RESPONSIBLE FOR REPLACING ANY DAMAGED FENCE (OVER THE 30 LF), POSTS, OR GATES TO COMPLETE. (INCIDENTAL)
 - CONNECT NEW SANITARY & WATER SERVICES TO NEW BUILDING STUBS (INCIDENTAL)



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.

D. Joseph Duncan
 D. JOSEPH DUNCAN
 LIC. NO. 26100 DATE 7/19/2019



1960 PREMIER DRIVE
 MANKATO, MINNESOTA 56001
 Phone: (507) 625-4171
 Email: Mankato@bolton-menk.com
 www.bolton-menk.com

DESIGNED	NO.	ISSUED FOR	DATE
DJD			
DRAWN			
MAJ			
CHECKED			
DJD			
CLIENT PROJ. NO.	M15-118762		

BELLE PLAINE, MINNESOTA
 HICKORY PARK ICE RINKS
 PROPOSED SITE PLAN

SHEET
C3.01

© Bolton & Menk, Inc. 2019. All Rights Reserved. M15-118762-C3.01-118762-30118762 8/17/2019 10:49:40 AM

